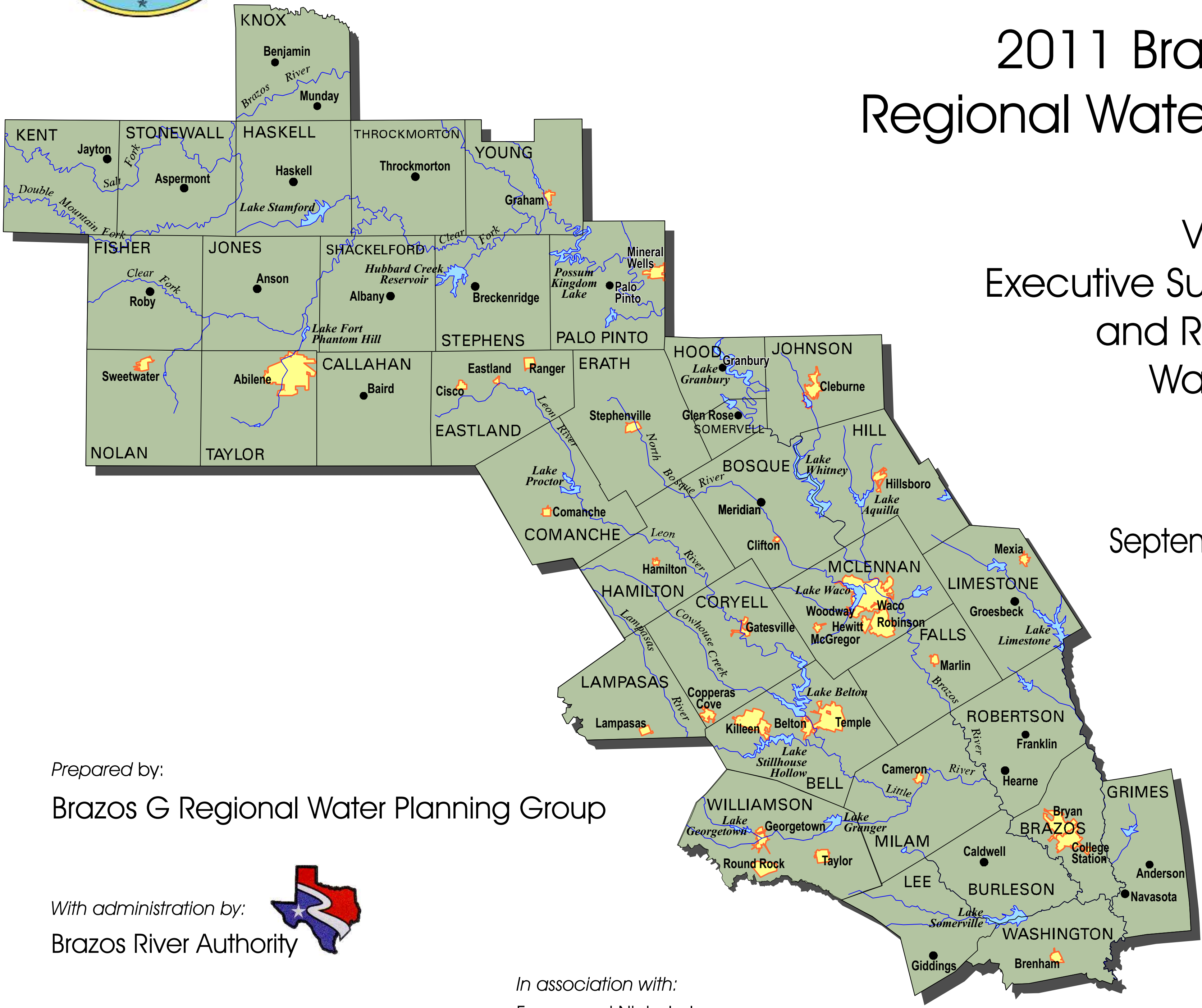
Brazos G Regional Water Planning Area

2011 Brazos G Regional Water Plan

Volume I Executive Summary and Regional Water Plan

September 2010



Prepared by:

Brazos G Regional Water Planning Group

With administration by:

Brazos River Authority

With technical assistance by:

HDR Engineering, Inc.

In association with:

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R.W. Harden and Associates, Inc.

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Brazos G Regional Water Plan

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 2007*, 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. 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. 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.

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 planning regions established by the TWDB. The TWDB appointed members to the regional planning groups, who serve without pay. The Brazos G Regional Water Planning Group (BGRWPG) was originally appointed by the TWDB to represent a wide range of stakeholder interests and act as the steering and decision-making body of the regional planning effort. As member terms expire, new members are appointed by the BGRWPG itself 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 a grant from the TWDB to develop the water plan. Mr. Trey Buzbee currently serves as the Regional Planning Project Manager for the BRA, assisted by Julie Andress. The BGRWPG selected HDR Engineering, Inc. as prime consultant for the planning and engineering tasks necessary for plan development.

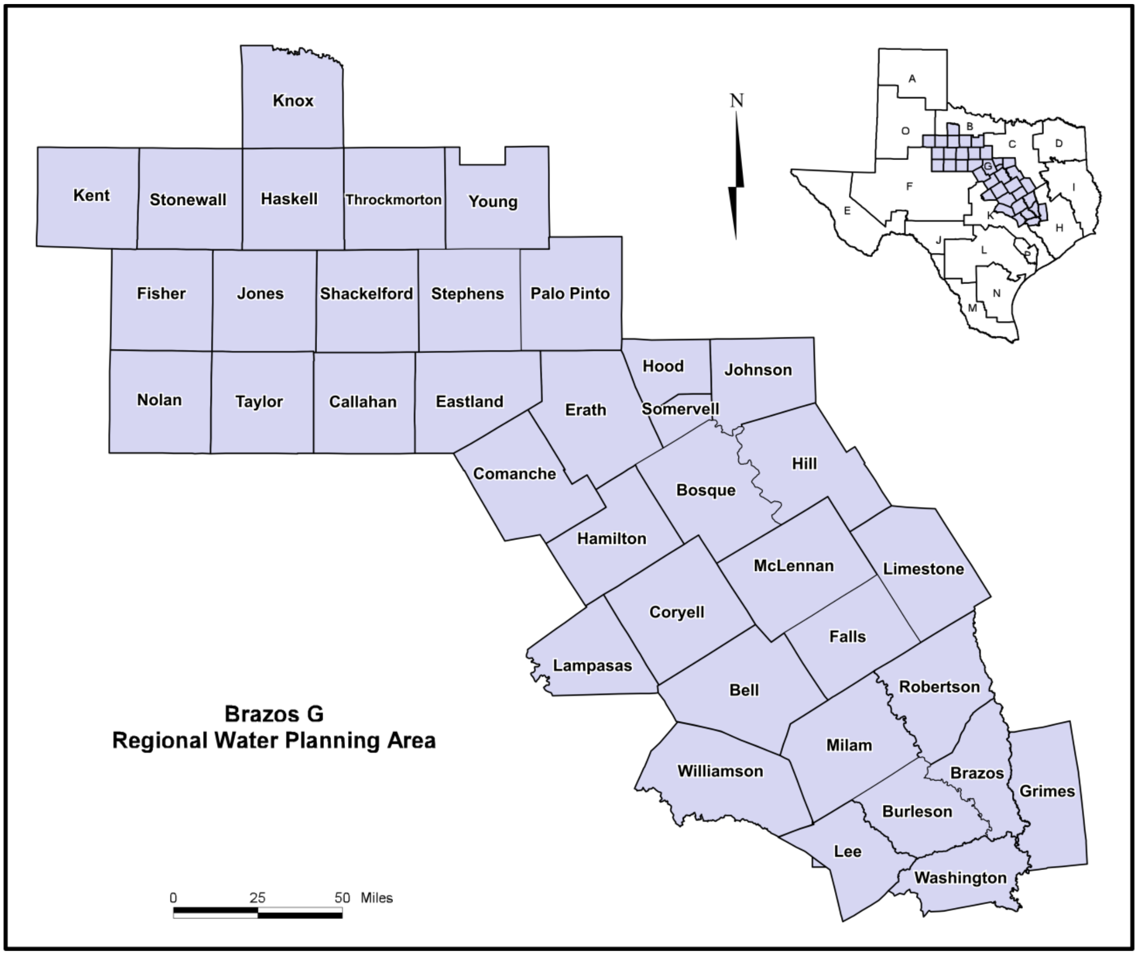

Figure ES-1. Brazos G Regional Water Planning Area

The BGRWPG consists of 19 voting members who represent the following 12 interests: the public, counties, municipalities, industries, agriculture, the environment, small businesses, electric-generating utilities, river authorities, water districts, water utilities and groundwater conservation districts. 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 2011 Brazos G Regional Water Plan (both current and recently retired).

The regional water plans are developed on a 5-year cycle, with previous plans developed in 2001 and 2006. This 2011 Plan is considered an update of the 2006 Plan. In accordance with SB2 (as amended), all of the regional water plans must be completed and adopted by September 1, 2010. The TWDB must approve them and compile the 16 plans into the State

Water Plan by January 5, 2011. The regional water plans will continue to be updated every 5 years.

Table ES-1.
Current and Recent Brazos G RWPG Voting Members
(since June 2005)

Interest Group	Name	Employment
Voting Members		
Agricultural	Dale Spurgin (Chairman) Wayne Wilson	Judge, Jones County Rancher
Counties	Tim Fambrough Jon Burrows Mike Sutherland	Judge, Nolan County Judge, Bell County Judge Burleson County
Electric Generating Utilities	Scott Diermann (Vice Chairman)	Luminant Power
Environmental	Sheril Smith Stephen Stark	University of Texas Retired (Texas A&M University)
Industry	Randy Waclawczyk	Portnoy Environmental
Municipalities	Tommy O. O'Brien Wiley Stem III Tom Clark Alva D. Cox David Blackburn Larry Groth	City of Abilene City of Waco Brushy Creek MUD City of Granbury City of Temple City of Waco
Public	Gary Newman Scott Mack (past Chairman)	Waterstone Development Retired
River Authorities	Phil Ford (Secretary/Treasurer)	Brazos River Authority
Small Business	Gail L. Peek Horace Grace	Beard Kultgen Brophy Bostwick & Dickson AMG Enterprises, Inc.
Water Districts	Terry Kelley Kathleen Webster Joe Cooper	Johnson County SUD Retired Real Estate Broker Middle Trinity GCD
Groundwater Districts	Mike McGuire	Rolling Plains GCD
Water Utilities	Charles Beseda Kent Watson	Birome WSC Wickson Creek SUD
Non-Voting Members		
Region H RWPG Liaison	John Hofmann	Brazos River Authority
LCRA Representative	James Kowis	Lower Colorado River Authority
Region F RWPG Liaison & CRMWD Representative	John Grant	Chair, Region F & GM of Colorado River Municipal Water District
Llano Estacado (O) RWPG Liaison	Mike McClendon	Brazos River Authority
Lower Colorado (K) RWPG Liaison	Mark Jordan	Lower Colorado River Authority
TWDB Project Manager	David Meesey Matt Nelson Lann Bookout	Texas Water Development Board
TPWD	Mellisa Mullins Dan Opdyke	Texas Parks and Wildlife Department
TDA	E.W. Wesley	Texas Department of Agriculture
Region C RWPG Liaison	Connie Standridge Paul Zweiacker	Texas Utilities Luminant

The planning horizon to be used is the 60-year period from 2000 to 2060. This planning period allows for long-term forecast of the prospective water situation, sufficiently in advance of needs, to allow for appropriate management measures to be implemented. As required in Senate Bill 1, the TWDB specified planning rules and guidelines (31 TAC 357.7 and 357.12) to focus the efforts and to provide for general consistency among the regions so that the regional plans can then be aggregated into an overall State Water Plan.

The structure of the 2011 Regional Water Plan is organized in accordance with TWDB guidelines and summarized by section title as follows.

1) Description of the Brazos G Region (Volume I)
2) Projected Population and Water Demands (Volume I)
3) Evaluation of Water Supplies in the Region (Volume I)
4) Identification, Evaluation and Selection of Water Management Strategies Based on Needs
   - 4A) Comparison of Demand to Supply (Volume I)
   - 4B.1) Identification, Evaluation and Selection of Water Management Strategies (Volume II)
   - 4B.2) Technical Evaluations of Water Management Strategies (Volume II)
   - 4C) Water Supply Plans (Volume I)
5) Impacts of Recommended Water Management Strategies on Key Parameters of Water Quality and Moving Water from Rural and Agricultural Areas (Volume I)
6) Water Conservation and Drought Management Recommendations (Volume I)
7) Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources (Volume I)
8) Recommendations for Unique Stream Segments, Unique Reservoir Sites and Other Legislative Recommendations (Volume I)
9) Report to the Legislature on Water Infrastructure Funding Recommendations (Volume I)
10) Adoption of Plan (Volume I)

ES.2 Description of the Region

The Brazos G Region 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 (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 189 municipal water user groups (WUGs), which are defined as cities with a population greater than 500 in 2000, and water supply corporations and utilities using water volumes of 280 acft or more in 2000. To account for people living outside the cities, projections were also developed for a 'county-other' category of municipal water use for each of the 37 counties in the region. In response to recent growth rates apparently greater than projected for the 2006 Plan, the TWDB revised population projections for 35 municipal WUGs, and added six new WUGs for the 2011 Plan.

Figure ES-2 illustrates population growth in the entire Brazos G Regional Water Planning Area (BGRWPA) for 1900 to 2000 and projected growth for 2010 to 2060.

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 2000 and projected growth from 2010 to 2060. Projected growth is greatest in the IH-35 Corridor.

ES.4 Water Demand Projections

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 water demand projections for each of the five non-municipal WUGs in each of the 37 counties in Region G. Revisions to steam-electric water demands were made to the projections used in the 2006 Plan to reflect input from industry and the Brazos G RWPG. All other non-municipal water demands used in the 2011 Plan are identical to those used in the 2006 Plan.

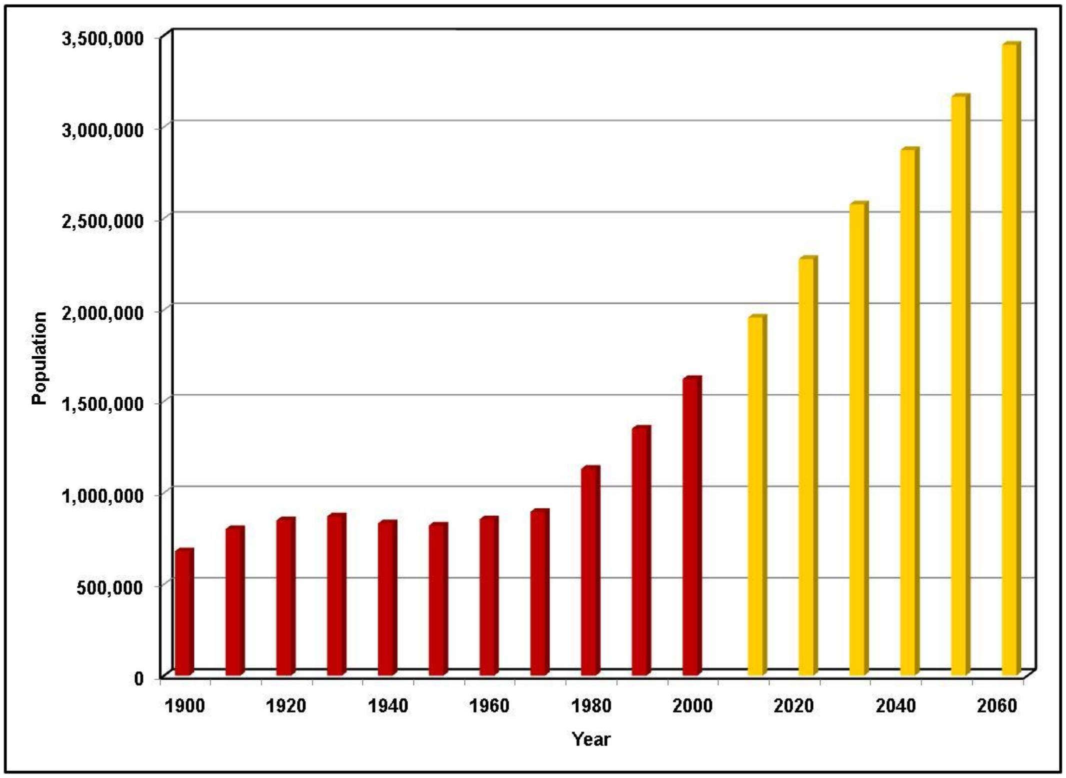

Figure ES-2. Historical and Projected Brazos G Area Population

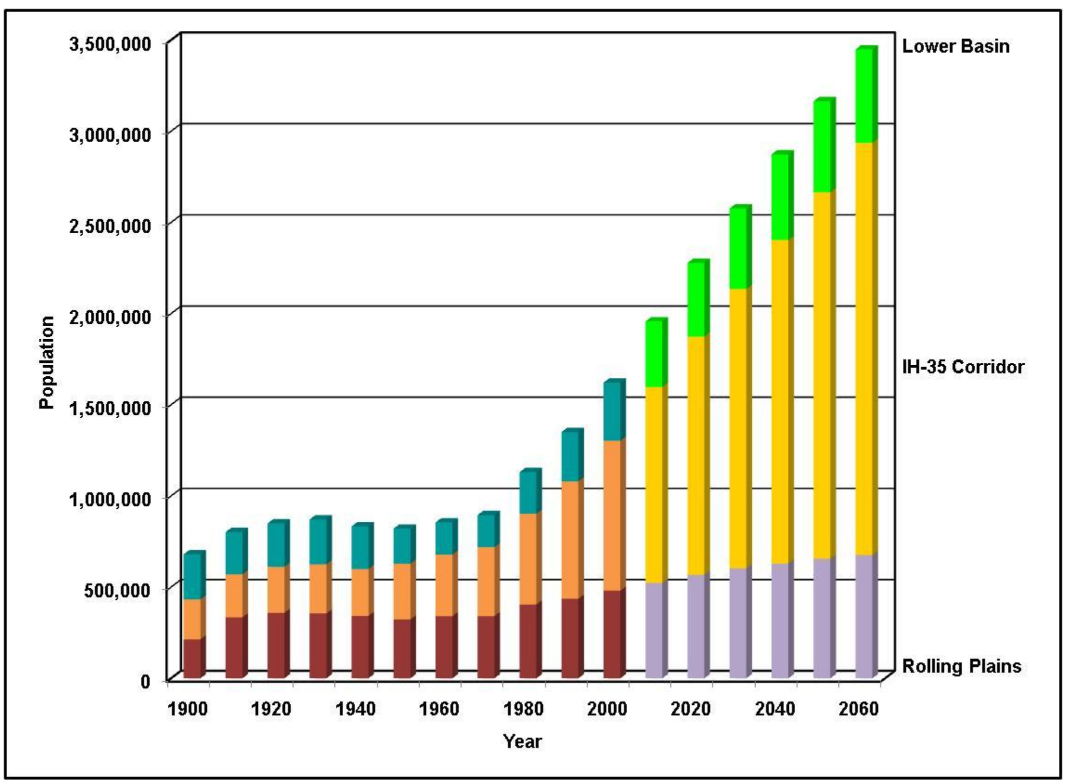

Figure ES-3. Historical and Projected Population by Sub-Region

Total water use for the region is projected to increase from 795,183 acft in 2000 to 1,248,514 acft in 2060, a 57 percent increase, as shown in Figure ES-4. The six types of water use as percentages of total water use are shown for 2000 and 2060 in Figure ES-5. Municipal and steam-electric water use as percentages of the total water use are projected to increase from 2000 to 2060, while mining, irrigation, and livestock water use are projected to decrease as percentages of the total. Manufacturing use is projected to retain it same percentage of the total water use.

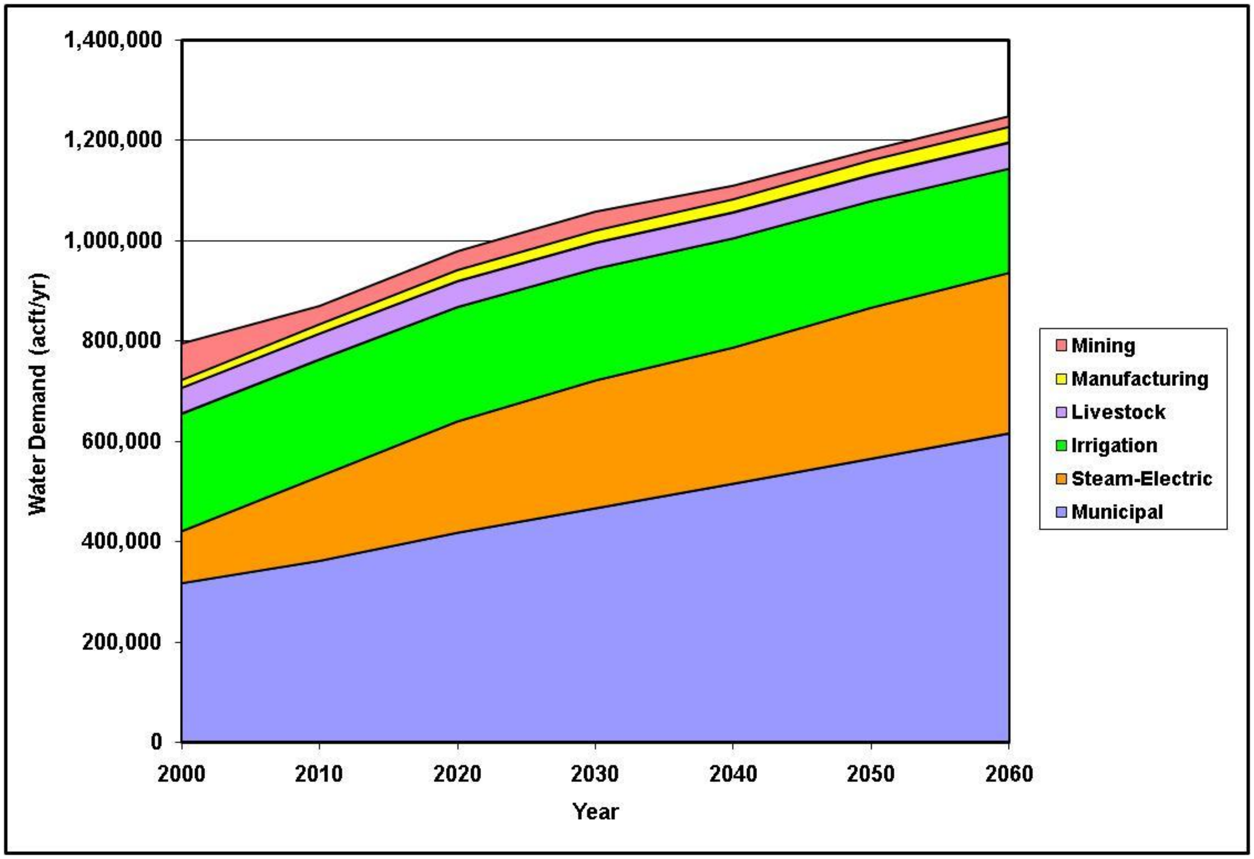

Figure ES-4. Projected Total Water Demand

ES.5 Water Supply

ES.5.1 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

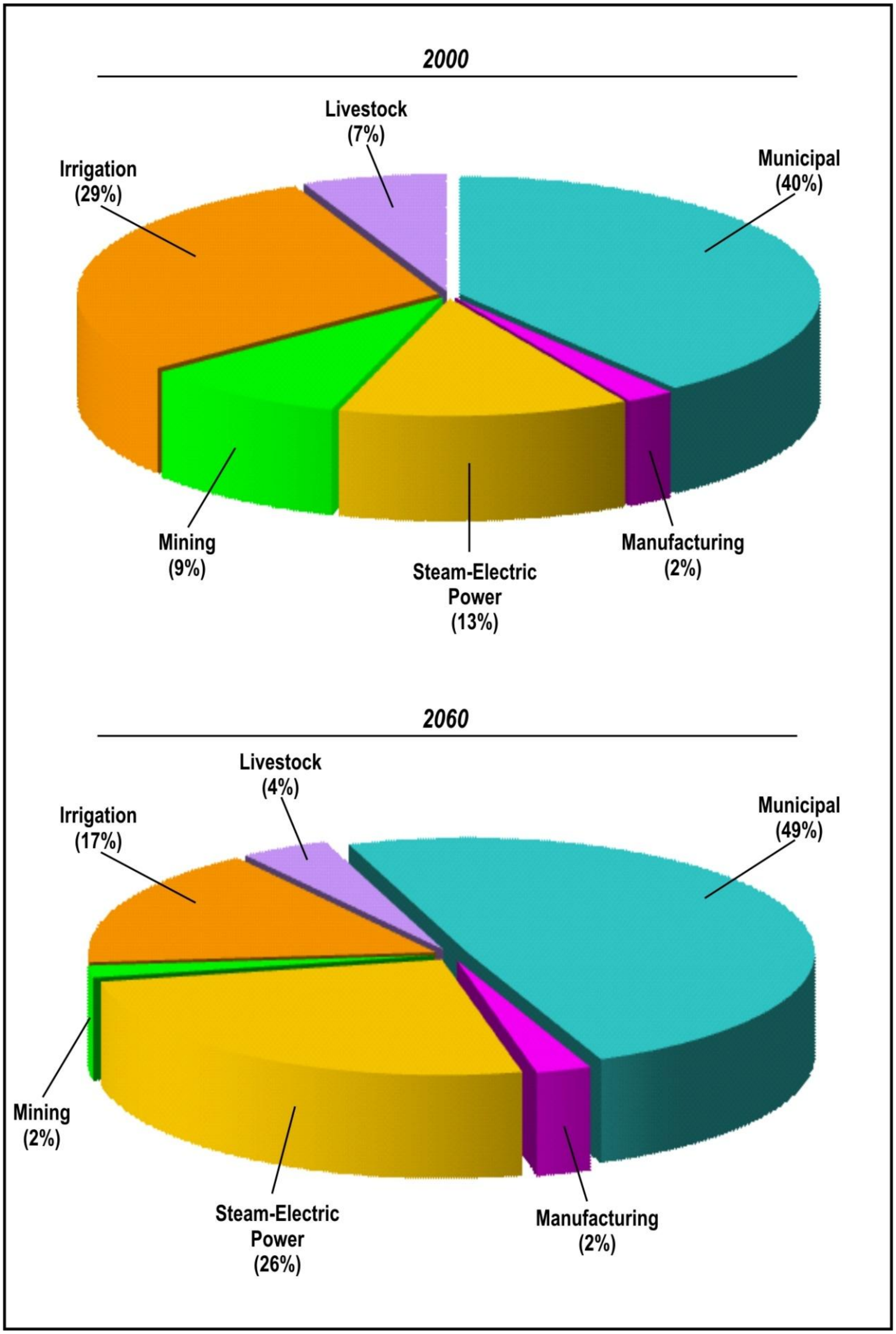

Figure ES-5. Total Water Demand

issued. 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 potable-quality groundwater.

The State of Texas owns the surface water resources of the State, and issues water rights to utilize surface water. A total of 1,095 water rights currently exist in the Brazos River Basin, with a total authorized diversion of 2,586,000 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 2,319,000 acft/yr (89.7 percent) of the authorized diversion volume. The remaining 1,055 water rights primarily consist 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.

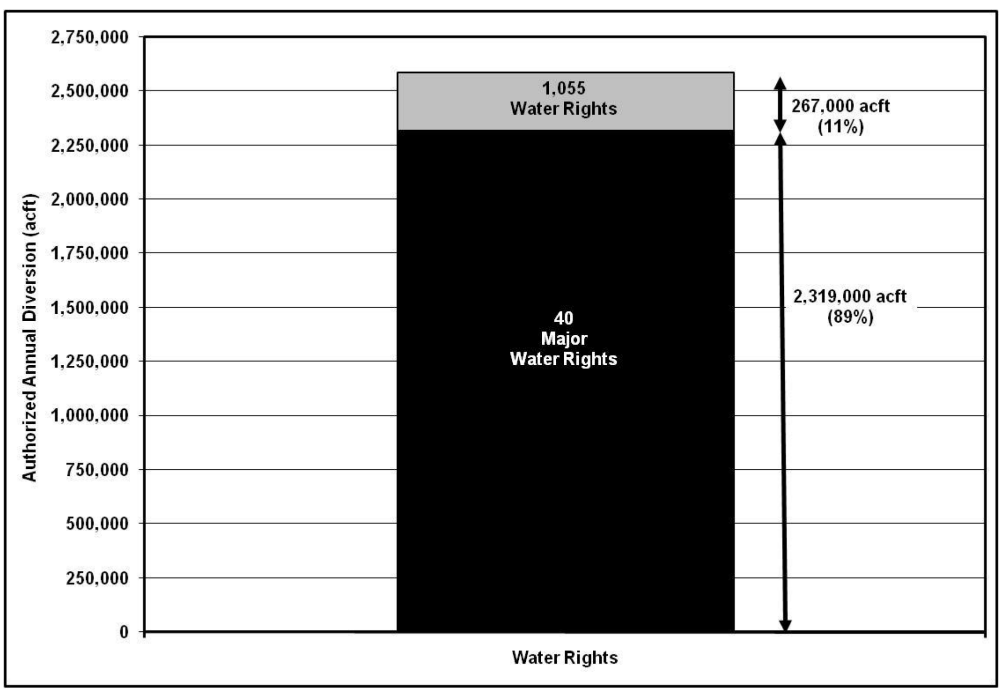

Figure ES-6. Comparison of Water Rights in the Brazos River Basin

ES.5.2 Groundwater Supplies

Fifteen aquifers underlie parts of the Brazos G Area and, if developed fully, can provide a combined reliable supply of about 587,595 acft/yr. As currently developed, a total groundwater supply of 355,811 acft/yr exists in the region (2010 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. Both of these aquifers are being pumped in excess of their estimated sustainable yield in some counties. 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.

Groundwater supplies in 20 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 Managed 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 for each aquifer, when finally determined, will govern the management plans and permitting decisions by the respective GCDs, and will represent the total groundwater available from an aquifer system in a county for use in planning by the BGRWPG. As of September 2009, only GMA-8 had determined DFCs and MAGs for the aquifers in its area. The MAG estimates from GMA-8 were used to determine groundwater availability from those specific aquifers and counties. For all other aquifers and counties, a combination of water availability estimates used in the 2006 Plan and projected MAG estimates not yet finalized by the GMAs were used to determine available groundwater supplies.

ES.5.3 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, which in turn improves the quality of water.

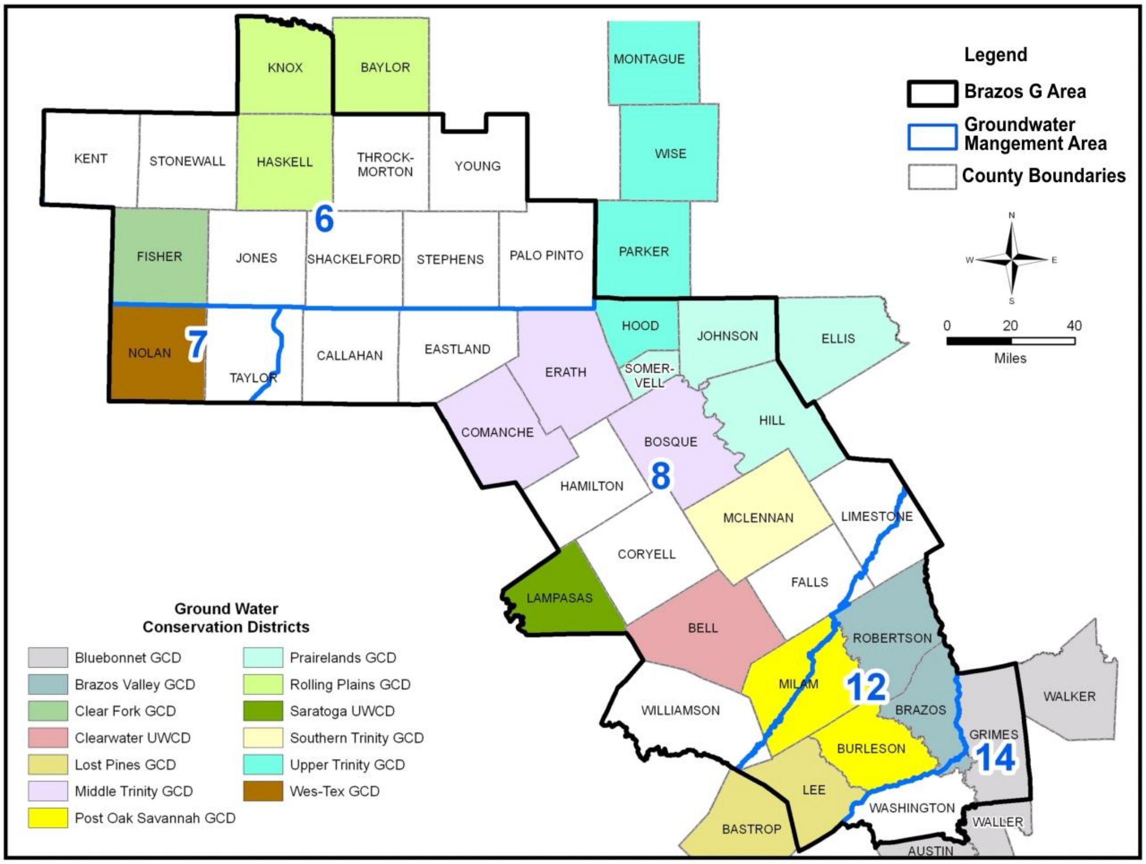

Figure ES-7. Groundwater Conservation Districts and Groundwater Management Areas Located Wholly or Partially within the Brazos G Area.

ES.5.4 Supply and Demand Comparison

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. 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 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. Only eight of the 37 counties in the Brazos G Area have no projected shortages for all water user groups: Burleson, Comanche, Erath, Fisher, Hamilton, Stonewall, Washington and Young.

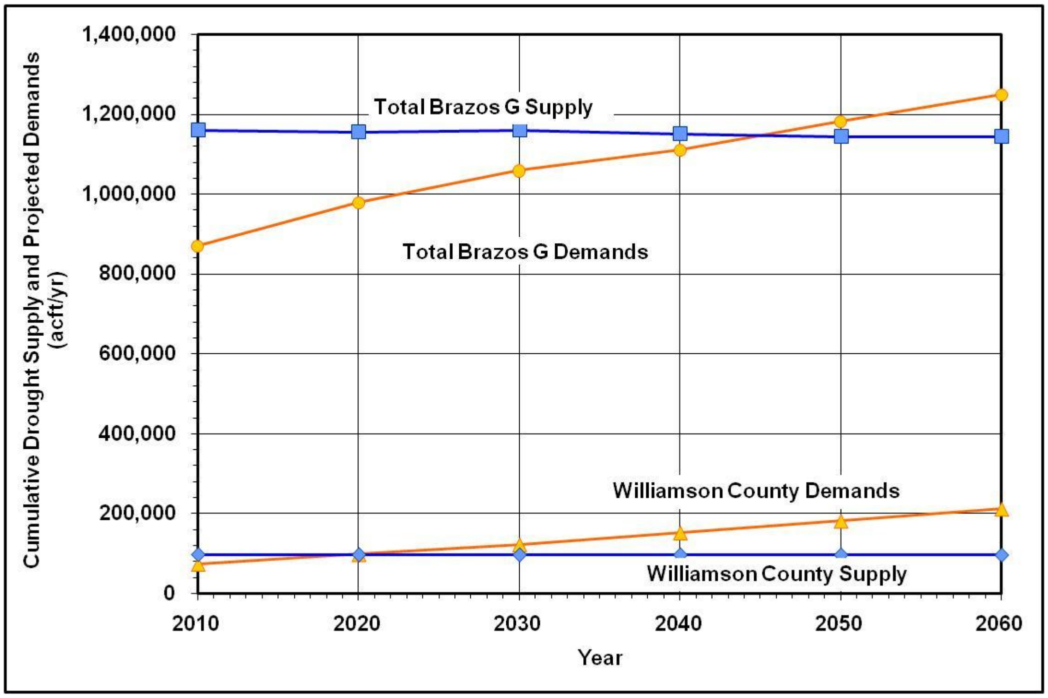

Figure ES-8. Comparison of Supplies and Demands for Brazos G Region and Williamson County

ES.5.5 Water Supply Strategies to Meet Needs

The water management strategies in Table ES-2 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. Section 4B in Volume 2 contains subsections discussing each of these possible strategies.

ES.5.6 Water Plan Findings

Table ES-3 summarizes the recommended water management strategies in the plan that develop or import new sources of supply into the Brazos G Area. Strategies that utilize existing water resources without increasing or augmenting those supplies are not listed.

Total new supplies of water into the Brazos G Area total 587,278 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 $3 billion.

Table ES-2.
Water Management Strategies Identified as Potentially Feasible to Meet Shortages

Report Section (Volume II)	Water Management Strategy and Description
4B.2	**Advanced 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)
4B.3	**Wastewater Reuse** (use highly treated wastewater treatment plant effluent to meet non-potable water needs, including landscape irrigation and industrial use)
4B.4	**System Operation of Brazos River Authority Reservoirs** (coordinated operation of the BRA reservoir system will increase supplies, maximize use of existing facilities and delay the need for new reservoir construction)
4B.5	**Groundwater/Surface Water Conjunctive Use** • Lake Granger Augmentation • Champion Well field and Oak Creek Reservoir
4B.6	**Desalination** (treatment of brackish water to remove minerals with resulting potable water) • Lake Granbury supplies to Johnson County • Brackish groundwater to N.E. Johnson County
4B.7	**Millers Creek Reservoir Augmentation** (supplement yield of a reservoir by diverting flows from an adjacent stream into the reservoir and construction of a new dam downstream from the existing structure)
4B.8	**Aquifer Storage and Recovery** (Inject or percolate excess surface water into groundwater aquifers, storing for future use) • Seymour Aquifer • Trinity Aquifer (Johnson County)
4B.9	**Brush Control and Range Management** (increase deep percolation and discharge to streams by removing unwanted brush)
4B.10	**Weather Modification** (cloud seeding to increase precipitation frequency and intensity)
4B.11	**Interregional Water Management Strategies** (provide water supplies into the Brazos G Region from adjacent regions) • TRA Reuse through Joe Pool Reservoir (Region C) • Regional Surface Water Supply to Williamson County from Lake Travis (Region K)
4B.12	**New Reservoirs** (new or updated evaluations of the following proposed new reservoirs) • Cedar Ridge Reservoir • South Bend Reservoir • Throckmorton Reservoir • Double Mountain Fork Reservoir (East and West sites) • Turkey Peak Reservoir • Little River Reservoir • Millican Reservoir (Bundic Crossing and Panther Creek Sites) • Gibbons Creek Reservoir Expansion • Brushy Creek Reservoir
4B.13	**Off-Channel Reservoirs** (construction of smaller reservoirs on tributary streams with lower environmental impact, lower cost dam, and usually with pump-over of supplies from a larger stream). Possible projects include: • City of Groesbeck Off-Channel Reservoir • Wheeler Branch Off-Channel Reservoir • Peach Creek Off-Channel Reservoir • Little River Off-Channel Reservoir • Lake Palo Pinto Off-Channel Reservoir • Coryell County Off-Channel Reservoir
4B.14	**Interconnection of Regional and Community Systems** (use larger cities' systems or other facilities more fully and assist smaller communities to meet their needs). Possible projects include: • Bosque County Regional Project • Midway Pipeline Project (West Central Brazos Distribution System) • Interconnection from Abilene to Sweetwater • Interconnection of Central Texas WSC with Salado WSC • Possum Kingdom Reservoir for Abilene
4B.15	**Carrizo-Wilcox Aquifer Development** (further develop and utilize the Carrizo-Wilcox Aquifer) • Additional Development of Carrizo-Wilcox Aquifer for Brazos County Needs • Carrizo-Wilcox Water Supply for Williamson County • Lake Granger Augmentation (Section 4B.5)

Table ES-2 (Concluded)

Report Section (Volume II)	***Water Management Strategy and Description***
4B.16	**Voluntary Redistribution** (the purchase or lease of water supply from an entity that has water supply in excess of long-term or interim needs)
4B.17	**Miscellaneous Strategies** (various pipelines, treatment plants and groundwater wells to meet projected needs of water user groups and wholesale water providers)
4B.18	**Storage Reallocation of Federal Reservoirs** (reallocate a portion of the flood control pool of US Army Corps of Engineers reservoirs to conservation storage)
4B.19	**Upper Brazos Chloride Control** (intercept highly-saline groundwater before it discharges to the surface)
4B.20	**BRA Reservoir Connection** • Lake Belton to Lake Stillhouse Hollow • Lake Aquilla Augmentation
4B.21	**2006 Plan Amendments** (various amendments to the 2006 Plan that are included in the 2011 Plan)

The 2011 Brazos G Regional Water Plan includes recommendations for 21,346 acft/yr of municipal conservation savings and another 83,527 acft/yr for wastewater reuse. The conservation savings are in excess of those already included in the TWDB demand projections, and the recommended reuse strategies are in excess of existing reuse supplies in the basin.

System operation of the Brazos River Authority's reservoirs can increase supplies in the Brazos G Area by more than 138,000 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 Brazos River Authority 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. As shown by analysis of the Lake Granger Augmentation strategy, the interruptible supply proposed by the BRA can be firmed up with groundwater resources, further extending existing resources in the basin.

Implementation of the 2011 Brazos G Regional Water Plan will result in the development of new water supplies that will be reliable in the event of a repeat of the most severe drought on record. It is evident that implementation of all recommended water management strategies is not likely to be necessary in order to meet projected needs within the planning period. The BGRWPG explicitly recognizes the difference between additional supplies and projected needs as System Management Supplies and has recommended the associated water management strategies in the 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 2011 Brazos G Regional Water Plan

In addition to providing a roadmap for development of supplies to meet future water needs in the basin, the 2011 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 region,
- The plan provides examples of drought management and water conservation plans 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.

Table ES-3.
Summary of Recommended Water Management Strategies Involving New Sources of Supply in the 2011 Brazos G Regional Water Plan

Strategy	WUG or WWP	New Supply by 2060 (acft/yr)	Total Project Cost (September2008 Prices)
Conservation Strategies			
Municipal	39 WUGs	21,346	N/D[1]
Manufacturing	5 Counties	594	N/D
Steam-Electric	6 Counties	11,803	N/D
Mining	3 Counties	973	N/D
Irrigation	5 Counties	7,041	N/D
Total Conservation		**41,757**	**N/D**
Reuse Strategies			
Reuse	City of Abilene	5,550	N/D
	City of Cleburne	4,533	$10,991,000
	City of Bryan	605	$6,485,000
	City of College Station	312	$3,292,000
	Steam Electric – Bell County	8,407	$17,404,000
	Steam-Electric – Robertson County	15,479	$23,126,000
	City of Waco	15,765	N/D
	Steam-Electric – Grimes County	11,000	$33,647,000
	City of Round Rock	7,443	$6,369,000
	City of Killeen	2,488	$18,323,000
	City of Harker Heights	185	
Total Reuse		**71,767**	**$119,637,000**
Water Supply from other Regions			
BCRUA	Chisholm Trail SUD	3,272	$13,264,000
	City of Round Rock	20,928	$147,264,000
	City of Leander	7,039	$169,147,000
	City of Cedar Park	12,620	$61,858,000
TRWD	Bethesda WSC	2,496	N/D
City of Arlington	Bethesda WSC	1,248	$16,334,000
City of Grand Prairie	Johnson County SUD	6,726	$35,646,000
Mansfield	Johnson County SUD	10,080	$27,182,000
Total from Other Regions		**64,409**	**$470,695,000**
Augmentation of Existing Surface Water Supplies			
Turkey Peak Reservoir	Palo Pinto County MWD No. 1	7,600	$50,227,000
Millers Creek Reservoir Augmentation	North Central Texas Municipal Water District	17,582	$46,948,000
Raise Level of Gibbons Creek Reservoir	Steam-Electric – Grimes County	3,870	$12,141,000
BRA System Operation (Lake Granger Augmentation)[2]	BRA	54,279	$643,928,000
Total Augmentation of Existing Surface Water Supplies		**83,331**	**$753,244,000**

Table ES-3 (Continued)

Strategy	WUG or WWP	New Supply by 2060 (acft/yr)	Total Project Cost (September 2008 Prices)
New Reservoirs			
Groesbeck Off-Channel	City of Groesbeck	1,755	$10,412,000
Coryell County	BRA – Little River	3,365	$37,489,000
Cedar Ridge	City of Abilene	23,380	$285,214,000
Brushy Creek Reservoir	City of Marlin	2,090	$18,553,000
Total New Reservoirs		**30,590**	**$351,668,000**
Systems Approaches			
BRA System Operation (Excluding Lake Granger Augmentation)	Cleburne	1,530	$14,086,000
	Bosque County – Steam Electric	5,222	$24,725,000
	White Bluff Community WSC	600	$9,277,000
	City of Keene	157	$3,062,000
	Woodrow-Osceola WSC	150	$7,231,000
	Somervell County – Steam Electric	76,270	$136,032,000
	College Station	2,500	$23,954,000
Total from Systems Approaches		**86,429**	**$218,366,000**
Groundwater Development			
Carrizo-Wilcox Aquifer – Limestone County	Manufacturing – Limestone County	75	$347,000
	City of Kosse	100	$2,386,000
	Bistone MWSD	3,600	$18,458,000
Champion Well Field Expansion	City of Sweetwater	1,000	$15,015,000
Carrizo-Wilcox Aquifer – Brazos County	City of College Station	3,000	$28,101,000
	Wickson SUD	1,500	$1,201,000
Carrizo-Wilcox Aquifer – Burleson County	Southwest Milam WSC[4]	966	$3,502,000
Carrizo-Wilcox Aquifer – Lee County	Aqua WSC	403	$1,364,000
	Lee County WSC	806	$2,166,000
Carrizo-Wilcox Aquifer – Milam County	Steam Electric – Milam County	1,613	$3,160,000
	Mining – Milam County	100	$715,000
Edwards-Trinity Nolan County	Mining – Nolan County	114	$679,000
Trinity Aquifer – McLennan County	Chalk Bluff WSC	230	$2,707,000
	Western Hills WSC	198	$1,073,000
Trinity Aquifer – Hood County	Lipan	685	$8,524,000
	Tolar	150	$1,286,000
Trinity Aquifer – Johnson County	Parker WSC	160	$2,045,000

Table ES-3 (Concluded)

Strategy	***WUG or WWP***	***New Supply by 2060 (acft/yr)***	***Total Project Cost (September 2008 Prices)***
Groundwater Development			
Trinity Aquifer – Williamson County	City of Florence	322	$1,648,000
	Williamson County-Other	280	$1,995,000
Gulf Coast Aquifer – Grimes County	Steam Electric – Grimes County	5,600	$31,630,000
Total Groundwater Development		**20,902**	**$128,002,000**
Total New Supplies		**799,185**	**>$2,041,612,000**

1. Not Determined or cost shared by multiple entities.
2. The Lake Granger Augmentation includes development of an average annual supply of groundwater from the Carrizo-Wilcox Aquifer of 30,832 acft/yr to develop the total new supply of 54,813 acft/yr (Volume II, Section 4B.5).
3. Includes additional BRA contractual commitments not specifically identified in Section 4B.4. Does not include Region H supplies, but does include minor increases to Region C.
4. Although Southwest Milam is primarily located in Milam County, supplies for this strategy are located in Burleson County.

Section 1
Description of the Region

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 and 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. The TWDB uses the 16 regional water plans to develop the State Water Plan.

The regional water plans are developed on a 5-year cycle, with previous plans developed in 2001 and 2006. This 2011 Plan is considered an update of the 2006 Plan. In accordance with SB2 (as amended), all of the regional water plans must be completed and adopted by September 1, 2010. The TWDB must approve them and compile the 16 plans into the State Water Plan by January 5, 2011. The regional water plans will continue to be updated every 5 years.

1.2 Brazos G Regional Water Planning Area

The Brazos G Regional Water Planning Area (Brazos G Area), 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 Brazos G Area, 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].

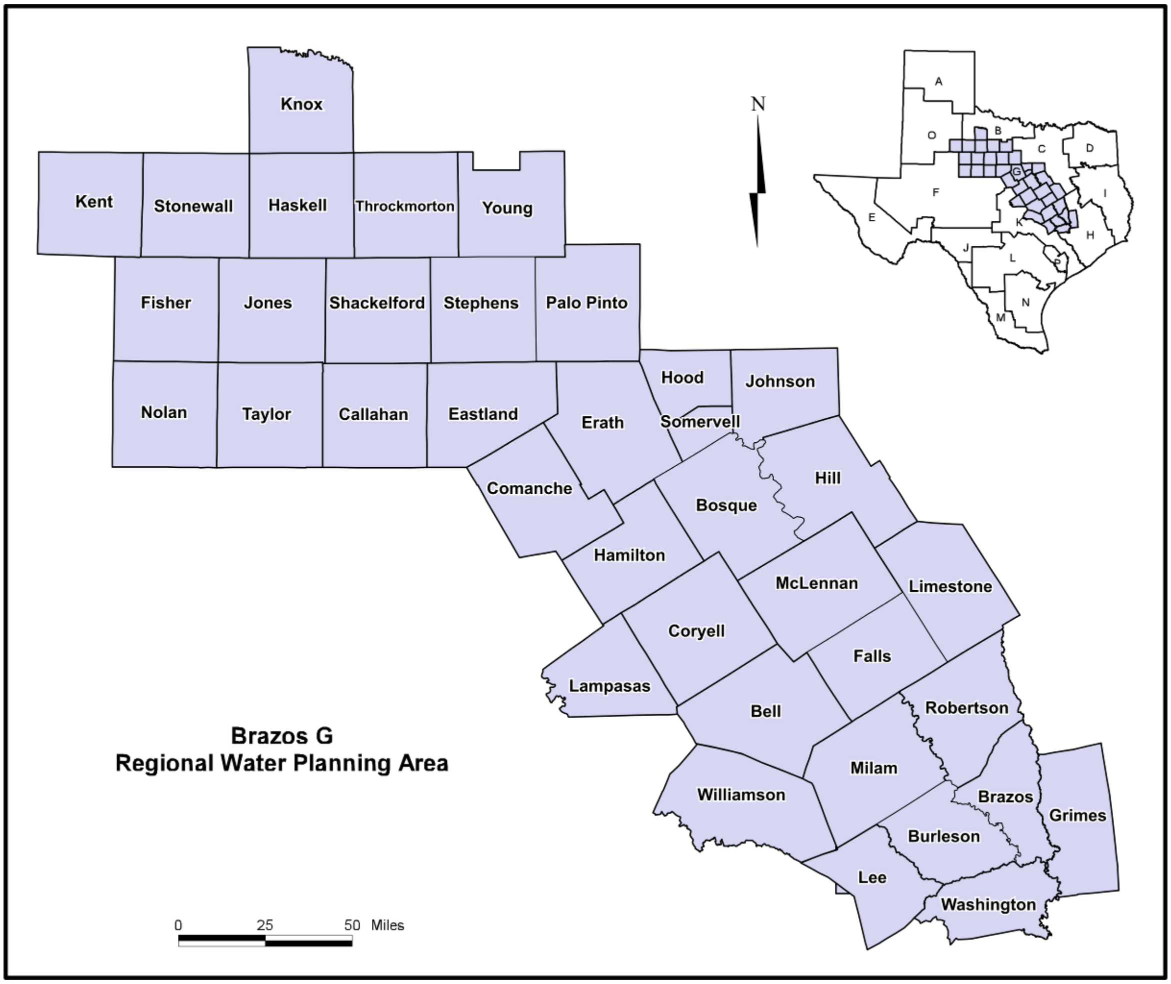

Figure 1-1. Location Map

[1] Texas State Data Center and Office of State Demographer, *Estimates of Total Populations of Counties and Places in Texas for July 1, 2007 and January 1, 2008*, October 2008.

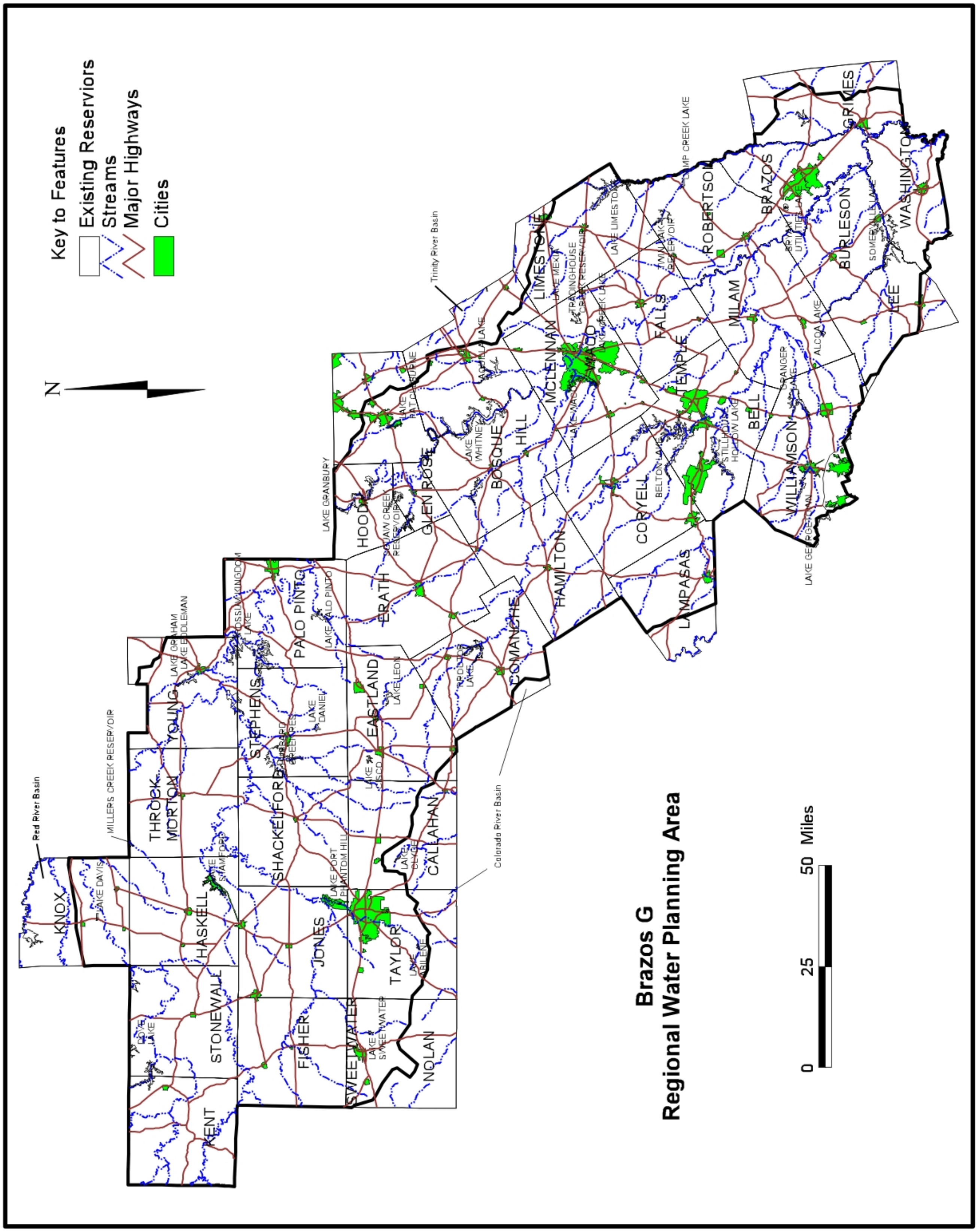

Figure 1-2. Major Features of the Brazos G Area

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]

Members of the RWPG serve defined terms, and some of these members' terms expired or began during development of this plan. Past and current members of the Brazos G RWPG who contributed to the development of the 2011 Brazos G Regional Water Plan are listed in Table 1-1. These members represent 12 interests: the public, counties, municipalities, industries, agriculture, the environment, small businesses, electric-generating utilities, river authorities, water districts, groundwater districts 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.

1.2.1 Population

1.2.1.1 Regional Trends

Figure 1-3 illustrates population growth in the entire Brazos G Area for 1900 to 2000 and projected growth for 2010 to 2060. Table A-1 in Appendix A gives historical population data for each county in the Brazos G Area, as well as regional and State population totals, for 1990 to 2000.

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 2.1 percent. Population in the Brazos G Area is expected to increase by an average of 1.2 percent annually, reaching 3.4 million by 2060. This is roughly double the population estimated in 2000.

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

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

Interest Group	***Name***	***Employment***
Voting Members		
Agricultural	Dale Spurgin (Chairman) Wayne Wilson	Judge, Jones County Rancher
Counties	Tim Fambrough Jon Burrows Mike Sutherland	Judge, Nolan County Judge, Bell County Judge Burleson County
Electric Generating Utilities	Scott Diermann (Vice Chairman)	Luminant Power
Environmental	Sheril Smith Stephen Stark	University of Texas Retired (Texas A&M University)
Industry	Randy Waclawczyk	Portnoy Environmental
Municipalities	Tommy O. O'Brien Wiley Stem III Tom Clark Alva D. Cox David Blackburn Larry Groth	City of Abilene City of Waco Brushy Creek MUD City of Granbury City of Temple City of Waco
Public	Gary Newman Scott Mack (past Chairman)	Waterstone Development Retired
River Authorities	Phil Ford (Secretary/Treasurer)	Brazos River Authority
Small Business	Gail L. Peek Horace Grace	Beard Kultgen Brophy Bostwick & Dickson AMG Enterprises, Inc.
Water Districts	Terry Kelley Kathleen Webster Joe Cooper	Johnson County SUD Retired Real Estate Broker Middle Trinity GCD
Groundwater Districts	Mike McGuire	Rolling Plains GCD
Water Utilities	Charles Beseda Kent Watson	Birome WSC Wickson Creek SUD
Non-Voting Members		
Region H RWPG Liaison	John Hofmann	Brazos River Authority
LCRA Representative	James Kowis	Lower Colorado River Authority
Region F RWPG Liaison & CRMWD Representative	John Grant	Chair, Region F & GM of Colorado River Municipal Water District
Llano Estacado (O) RWPG Liaison	Mike McClendon	Brazos River Authority
Lower Colorado (K) RWPG Liaison	Mark Jordan	Lower Colorado River Authority
TWDB Project Manager	David Meesey Matt Nelson Lann Bookout	Texas Water Development Board
TPWD	Mellisa Mullins Dan Opdyke	Texas Parks and Wildlife Department
TDA	E.W. Wesley	Texas Department of Agriculture
Region C RWPG Liaison	Connie Standridge Paul Zweiacker	Texas Utilities Luminant

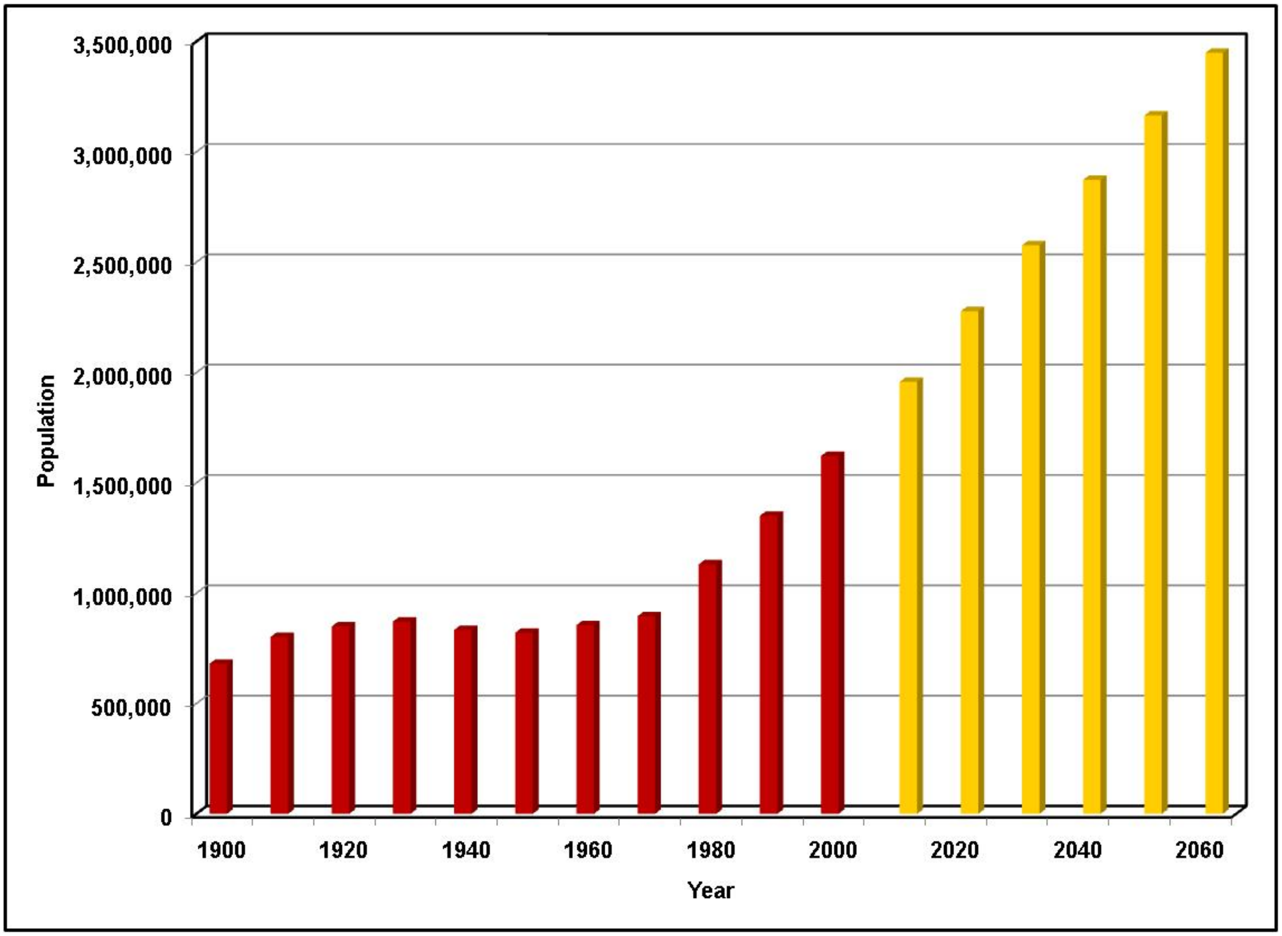

Figure 1-3. Historical and Projected Brazos G Area Population

Population trends may be further understood by dividing the Brazos G Area 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 1990 to 2000.

Figure 1-4 illustrates historical population growth in the three subregions from 1900 to 2000 and projected growth from 2010 to 2060. Figures 1-5 and 1-6 illustrate population distribution by county for years 2000 and 2060, 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 2000 populations and projected populations for 2010 and 2060 for the major cities in each subregion. Major cities are defined as those having at least 10,000 people in

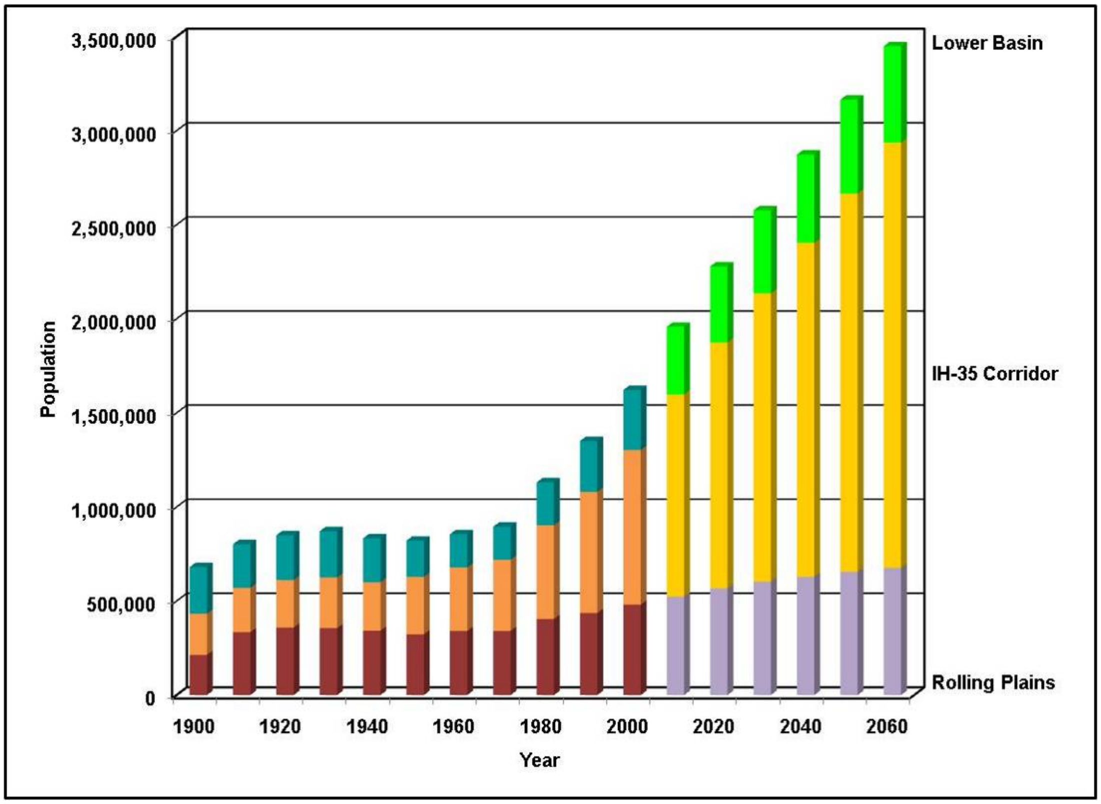

Figure 1-4. Historical and Projected Population by Subregion

2000. This table also presents the percent change in populations from 2010 to 2060 in each city. The overall division of the population between large cities and rural areas is expected to remain relatively constant, only changing about 2 percent between 2000 and 2060.

1.2.1.2 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 30 percent of the Brazos G Area's population in 2000, have grown moderately since 1970 at an average rate of 1.4 percent per year. Major cities in this subregion include Abilene, Copperas Cove, Gatesville, Mineral Wells, Stephenville, and Sweetwater.

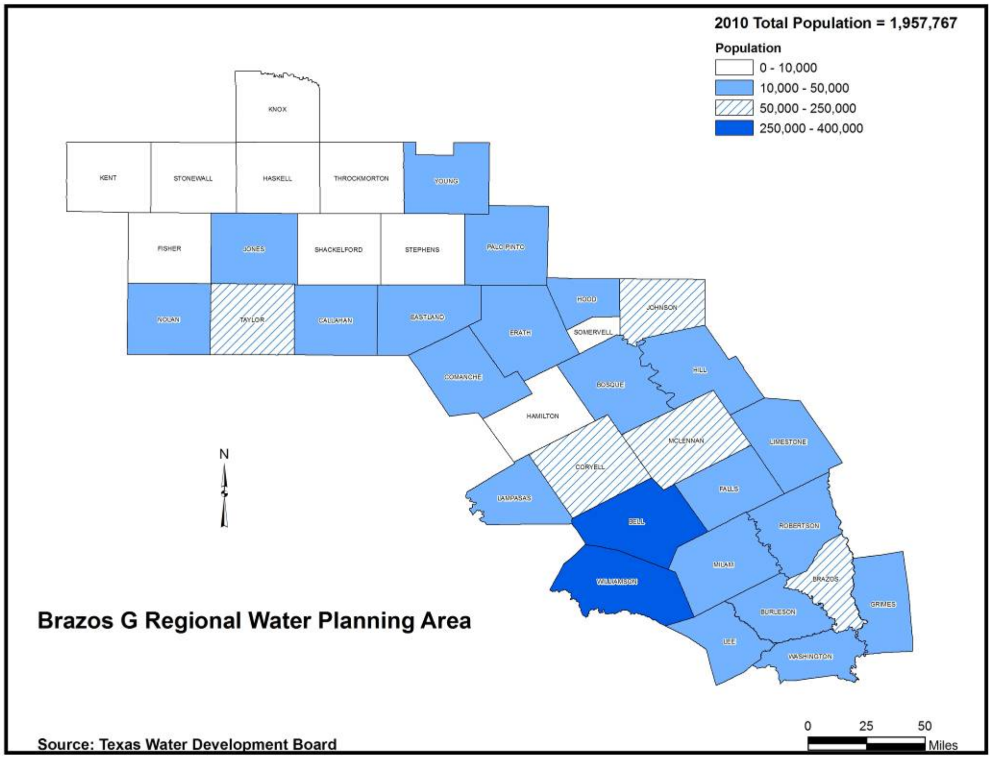

Figure 1-5. 2010 Population Distribution by County

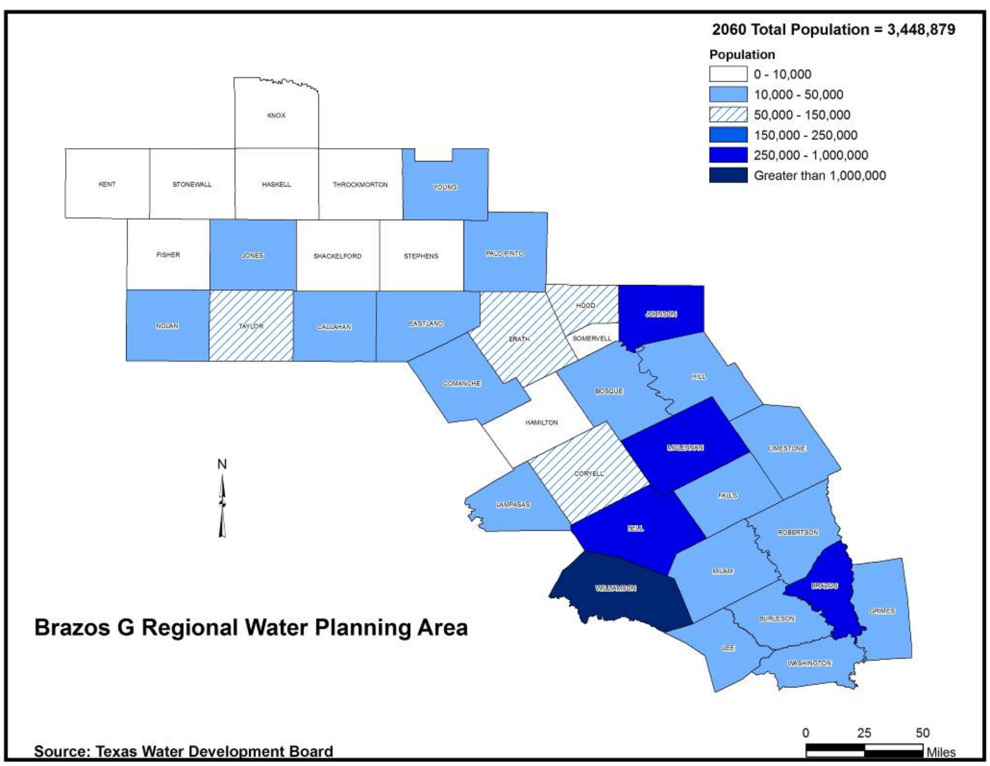

Figure 1-6. 2060 Population Distribution by County

Table 1-2.
Population of Major Cities in the Brazos G Area
(Greater than 10,000 People in 2000)

City	*County*	*Population Data[1] 2000*	*2010*	*2060*	*% Change (2010 to 2060)*
Rolling Plains					
Abilene	Jones, Taylor	115,926	124,607	126,835	1.8
Copperas Cove	Coryell	29,455	34,762	57,765	66.2
Gatesville	Coryell	15,591	19,637	37,177	89.3
Mineral Wells	Palo Pinto	14,770	15,074	19,901	32.0
Stephenville	Erath	14,921	15,959	23,462	47.0
Sweetwater	Nolan	11,415	11,955	11,525	-3.6
IH-35 Corridor					
Belton	Bell	14,623	17,633	26,116	48.1
Burleson[2]	Johnson	17,514	27,206	52,747	93.9
Cedar Park[2]	Williamson	25,508	58,665	108,018	84.1
Cleburne	Johnson	26,005	30,572	52,812	72.7
Fort Hood	Bell, Coryell	33,711	33,711	33,711	0.0
Georgetown	Williamson	28,339	49,112	163,453	232.8
Harker Heights	Bell	17,308	23,869	44,407	86.0
Hewitt	McLennan	11,085	12,667	19,170	51.3
Killeen	Bell	86,911	113,217	184,064	62.6
Round Rock[2]	Williamson	60,060	104,696	351,804	236.0
Taylor	Williamson	13,575	17,935	35,065	95.5
Temple	Bell	54,514	62,382	105,519	69.1
Waco	McLennan	113,726	121,355	152,715	25.8
Lower Basin					
Brenham	Washington	13,507	14,313	16,844	17.7
Bryan	Brazos	65,660	74,650	109,881	47.2
College Station	Brazos	67,890	80,920	131,981	63.1
Total, Major Cities	—	852,014	1,064,897	1,864,972	75.1
% of Region Total	—	52.5	54.4	54.1	
Total, Rural Areas	—	769,947	892,870	1,583,907	77.4
% of Region Total	—	47.5	45.6	45.9	
Region Total	—	1,621,961	1,957,767	3,448,879	76.2

[1] 2000 population data obtained from U.S. Census. 2010 and 2060 projections are based on revised Brazos G Area population projections approved by TWDB May 21, 2009.

[2] Represents only the portion of the city located in the Brazos G Area.

1.2.1.3 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 3.9 percent annually. In this subregion, cities with a current population greater than 10,000 include Belton, Brenham, Burleson, Cedar Park, Cleburne, Fort Hood, Gatesville, Georgetown, Harker Heights, Hewitt, Killeen, Round Rock, Taylor, Temple, and Waco[3]. Total population in the IH-35 Corridor was about 51 percent of the region's total in year 2000, and it is expected to keep growing at a fast rate.

1.2.1.4 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 2.7 percent annually since 1970. Major cities include Brenham, Bryan, and College Station. The Lower Basin had 20 percent of the population of the Brazos G Area in 2000.

1.2.2 Economic Activities

The Brazos G Area 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 2007 payrolls and employment in the Brazos G Area by subregion and economic sector.[4] As of this writing, 2007 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 2007 had a total payroll of about $11.7 billion and employment of almost 330,000 people. Primary economic activities accounting for about 56 percent of the region's total payroll in 2007 were manufacturing, retail trade, and services.

[3] Texas State Data Center and Office of State Demographer, *Estimates of Total Populations of Counties and Places in Texas for July 1, 2007 and January 1, 2008*, October 2008.
[4] U.S. Census Bureau, "2007 Economic Data," Online: available URL: http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_submenuId=datasets_4&_lang=en&_ts=.

Table 1-3.
2007 Economic Data[1]
($1,000)

Economic Sector	Rolling Plains	IH-35 Corridor	Lower Basin	Region Total
Agricultural, Forestry, Fishing	$4,871	$953	$2,027	$7,851
Mining	$240,234	$96,048	$87,614	$423,896
Construction	$316,292	$945,801	$248,870	$1,510,963
Manufacturing	$453,641	$1,377,460	$451,014	$2,282,115
Transportation, Public Utilities	$205,246	$313,694	$78,536	$597,476
Wholesale Trade	$172,037	$1,337,347	$131,393	$1,640,777
Retail Trade	$467,967	$1,217,151	$314,683	$1,999,801
Finance, Insurance, Real Estate	$248,908	$988,305	$166,567	$1,403,780
Services	$1,243,423	$3,748,573	$912,612	$5,904,608
Unclassified	$141,510	$459,354	$91,601	$692,465
Not Categorized	$90	$97,204	$86	$97,380
Total Payroll	$3,775,816	$11,732,189	$2,697,510	$18,205,515
Total Employed	132,788	329,923	91,927	554,638

[1] Data from U.S. Census Bureau.

1.2.3 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 44 inches in Washington and Grimes Counties in the southeast. Figure 1-7 depicts average annual precipitation for the entire region.

1.3 Sources of Water

Table A-3 in Appendix A provides historical data on use of groundwater and surface water within the Brazos G Area from 1980 to 2004. 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 2004. While the proportions were equal in 1980, surface water use was greater by 4 percent in 1990, 6 percent in 2000, and 8 percent in 2004.

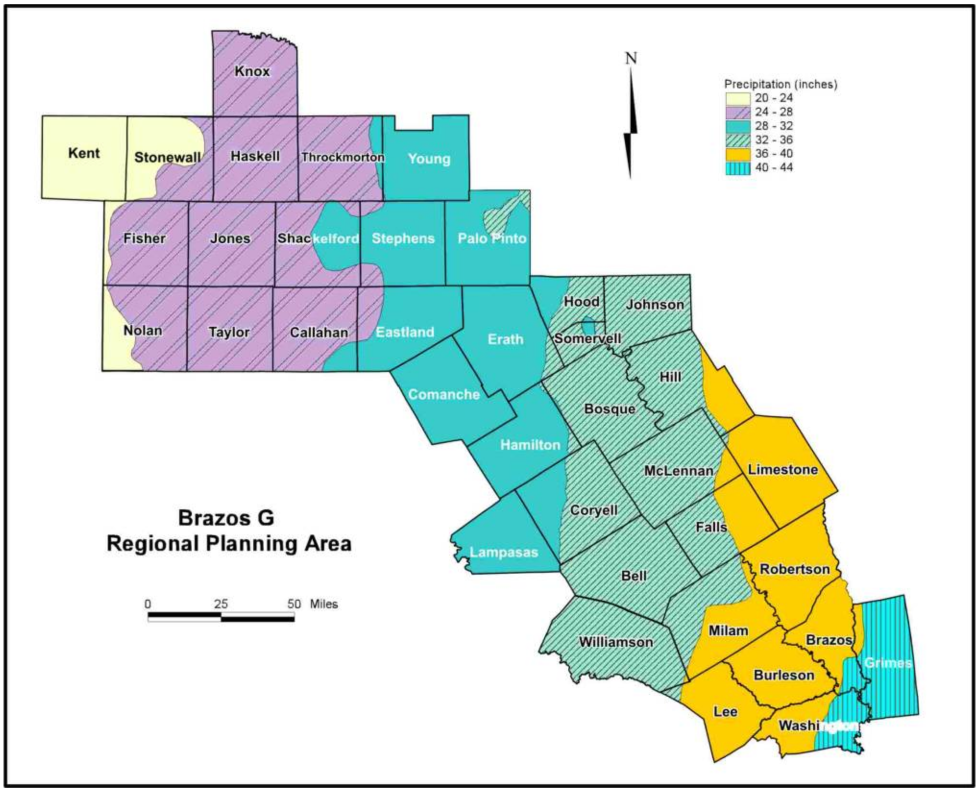

Figure 1-7. Average Annual Precipitation (1961 to 1990)

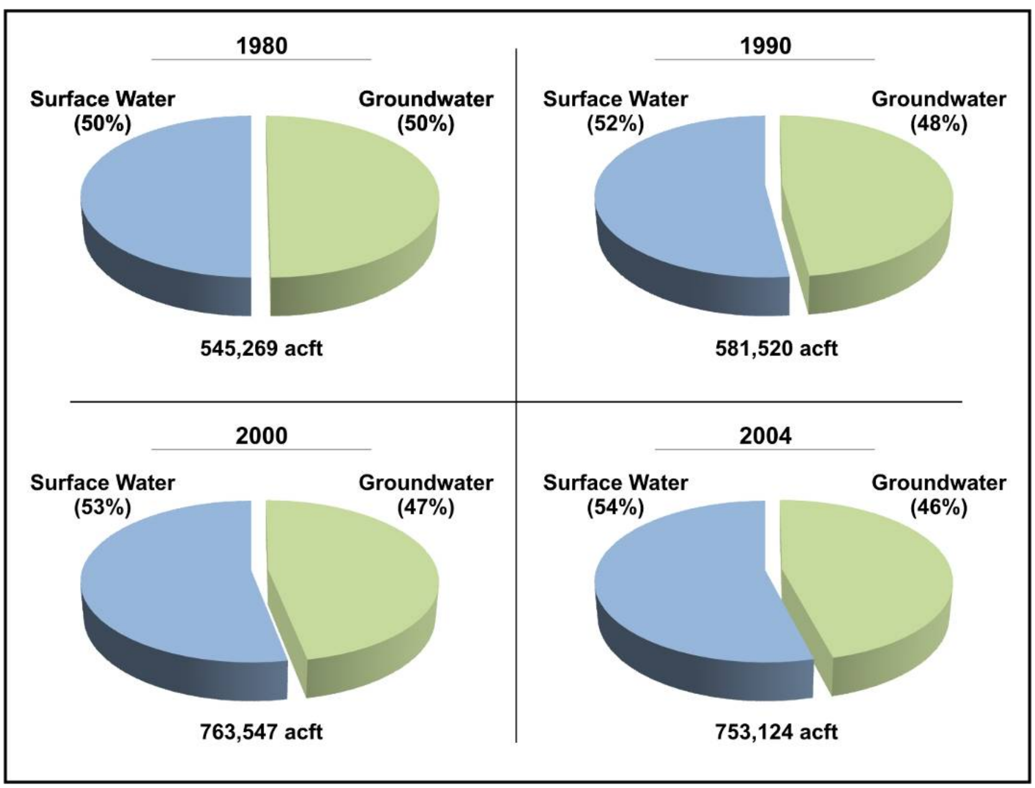

Figure 1-8. Brazos G Area Historical Water Use by Source

1.3.1 Groundwater

1.3.1.1 Aquifers[5,6,7]

Portions of six major and nine 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 Brazos G Area in 1980, 1990, 2000, and 2003. In 2003, about 77 percent of the groundwater pumped came from three aquifers: Seymour, Trinity, and Carrizo-Wilcox. Table 1-4 depicts historical pumpage in 2003 and projected availability in 2060 of groundwater in each aquifer in the Brazos G Area.

Fewer than half of the aquifers in the Brazos G Area have potential for further development. Seven of them extend only slightly into the planning area. The several 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 aquifers, including the counties of Throckmorton, Young, Shackelford, Stephens, and Palo Pinto. In these areas, locally occurring groundwater is not associated with a defined major or minor aquifer system and is sufficient only for individual homes and livestock.

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

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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*, 2000.

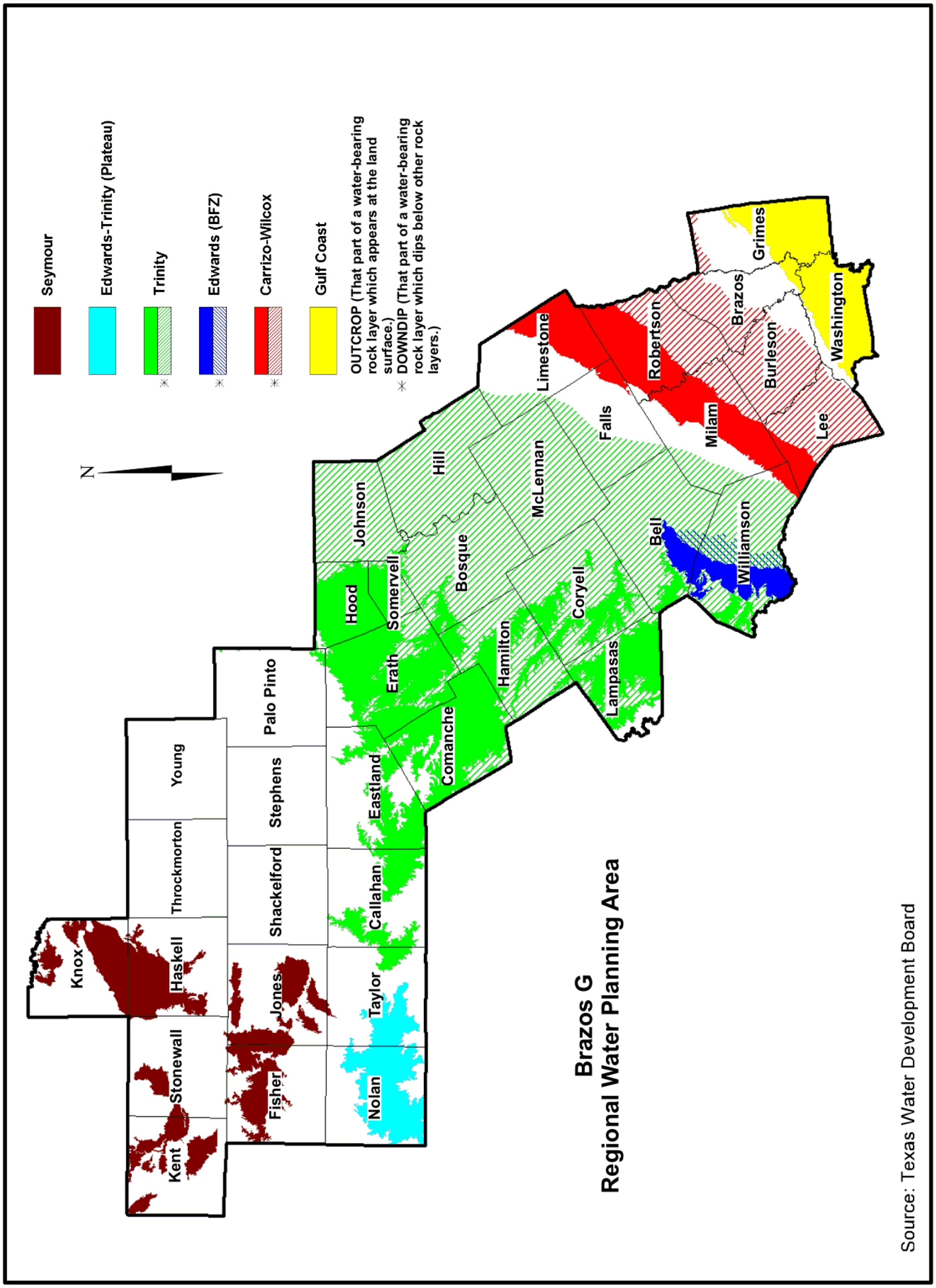

Figure 1-9. Major Aquifers

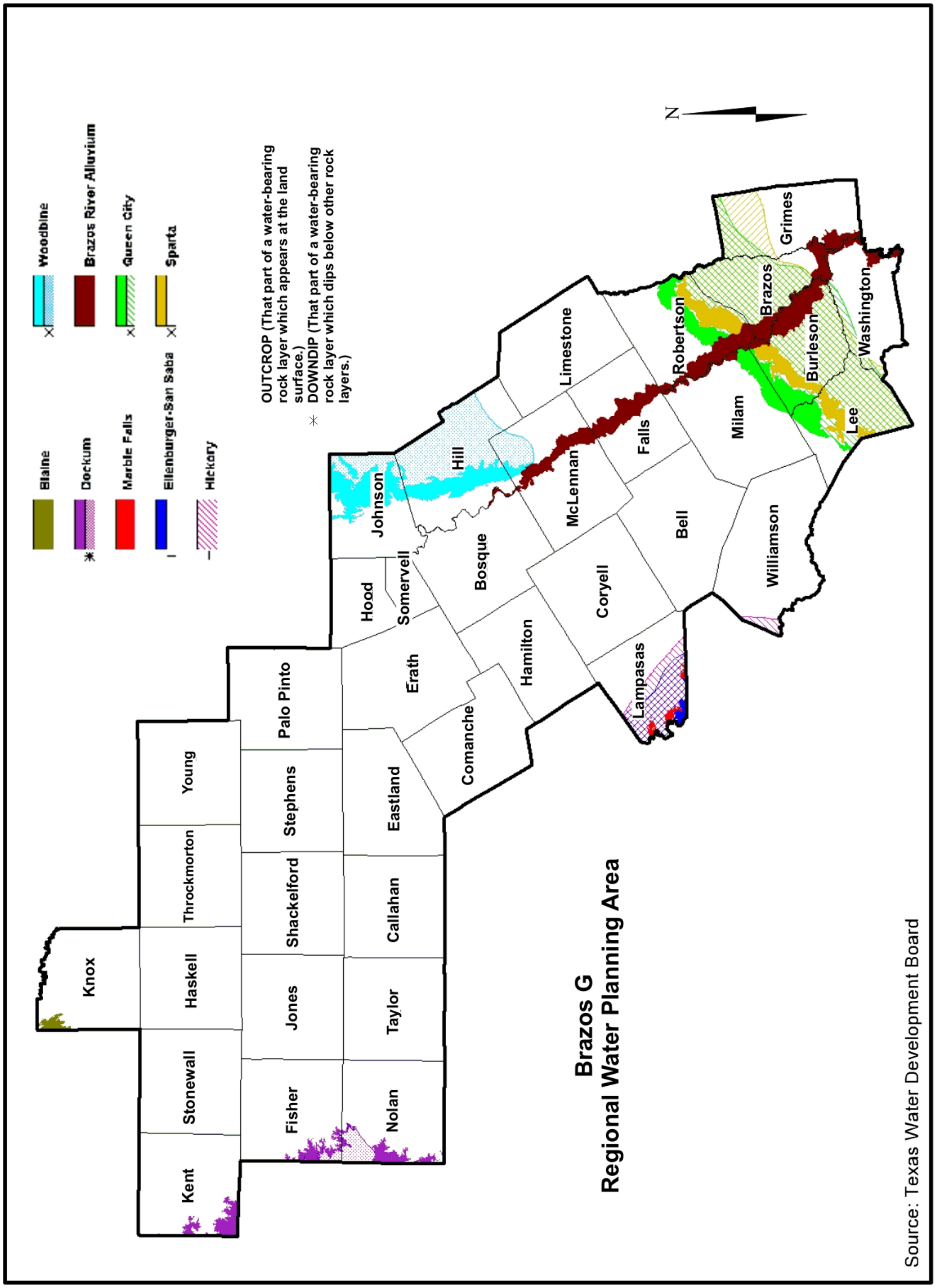

Figure 1-10. Minor Aquifers

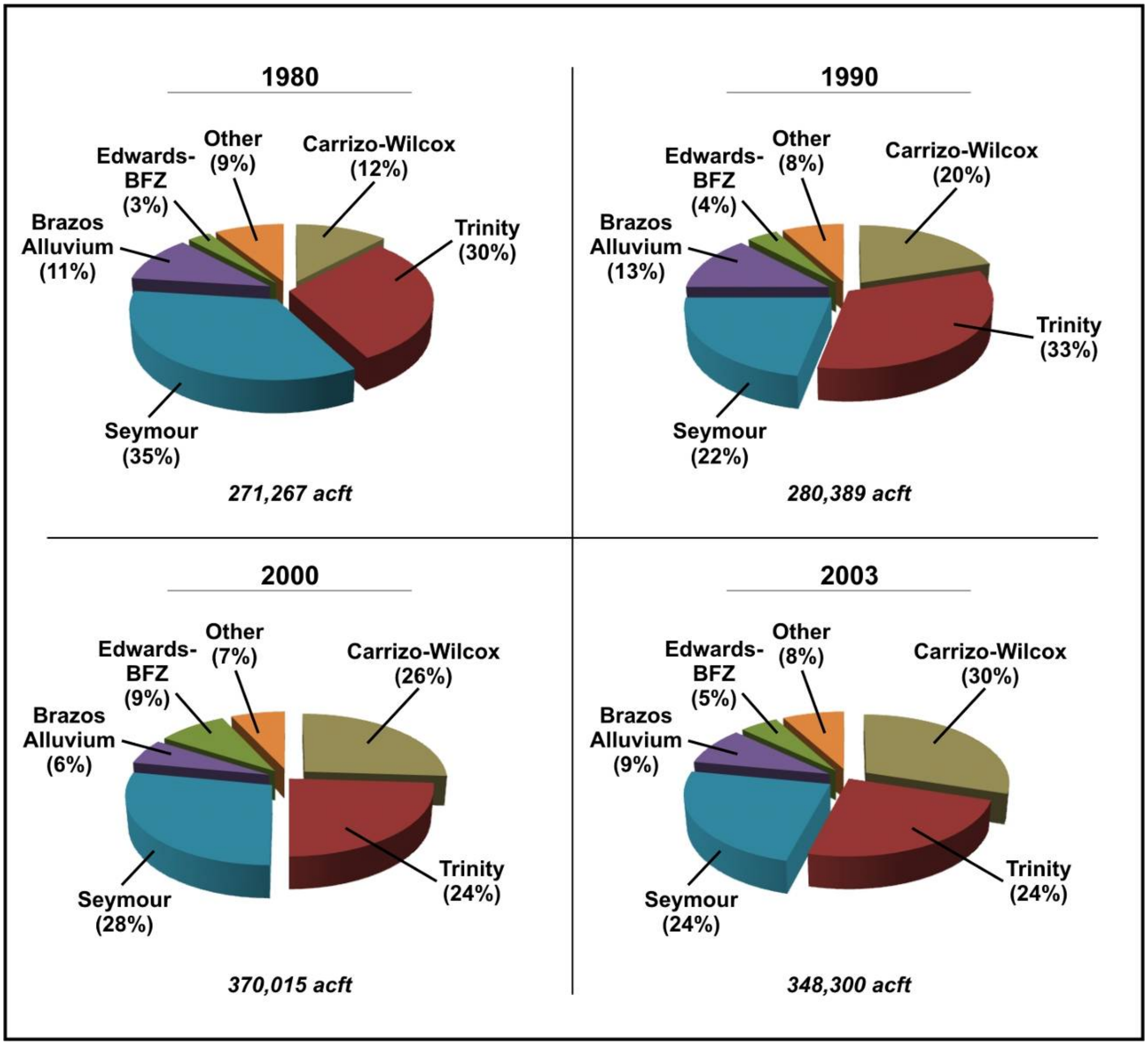

Figure 1-11. Brazos G Area Historical Water Pumpage by Aquifer

In the southeastern part of the region, groundwater supplies are dominated by the Carrizo-Wilcox System and, to a lesser extent, 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 Brazos G Area's undeveloped groundwater lies in the southeastern sector.

Table 1-4.
Brazos G Area Aquifers

Aquifer	***2003 Pumpage (acft)***	***2060 Availability (acft/yr)***	***Remarks***
Western Area			
Seymour	**83,040**	**67,000**	Overdeveloped in drought
Dockum	**2,710**	**5,950**	
Blaine	**ND**[1]	**13,100**	Currently undeveloped
Edwards-Trinity (Plateau)	**450**	**1,500**	Limited extent within region
Subtotal:	**86,200**	**87,550**	
Central Area			
Trinity	**86,060**	**136,300**	Overdeveloped in some areas
Edwards (BFZ)	**17,110**	**9,921**	Overdeveloped in drought
Woodbine	**1,530**	**7,032**	
Marble Falls	**ND**[1]	**2,872**	Limited extent within region
Ellenburger-San Saba	**ND**[1]	**2,341**	Limited extent within region
Brazos River Alluvium	**ND**[1]	**33,169**	Water quality variable
Hickory	**ND**[1]	**ND**[1]	Limited extent within region
Subtotal:	104,700	**191,635**	
Southeastern Area			
Brazos River Alluvium	**30,340**	**33,475**	Water quality variable
Carrizo-Wilcox	**103,690**	**204,349**	Large added potential
Queen City	**2,250**	**1,792**	
Sparta	**3,540**	**13,874**	Added potential
Gulf Coast	**7,150**	**28,296**	Added potential
Yegua-Jackson	**ND**[1]	**22,900**	
Subtotal:	**146,970**	**304,686**	
Other and Undifferentiated	**10,430**	**2,915**	Many widely-scattered sources
Total:	348,300	586,786	

[1] ND indicates no data available.

The Trinity Aquifer and all other artesian aquifers to the southeast have outcrop areas under water-table conditions and downdip areas with overlying confining layers where artesian conditions 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 Brazos G Area 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 Brazos G Area are in Appendix B.

1.3.1.2 Major Springs

The Brazos G Area 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 along the Lampasas River with discharges ranging from 5 to 60 cfs.
2. Berry Springs, which is located 5 miles north of Georgetown, with discharges ranging from 0 to 50 cfs.
3. San Gabriel Springs at Georgetown 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.

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. 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 Brazos G Area.[9] These springs flow substantially less than 1 cfs, and most flow only a few gallons per minute (1 cfs = 448.8 gpm).

1.3.2 Surface Water

The Brazos G Area 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 Brazos G Area.

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 are located in the Brazos G Area, along with several located outside the Brazos G Area that also supply water to the region (O.H. Ivie, Oak Creek, Travis). 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 Brazos G Area, and Table A-5 in Appendix A provides more detailed information about all reservoirs in the Brazos G Area with a permitted capacity greater than 2,500 acft. Diversions permitted for municipal, industrial, irrigation, and mining uses for each Brazos G Area subregion are listed in Table 1-6. Total diversions permitted by use in each Brazos G Area county are given in Table A-6 in Appendix A.

[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 the Brazos G Area
(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	112,257	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	30,690	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	20,780	Luminant
Stamford	Paint Creek	Haskell	60,000[4]	10,000	City of Stamford
Stillhouse Hollow	Lampasas River	Bell	235,700	67,768	U.S. Army Corps of Engineers[1]
Tradinghouse	Tradinghouse Creek	McLennan	37,800	27,000	Luminant
Truscott Brine	Bluff Creek	Knox	107,000	N/A	Red River Authority of Texas
Twin Oak	Duck Creek	Robertson	30,319	13,200	Luminant
Waco	Bosque River	McLennan	192,062	79,870	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**	**997,633**	—

[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 primarily 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	473,974	46,658	63,729	9,379	1,695	595,434
IH-35 Corridor	412,025	93,181	16,123	921	5	522,255
Lower Basin	127,637	121,435	48,617	885	1,599	300,173
Region Total	1,013,636	261,274	128,469	11,185	3,299	1,417,862

[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.

1.4 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 25 identified wholesale water providers which supply water to the Brazos G Area, six of which are located outside of the Brazos G Area. These providers are listed in Table 1-7 and described below.

1.4.1 Authorities

1.4.1.1 Brazos River Authority

The largest provider of water in the Brazos G Area 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/yr, and

Table 1-7.
Wholesale Water Providers Supplying the Brazos G Area

Entity	*2000 Contracts*	*2000 Deliveries*	*Water Source(s)*
Brazos G WWPs			
Aquilla WSD	**5,953**	**4,844**	Lake Aquilla
Bell County WCID #1	**49,510**	**26,211**	Lake Belton
Bistone MWSD	**5,682**	**ND**	Lake Mexia, Carrizo-Wilcox Aquifer
Bluebonnet WSC	**2,675**	**2,848**	Lake Belton
Brazos River Authority	**600,640**[1]	**231,613**[1]	Lakes Aquilla, Belton, Georgetown, Granbury, Granger, Limestone, Possum Kingdom, Proctor, Somerville, Stillhouse Hollow, Whitney
Central Texas WSC	**7,741**	**6,900**	Lake Stillhouse Hollow
City of Abilene	**4,824**	**3,659**	Lake Fort Phantom Hill, Hubbard Creek Reservoir, O.H. Ivie Reservoir
City of Bryan	**1,120**	**ND**	Carrizo-Wilcox Aquifer
City of Cedar Park	**1,819**	**2,378**	Lake Travis
City of Round Rock	**4,295**	**3,090**	Edwards BFZ Aquifer
City of Stamford	**4,219**	**ND**	Lake Stamford
City of Sweetwater	**2,604**	**1,120**	Dockum Aquifer, Lakes Sweetwater, Trammel, Oak Creek (Oak Creek is located in Region F)
City of Temple	**506**	**ND**	Lake Belton, run-of-river water right (Leon River)
City of Waco	**8,587**	**1,278**	Lake Waco
Eastland County WSD	**2,621**	**1,762**	Lake Leon
North Central Texas MWA	**1,319**	**1,410**	Millers Creek Lake
Palo Pinto County MWD No. 1	**6,574**	**5,994**	Lake Palo Pinto
Upper Leon MWD	**3,435**	**2,445**	Lake Proctor
West Central Texas MWD	**27,766**	**24,230**	Hubbard Creek Reservoir
Out of Region WWPs			
Colorado River MWD	**15,000**	**0**	Lake Ivie (Region F to Brazos G)
Lower Colorado River Auth.	**49,400**[2]	**8,524**[2]	Lake Travis (Region K to Brazos G)
Trinity River Authority	**ND**	**ND**	TRWD (Region C to Brazos G)
City of Fort Worth	**ND**	**ND**	TRWD (Region C to Brazos G)
City of Arlington	**ND**	**ND**	TRWD (Region C to Brazos G)
City of Mansfield	**ND**	**ND**	TRWD (Region C to Brazos G)

[1] Includes contracts in other regions.
[2] Region G contracts only.

contracts to supply water to municipal, industrial, and agricultural water customers in the Brazos G Area 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 Section 4B.4. The water right application is pending with the TCEQ.

1.4.1.2 Lower Colorado River Authority

The Lower Colorado River Authority (LCRA) manages much of the lower Colorado River Basin and is a significant regional water provider in Region K. In the Brazos G Area, LCRA provides raw water to the City of Cedar Park from Lake Travis in Travis County (Region K). Additional supplies are projected to be provided by the LCRA to the Cities of Leander and Round Rock (and Cedar Park) through the Brushy Creek Regional Utility Authority.

1.4.2 Districts and Water Supply Corporations

1.4.2.1 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 six wholesale customers. The City of Hillsboro is the district's largest customer, and purchased 3,889 acft in 2000. Total sales for Aquilla Water Supply District in 2000 were 4,844 acft.

1.4.2.2 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. Wholesale sales in 2000 totaled 26,211 acft.

1.4.2.3 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. The

MWSD also utilizes groundwater from the Carrizo-Wilcox Aquifer. The MWSD serves the City of Mexia and other entities in Limestone County.

1.4.2.4 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 nine entities in the Brazos G Area. The largest customer is the City of McGregor, which purchased 943 acft in 2000. Wholesale sales in year 2000 totaled 2,848 acft.

1.4.2.5 Central Texas Water Supply Corporation

Central Texas WSC contracts with the BRA to obtain raw water from Lake Stillhouse Hollow. This provider sold a total of 6,900 acft of treated water to 16 water-supply entities in 2000. Its largest customer was Kempner Water Supply Corporation, which purchased about 3,300 acft.

1.4.2.6 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 Brazos G Area. Treated water from the City of Snyder, a CRMWD member city, is supplied to the City of Rotan in Fisher County in the Brazos G Area. 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 Brazos G Area, the district is contracted to provide up to 10,900 acft of raw water per year to the City of Abilene from Lake Ivie. This amount is based upon a specified allocation of the estimated yield of Lake Ivie, which has been reduced in response to a long-term continuing drought.

1.4.2.7 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 per year 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. Total water sales in 2000 were 1,762 acft.

1.4.2.8 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 per year from Millers Creek Reservoir for municipal, industrial, and mining purposes. Wholesale water sales totaled 1,410 acft in 2000.

1.4.2.9 Palo Pinto Municipal Water District No. 1

Palo Pinto 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. The district has rights to 18,500 acft per 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. Wholesale municipal sales totaled 4,616 acft in 2000 and steam electric power sales were 1,378 acft.

1.4.2.10 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. Total 2000 sales were 2,445 acft.

1.4.2.11 West Central Texas Municipal Water District

The West Central Texas Municipal Water District (MWD) diverts raw water from Hubbard Creek Reservoir, which it owns and operates, for distribution to the Cities of Abilene, Albany, Anson, and Breckenridge. This district has rights to 56,000 acft per year for municipal, industrial, irrigation, and mining uses. In 2000, the district provided 24,230 acft of raw water to its customer cities.

1.4.3 Municipal

1.4.3.1 City of Abilene

The City of Abilene relies on Fort Phantom Hill Reservoir, and contract water supplies from West Central Texas MWD (Hubbard Creek Reservoir). The City also has a contract with West Central Texas MWD for 16.54 percent (~10,900 acft/yr) of the safe yield of O.H Ivie

Reservoir, owned by the Colorado River Municipal Water District. The City currently has facilities to utilize 6,720 acft/yr of the supply from O.H. Ivie..

1.4.3.2 City of Waco

The City of Waco's primary water supply is Lake Waco, with 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 per year for municipal, industrial, and irrigation uses. In 2000, the City provided 1,278 acft of treated wholesale water to the City of Hewitt, City of Woodway, and Bosqueville Green Acres WSC. Total water used by Waco in 2000 was over 30,000 acft, including wholesale sales.

1.4.3.3 City of Round Rock

The City of Round Rock obtains raw water from the Edwards (BFZ) Aquifer and purchases additional water from Lake Georgetown. The City sells wholesale water to local providers in Williamson County. Its largest customer, Brushy Creek MUD, bought 1,999 acft in 2000. In addition to the 3,090 acft of wholesale water sales in 2000, the City provided approximately 14,000 acft of treated water to retail and manufacturing customers. The City of Round Rock has contracted to purchase 18,134 acft per year from the BRA at Stillhouse Hollow Reservoir in Bell County. The pipeline that delivers this water to Lake Georgetown was completed in late 2004. Round Rock has plans to introduce a new supply from Lake Travis (20,928 acft/yr) through the Brushy Creek RUA Water Supply Project.

1.4.3.4 City of Stamford

The City of Stamford obtains supply from Lake Stamford and supplies water to several entities in Jones and Haskell Counties.

1.4.3.5 City of Sweetwater

The City of Sweetwater owns and operates two reservoirs in the Brazos G Area, 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. The City also has a contract with American Electric Power (AEP) for cooling water from Oak Creek Reservoir. In 2000, Sweetwater sold approximately 750 acft of wholesale water to its municipal customers and 370 acft for steam electric power.

1.4.3.6 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. In 2000, the City purchased all of its raw water from the LCRA Highland Lakes System (Region K). The City sold 2,378 acft to its wholesale customers and provided 6,000 acft of water to retail customers.

1.5 Current Water Users and Demand Centers

1.5.1 Regional Water Use

Total water use by each county in the Brazos G Area is provided in Figure 1-12 for 2006. Water use can be better understood by looking at 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 Brazos G Area. 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.

In Appendix A, Table A-7 gives historical water-use data for all counties in the Brazos G Area, and Table A-8 gives historical water-use data by category of use. Historical, annual surface water use greater than or equal to 1,000 acft is given in Appendix D by each water-right holder.

1.5.2 Municipal Use

Municipal water use includes water consumed for residential and 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

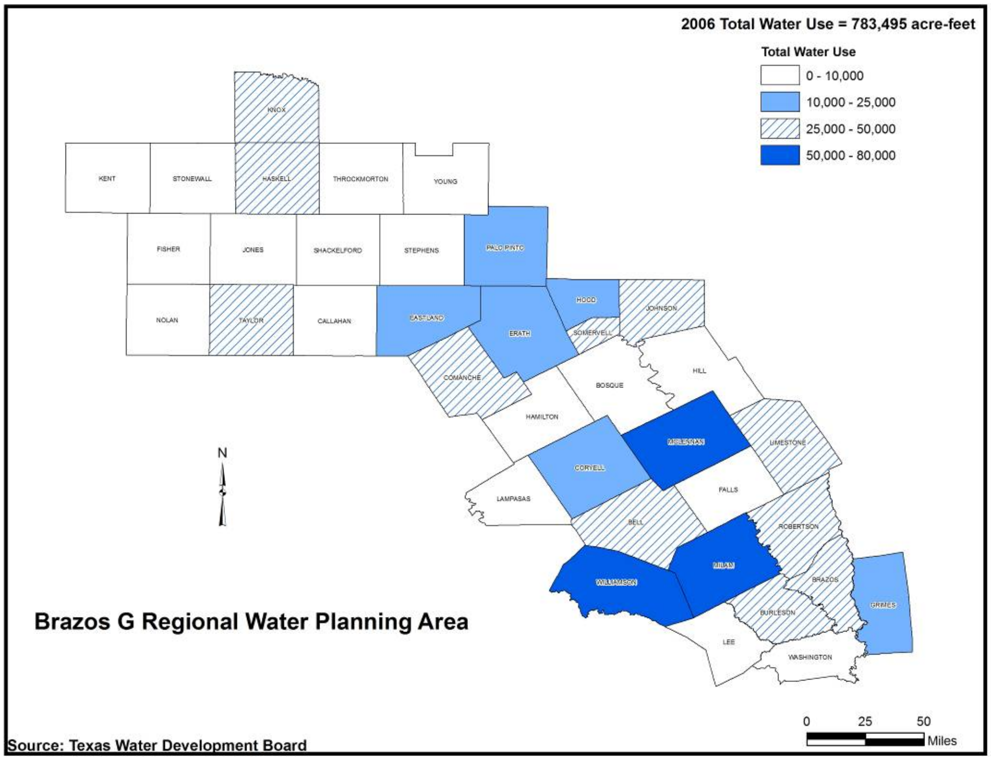

Figure 1-12. 2006 Total Water Use by County

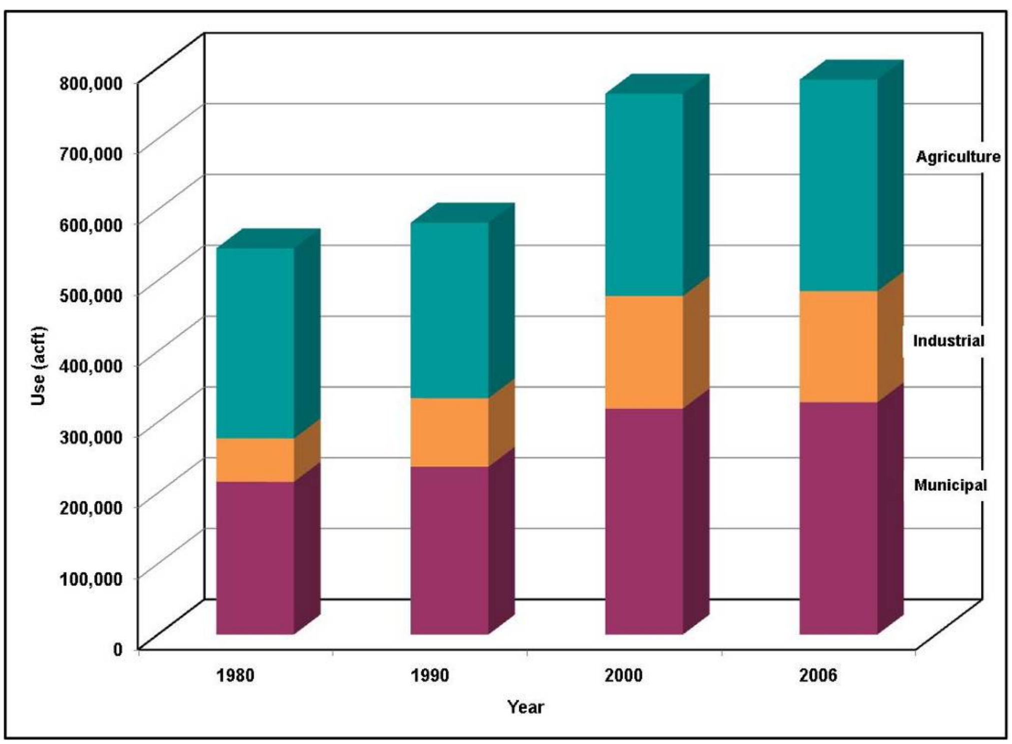

Figure 1-13. Brazos G Area Historical Water Use by Type

Table 1-8.
Brazos G Area Historical Water Use[1] (acft/yr)

Category	1980	1990	2000	2006
Municipal Use	215,744	236,955	319,141	328,057
Manufacturing Use	21,124	32,240	56,993	54,828
Steam-Electric Use	28,686	57,657	86,963	85,366
Mining Use	11,413	6,944	15,008	16,683
Irrigation Use	229,387	200,954	232,991	244,694
Livestock Use	38,915	46,770	52,451	53,867
Total Use	545,269	581,520	763,547	783,495
Percent of State Total	**3.06**	**3.70**	**4.67**	**5.37**

[1] Historical data obtained from TWDB.

anticipated efforts at water conservation. Municipal use of 328,057 acft accounted for about 42 percent of the region's total water use in 2006. Figure 1-14 shows municipal water use in each Brazos G Area county in 2006.

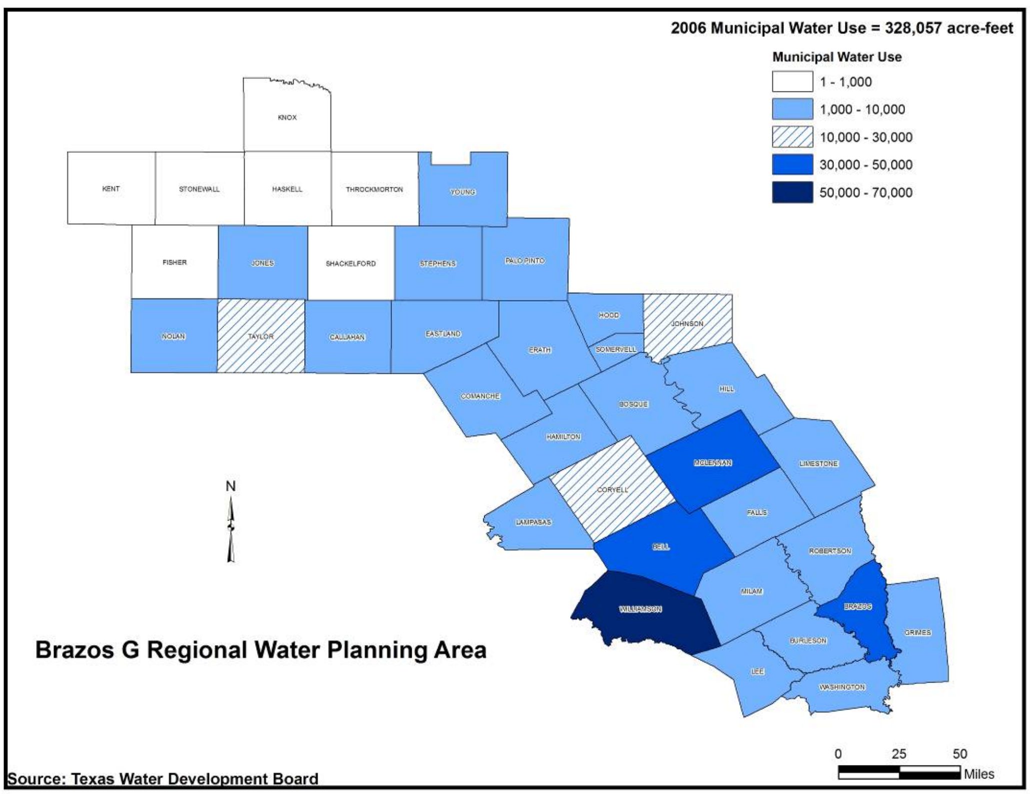

Figure 1-14. 2006 Municipal Water Use

1.5.3 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 2006, industrial use was 156,877 acft, or about 20 percent of the total water used in the Brazos G Area. Refer to Figure 1-15 for 2006 industrial water use by county.

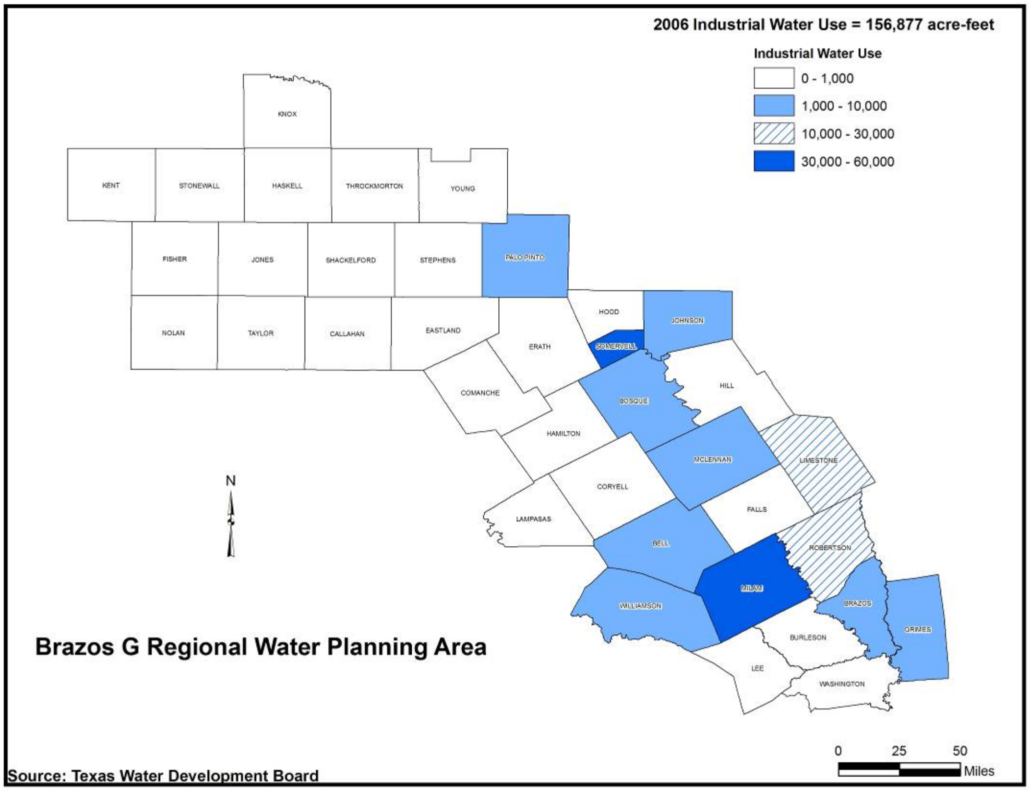

Figure 1-15. 2006 Industrial Water Use (Manufacturing, Steam-Electric Cooling, and Mining)

1.5.3.1 Manufacturing

Manufacturing use is water used for producing finished goods. Manufacturing use was about 55,000 acft in 2006, or 35 percent of total industrial water usage that year.

1.5.3.2 Steam-Electric Cooling

This category is water used during the power-generation process and is typically 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 2006 was 85,366 acft, or 54 percent of total industrial water use.

1.5.3.3 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 2006 was 16,683 acft, or 11 percent of the total industrial water use.

1.5.4 Agricultural Use

Agricultural use is water used for irrigation and for watering livestock. Agricultural use was 298,560 acft in 2006 or 38 percent of the Brazos G Area's total water use. Refer to Figure 1-16 for agricultural water use by each county in the planning area in 2006.

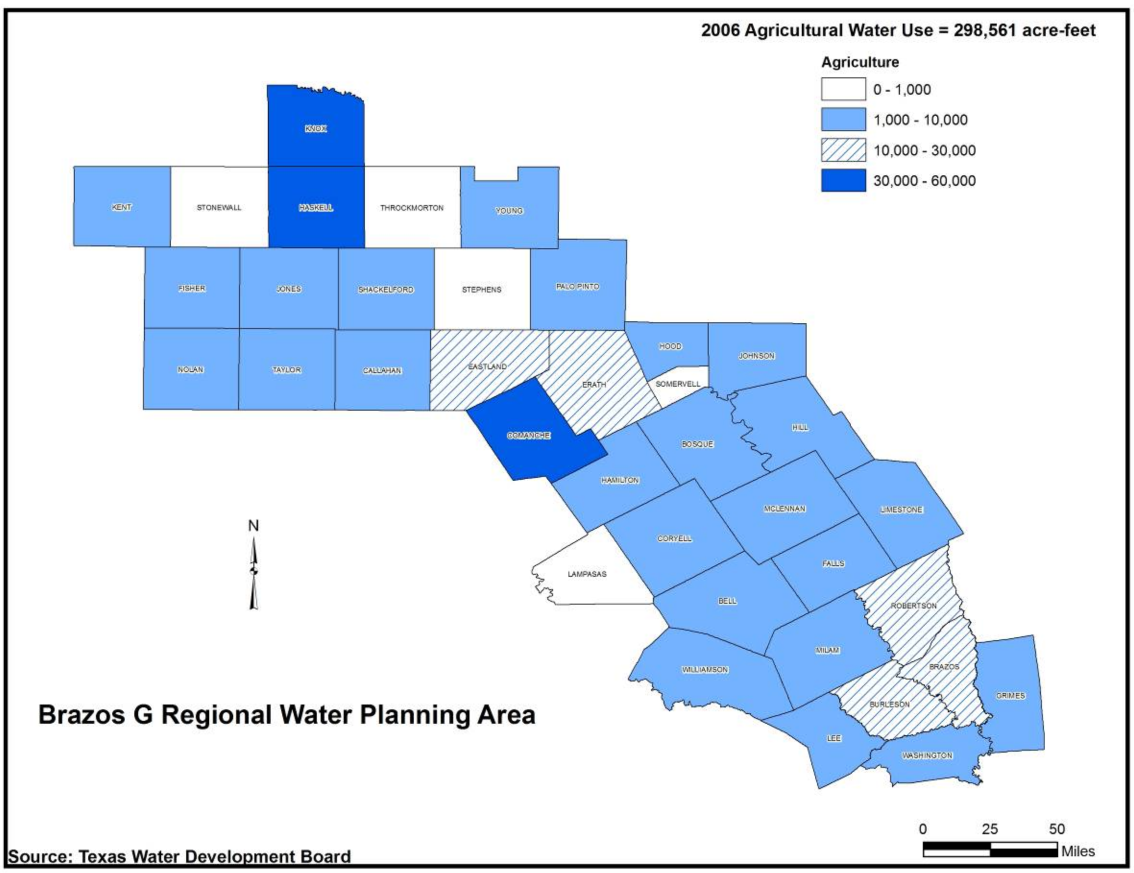

Figure 1-16. 2006 Agricultural Water Use (Livestock and Irrigation)

1.5.4.1 Irrigation

Irrigation use in 2006 totaled 244,690 acft, or about 82 percent of the total agricultural water use. Refer to Appendix F for more detailed information about irrigation use in the Brazos G Area.

1.5.4.2 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 53,870 acft, or 18 percent of agricultural use in 2006. Refer to Appendix F for more detailed information on water used for livestock.

1.5.5 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 Brazos G Area 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 Brazos G Area 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 Brazos G Area includes no use of water for navigation. No water management strategy considered by the BGRWPG will affect navigation, either in the Brazos G Area or in adjacent regions.

Power generation demands large amounts of water for cooling equipment. Fifteen steam-electric power-generating facilities were operating in the Brazos G Area in 2000. 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 1.5.3.

1.6 Natural Resources

1.6.1 Regional Vegetation

The Brazos G Area lies within several different vegetational areas, or ecoregions.[11] Figure 1-17 shows the locations of these ecoregions, which are relatively homogenous areas in terms of geography, hydrology, and land use. The five ecoregions in the Brazos G Area are 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.

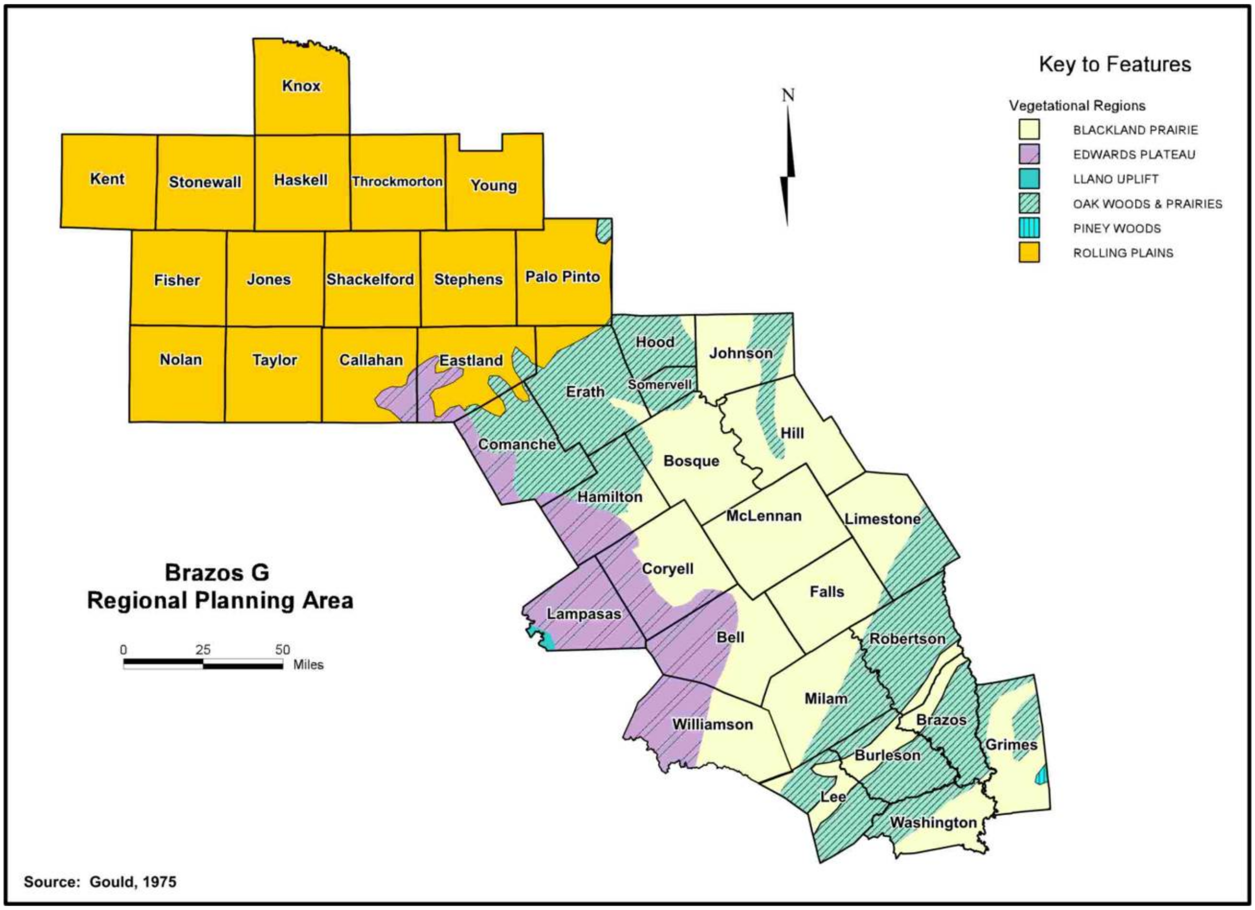

Figure 1-17. Vegetational Areas of the Brazos G Area

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

1.6.1.1 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.

1.6.1.2 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 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]

1.6.1.3 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 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.

[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.

1.6.1.4 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.

1.6.1.5 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.

1.6.2 Regional Geology

Figure 1-18 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.

1.6.3 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 Brazos G Area. These soil types are briefly described in the following subsections.

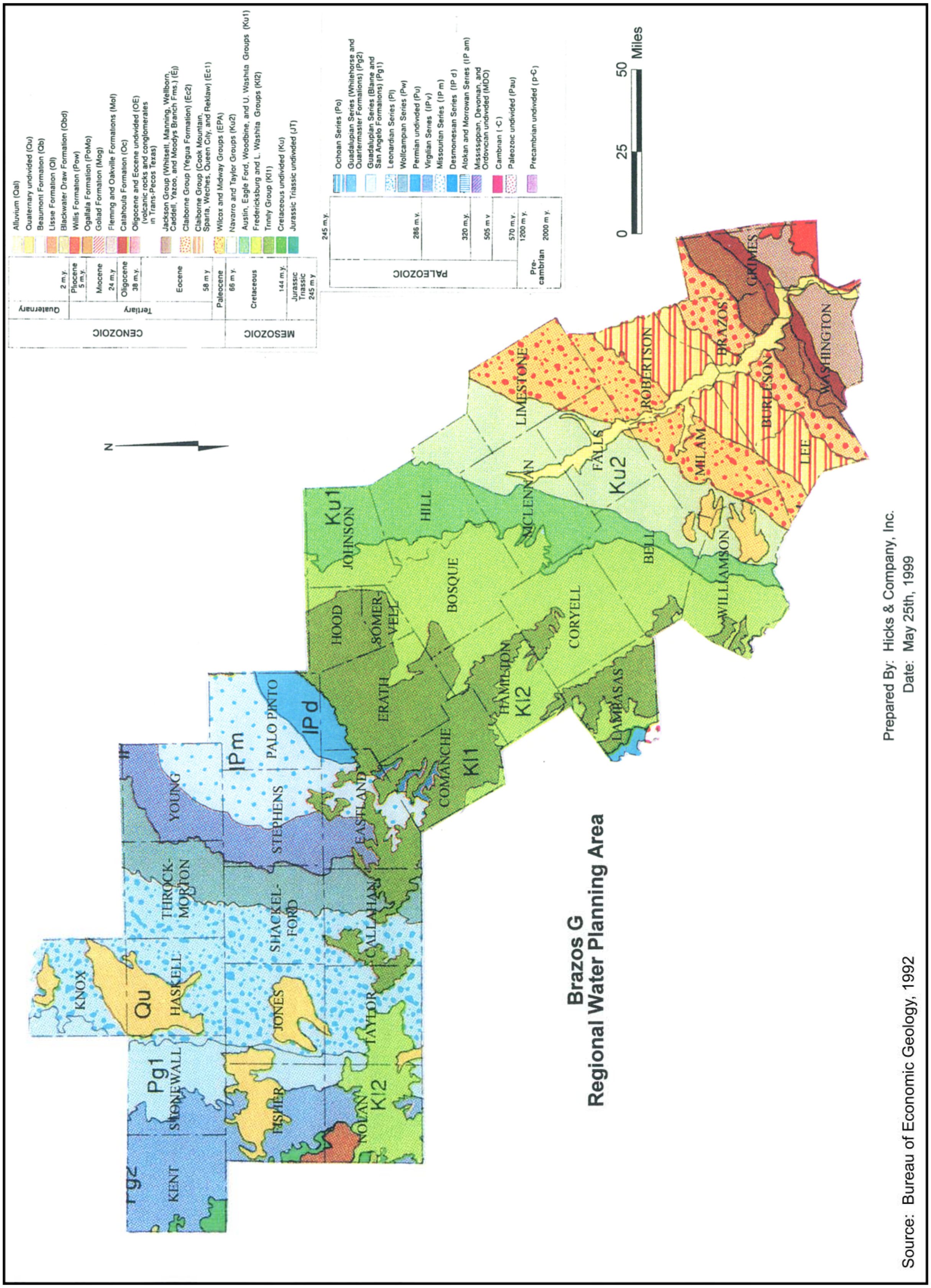

Figure 1-18. Geology of Brazos G Area

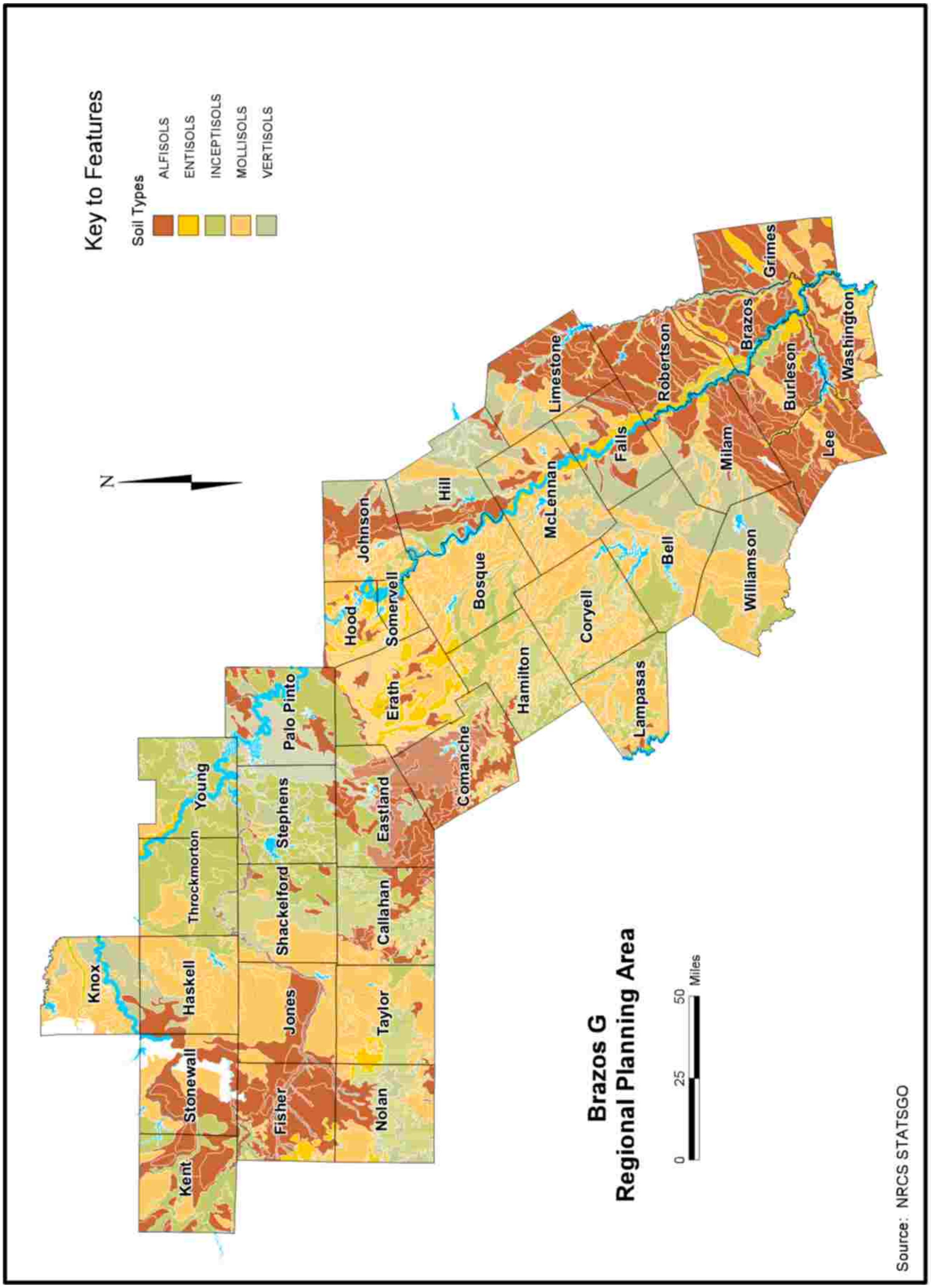

Figure 1-19. Soils of the Brazos G Area

1.6.3.1 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.

1.6.3.2 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.

1.6.3.3 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.

1.6.3.4 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.

1.6.3.5 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.

1.6.4 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.

1.6.5 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, 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 (Figure 1-20) provide habitat for inland fish stocks and waterfowl. Many reservoirs in the planning area provide habitat for fish stocks and waterfowl include 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.

1.6.6 Wildlife Resources

1.6.6.1 Biotic Provinces

Just as Texas has been divided into major plant zones,[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 Brazos G Area includes the Kansan, Austroriparian, Balconian, and Texan biotic provinces.

[14] Gould, Op. Cit., 1975.
[15] Blair, 1950.

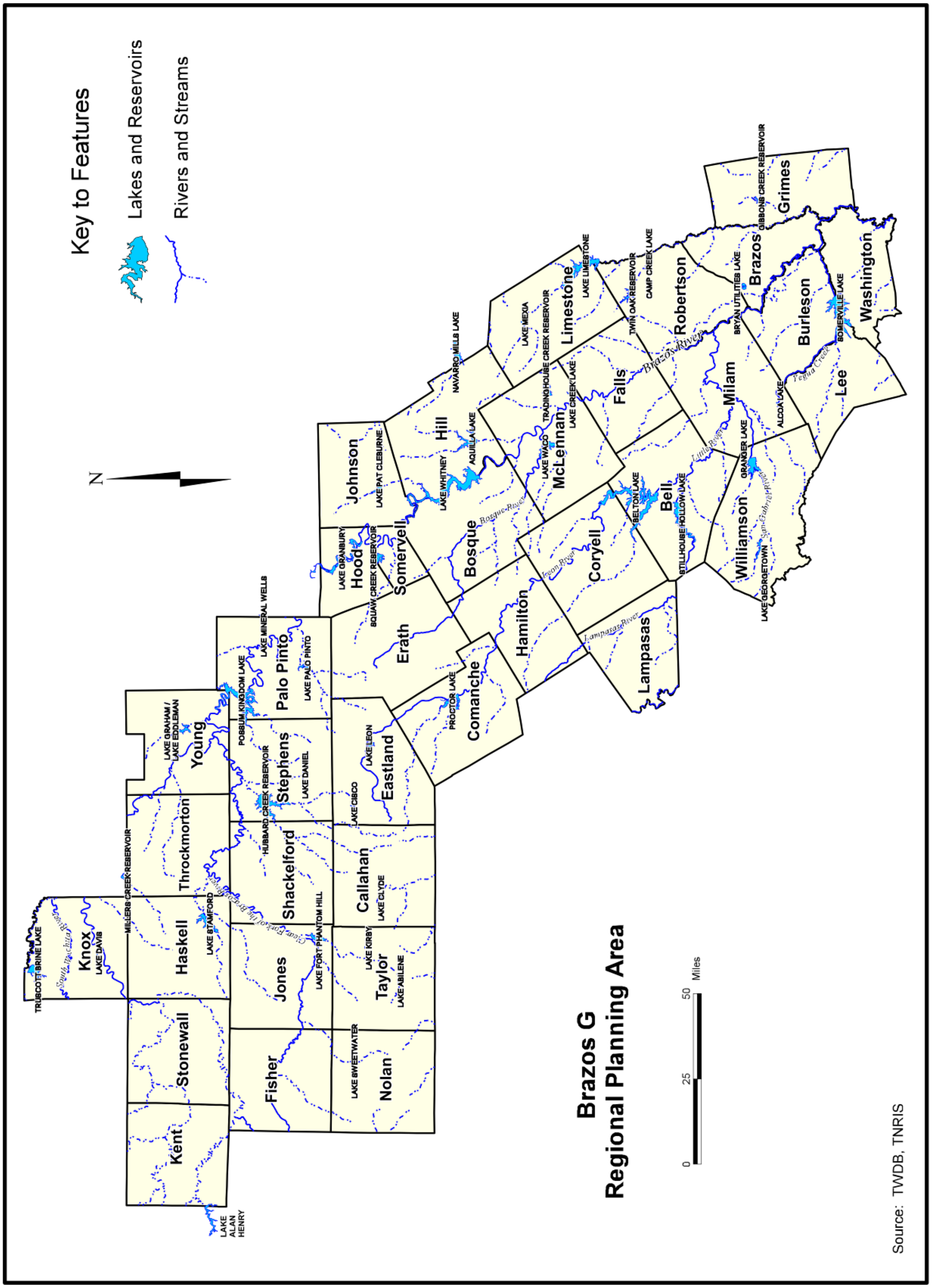

Figure 1-20. Water Resources of the Brazos G Area

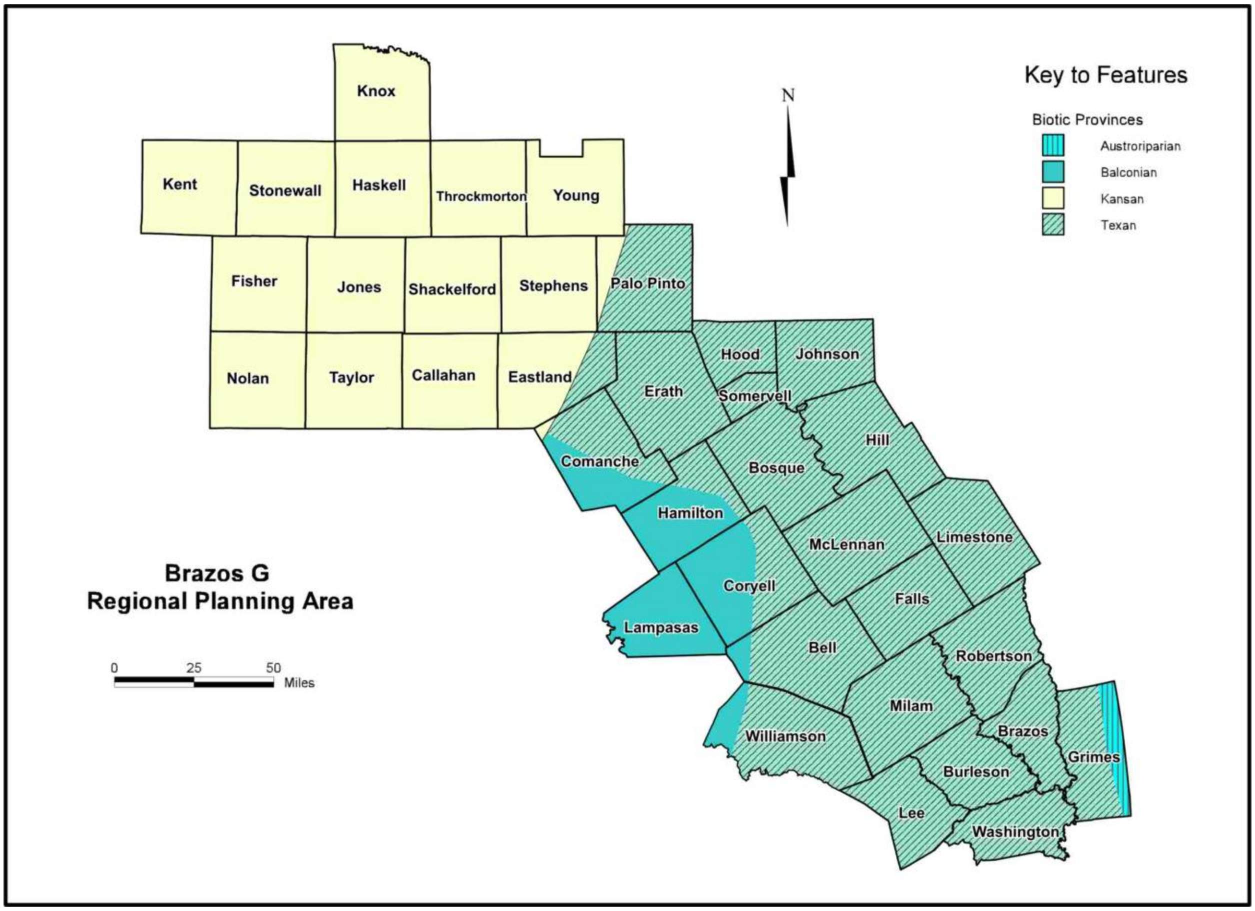

Figure 1-21. Biotic Provinces of the Brazos G Area

1.6.6.1.1 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.

1.6.6.1.2 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.

1.6.6.1.3 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.

1.6.6.1.4 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*).

1.6.6.2 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 planning 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*). Table E-1 in Appendix E gives a complete list of threatened and endangered species in each county in the Brazos G Area.

1.6.7 Agricultural Resources

Agriculture is a mainstay of the Brazos G Area rural economy. Among livestock, cattle were the most significant component, approaching 2.4 million head with an additional 118,000 dairy cows in 2002. Over 17 million acres, or about 87 percent of Brazos G Area's total area, were classified as farmland in 2002. Of the 17 million acres of farmland, about six million acres were classified as cropland, of which about three million acres were harvested. Refer to Appendix F for detailed listings of agricultural information for the Brazos G Area.

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

1.6.7.1 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 Brazos G Area.

1.6.7.2 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.

1.6.7.3 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.

1.6.7.4 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.

1.7 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, for example, is expected to increase more than four-fold by the year 2060 to about 1,027,400 people. Water will become even more valuable, especially in the western and central parts of the Brazos G Area, 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 a high chloride content is more expensive to treat and therefore places capital constraints on suppliers who obtain surface water from affected streams and reservoirs.

1.7.1 Susceptibility of Water Supplies to Drought

1.7.1.1 Groundwater

The 15 aquifers within the Brazos G Area 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 Brazos G Area 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 are commonly 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-Balcones Fault Zone (BFZ) Aquifer, with more developed well capacity than is available in extended droughts, is the least drought-resistant of all the aquifers in the Brazos G Area. 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.

1.7.1.2 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 44 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 aggravate 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 system 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[16] through a repeat of the drought of record. 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 shows that in some areas the 1997 through 2000 period has produced less runoff than the first three years of the drought of record in the 1950s.

1.7.2 Identified Water Quality Problems

Water quality varies throughout the upper, middle and lower portions of the Brazos G Area. 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 salinity.[17] Except for the third factor, these threats

[16] 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.
[17] Texas Natural Resource Conservation Commission (TNRCC), *Summary Report: Regional Assessments of Water Quality Pursuant to the Texas Clean Rivers Act (Senate Bill 818)*, 1992.

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 Brazos G Area are summarized according to specific regions in the basin, and are based on information from the Texas Clean Rivers Program 2004 Basin Highlights Report.[18]

1.7.2.1 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 impacts represented by high conductivity levels, along with high total dissolved solids and 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.

1.7.2.2 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 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

[18] Brazos River Authority (BRA), Texas Clean Rivers Program 2004 Highlights Report, available online at http://www.brazos.org/CleanRiversProgram/BasinReport/Executive_Summary.pdf, 2004.

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 remains primarily undeveloped. Discharging into the Lampasas River downstream of the lake, Salado Creek is experiencing concerns from elevated nutrient concentrations.

1.7.2.3 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 collected to date show 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.

1.7.2.4 Lower Basin Activity Region

The BRA monitors eight sites in 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.

1.7.3 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.

1.7.3.1 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 on the surface soils, creating a hardpan effect 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 be subject to competing interests.

1.7.3.2 Threats to Natural Resources

The Brazos River Basin within the Brazos G Area 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.[19] 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 1.7.2, 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 1.7.2 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

[19] 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.

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

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
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

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).

1.8 Drought Preparations

Drought contingency plans are required by the State for wholesale water suppliers, irrigation districts, and retail water suppliers. 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, SB1 requires a water conservation plan. To aid entities in the region with the development of these plans, example water conservation and drought management plans are provided in Appendices J and K.

In addition, conservation plans are commonly included in the management plans of Groundwater Conservation Districts or Underground Water Conservation Districts.

1.9 Groundwater Regulation

1.9.1 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. Citizens in the PGMA have two years to establish a Groundwater Conservation District (GCD). If a GCD is not established in the required timeframe, a GCD will be established that is consistent with the original recommendation, which will be governed by a locally elected board of directors.

Most counties (excluding Nolan and Taylor Counties) in the Brazos G Area have been studied to determine if they should be designated a PGMA. These counties are shown in Figure 1-22. TCEQ designated two PGMA areas in the Brazos G Area, also shown on Figure 1-22. These include the Central Texas-Trinity Aquifer PGMA and the Northern Trinity and Woodbine Aquifers PGMA. TCEQ designated the Central Texas-Trinity Aquifer PGMA on October 31, 2008. Counties in this PGMA include Bosque, Coryell, Hill, McLennan, and Somervell. The 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.

Following a PGMA designation, voters must create or join an existing GCD within two years. Therefore, in 2007 the Upper Trinity GCD was formed, which includes Hood County. In May 2009, Bosque County joined the Middle Trinity GCD. In 2009, the Texas Legislature created the Prairielands GCD and the Southern Trinity GCD. The Prairieland GCD includes Johnson, Hill and Somervell counties. The Southern Trinity GCD (formally the McLennan County GCD) must add an adjacent county to the GCD by September 2011 or it will be dissolved by the TCEQ. The Tablerock GCD, which included Coryell County, was dissolved by the Legislature; Coryell County joined the Middle Trinity GCD in 2009.

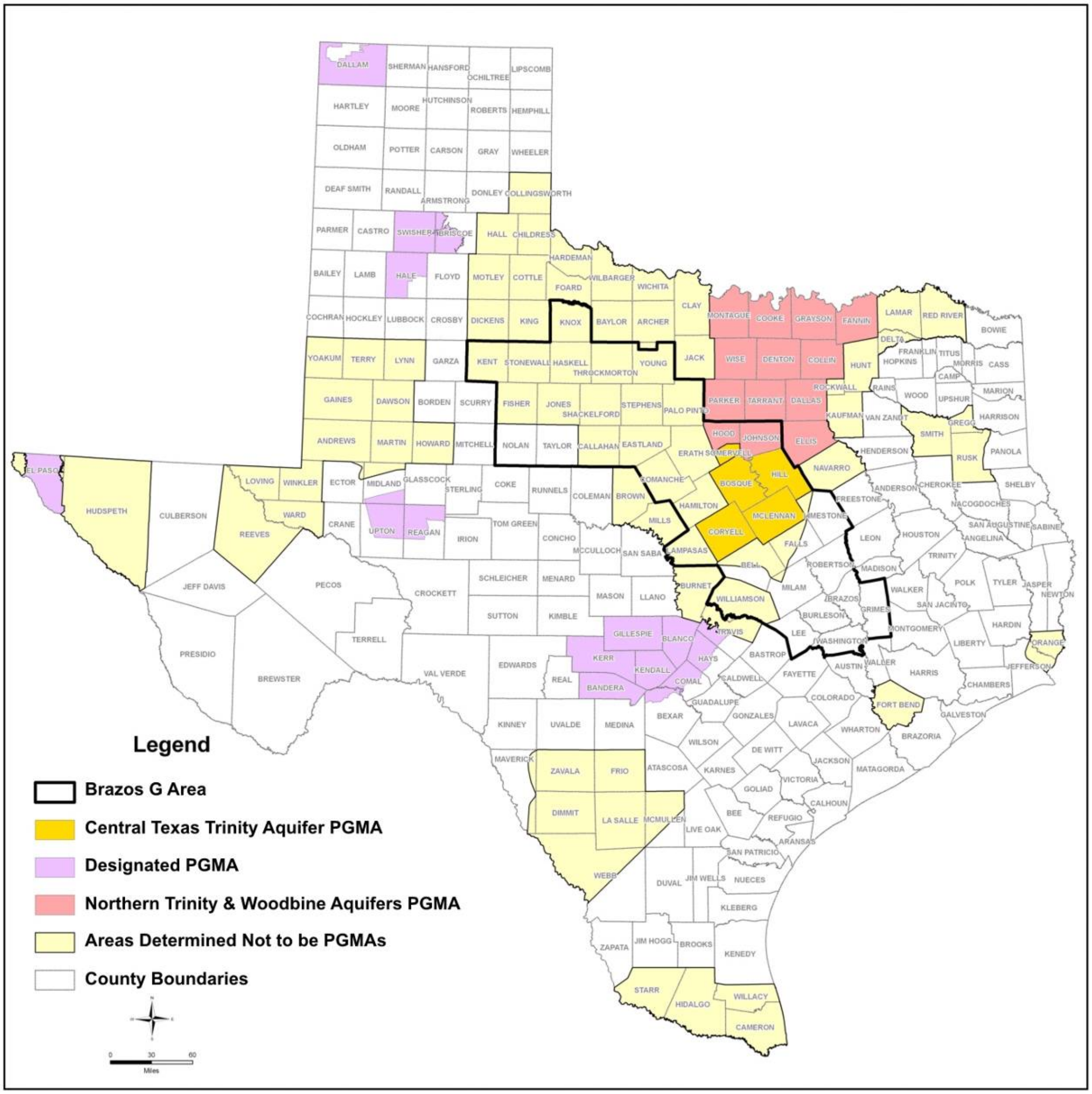

Figure 1-22. Priority Groundwater Management Areas

1.9.2 Groundwater Conservation Districts and Groundwater Management Areas

In addition to the four GCDs mentioned previously, there are nine other GCDs in the Brazos G Area, 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 GCDs' management plan approval dates are shown on Table 1-11.

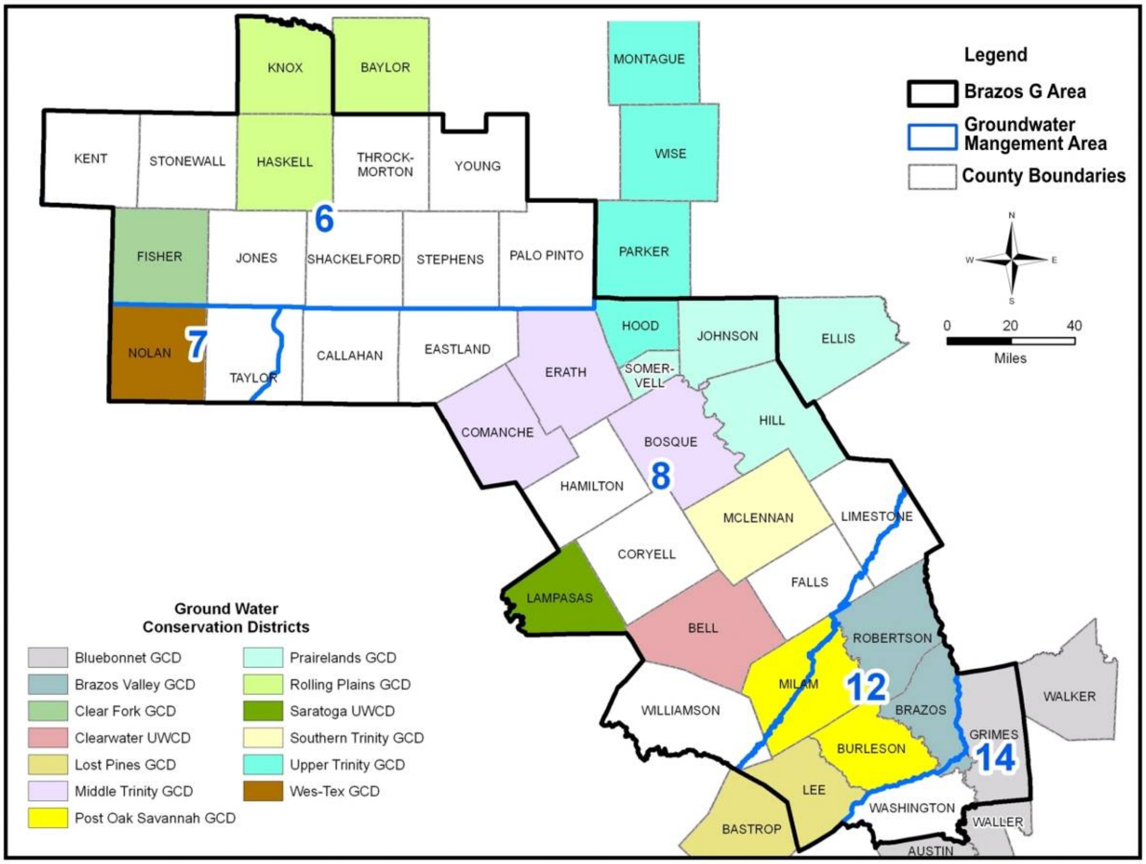

Figure 1-23. Groundwater Conservation Districts and Groundwater Management Areas Located Wholly or Partially within the Brazos G Area

Table 1-11.
GCD Management Plan Approval Dates

Name of District	***Date Plan Approved***
Bluebonnet Groundwater Conservation District	11/18/2004
Brazos Valley Groundwater Conservation District	7/22/2004
Clear Fork Groundwater Conservation District	7/6/2005
Clearwater Underground Water Conservation District	3/6/2006
Lost Pines Groundwater Conservation District	2/15/2005
Middle Trinity Groundwater Conservation District	5/5/2009
Post Oak Savannah Groundwater Conservation District	9/26/2005
Prairielands Groundwater Conservation District	not yet developed
Rolling Plains Groundwater Conservation District	10/17/2005
Saratoga Underground Water Conservation District	11/30/2009
Southern Trinity Groundwater Conservation District	January 7, 2010 (adopted)
Upper Trinity Groundwater Conservation District	not yet developed
Wes-Tex Groundwater Conservation District	4/7/2010

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 with the objective of providing the most suitable area for the management of the groundwater resources.

In 2005, House Bill 1763 of the 79th Texas Legislature required GCDs in groundwater management areas to meet and define the *Desired Future Conditions* 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 acceptable, quantifiable aquifer conditions at some future date, i.e. water levels, water quality, spring flows, etc. Once the *Desired Future Conditions* are developed and submitted to the TWDB, the TWDB determines the amount of *Managed Available Groundwater* based on the GMA's *Desired Future Conditions*. The groundwater management plans of the GCDs, permitting, and the Regional Water Plans are to reflect the *Managed Available Groundwater* values.

The Brazos G Area intersects GMA 6, 7, 8, 12, and 14. These GMAs are shown on Figure 1-23 and are listed in Table 1-12 along with each GCD in the Brazos G Area, each major and minor aquifer, the status of the *Desired Future Conditions* development, and the status of the determination of *Managed Available Groundwater*. Only GMA 8 has adopted *Desired Future Conditions* for all aquifers, for which the TWDB has developed *Managed Available Groundwater* estimates.

1.10 Existing Programs and Goals

1.10.1 Texas Clean Rivers Act

In 1991, the 72nd Legislature passed the Texas Clean Rivers Act [20] to establish for the first time a watershed basis for water quality planning in Texas.[21,22] The Act requires each river basin in the State to be assessed for water quality and management strategies on an on-going

[20] Senate Bill 818, amending the Texas Water Code, Sections 5.103, 5.105, 26.011; T.A.C. Sections 320.1-320.9
[21] TNRCC, Op. Cit., 1992.
[22] TNRCC, Op. Cit., 1999.

Table 1-12.
Groundwater Conservation Districts, Aquifers, Desired Future Conditions (DFCs), and Managed Available Groundwater (MAG) Status by GMA for the Brazos G Area (as of October 2009)

Groundwater Management Area 6			
Clear Fork Groundwater Conservation District			
Rolling Plains Groundwater Conservation District			
Aquifer	Major or Minor Aquifer?	Desired Future Conditions Status	Managed Available Groundwater Status
Seymour	Major	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Dockum	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Blaine	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Groundwater Management Area 7			
Wes-Tex Groundwater Conservation District			
Aquifer	Major or Minor Aquifer?	Desired Future Conditions Status	Managed Available Groundwater Status
Edwards-Trinity (Plateau)	Major	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Dockum	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Groundwater Management Area 8			
Southern Trinity Groundwater Conservation District			
Post Oak Savannah Groundwater Conservation District *			
Clearwater Underground Water Conservation District			
Middle Trinity Groundwater Conservation District			
Saratoga Underground Water Conservation District			
Prairielands Groundwater Conservation District			
Upper Trinity Groundwater Conservation District			
Aquifer	Major or Minor Aquifer?	Desired Future Conditions Status	Managed Available Groundwater Status
Trinity	Major	Adopted - September 17, 2008	The TWDB MAG was finalized March 31, 2009.
Edwards (BFZ)	Major	Adopted - December 17, 2007	The TWDB MAG was finalized September 30, 2008.
Brazos River Alluvium	Minor	Adopted - December 17, 2007	The TWDB MAG for the Brazos River Alluvium Aquifer was finalized November 7, 2008.
Ellenburger-San Saba	Minor	Adopted - May 19, 2008	Currently in draft form.
Hickory	Minor	Adopted - May 19, 2008	Currently in draft form.
Marble Falls	Minor	Adopted - May 19, 2008	The TWDB MAG was finalized April 30, 2009.
Woobine	Minor	Adopted - December 17, 2007	The TWDB MAG was finalized November 10, 2008.

Table 1-12 (Concluded)

Groundwater Management Area 12			
Brazos Valley Groundwater Conservation District			
Post Oak Savannah Groundwater Conservation District*			
Lost Pines Groundwater Conservation District			
Aquifer	Major or Minor Aquifer?	Desired Future Conditions Status	Managed Available Groundwater Status
Carrizo-Wilcox	Major	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Brazos River Alluvium	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Queen City	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Sparta	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Yegua-Jackson	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Groundwater Management Area 14			
Bluebonnet Groundwater Conservation District			
Aquifer	Major or Minor Aquifer?	Desired Future Conditions Status	Managed Available Groundwater Status
Carrizo-Wilcox	Major	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Gulf Coast	Major	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Brazos River Alluvium	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Queen City	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Sparta	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
Yegua-Jackson	Minor	DFCs have not been adopted at this time.	Will be completed after adoption of the aquifers' DFCs.
*The Post Oak Savannah Groundwater Conservation District is in GMA 8 and GMA 12.			

basis. It also requires reports to be provided to the TCEQ every even-numbered year.[23] 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 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- and water-rights permittees.

The BRA is a partner with the TCEQ in the Clean Rivers Program for the Brazos G Area. 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

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

Report[24] 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 Brazos G Area were summarized in Section 1.7.2.

1.10.2 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 Brazos G Area. 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.[25] 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.[26] Other provisions protect particular types of ecosystems such as lakes (Section 314), estuaries (Section 320), and oceans (Section 403).[27] Several of these provisions are relevant to specific water quality concerns in the Brazos G Area.

[24] BRA, Op. Cit., 2004.
[25] 33 USCA, Sections 1251 through 1387.
[26] TWDB, 1997.
[27] Adler, R.W., Landman, J. and Cameron, D., *The Clean Water Act: Twenty Years Later*, Island Press, Washington D.C., 1993.

1.10.3 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.

1.10.4 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 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. The 2001 *Brazos G Regional Water Plan*[28] was a first step in evaluating and compiling the different water needs of users in the region and identifying a comprehensive plan to meet these needs. The 2006 Plan further refined the 2001 Plan, with population projections based upon year 2000 census information. The 2006 Plan includes information resulting from several local studies initiated following publication of the 2001 Plan, including:

- 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]

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[28] HDR, January 2001, Brazos G Regional Water Planning Area, Regional Water Plan.
[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.

- 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]
- In 2004, the City of Abilene, in cooperation with the West Central Texas Municipal Water District, completed a long-range water supply study for the City and District[32]. The study evaluated and compared multiple potential water supply projects, including Scalping from the Clear Fork to Hubbard Creek Reservoir; Purchase of Lake Alan Henry Supply; Purchase of Possum Kingdom Supply; Double Mountain Fork Reservoir (West Site); and Breckenridge Reservoir (Cedar Ridge Site). In 2008, the City of Abilene updated evaluations of Cedar Ridge Reservoir and Possum Kingdom Reservoir Supply[33]. The City of Abilene has continued to pursue feasibility studies (geologic, geotechnical, and environmental) related to the Cedar Ridge Reservoir.

Brief summaries of the 2001 and 2006 *Brazos G Regional Water Plan* and the completed studies to date are presented in the following sections.

1.11.1 2001 Brazos G Regional Water Plan and 2002 State Water Plan

The Brazos G Regional Water Plan was completed in January 2001 (2001 Plan), and amended in 2002 and 2005. This plan was incorporated into the 2002 State Water Plan,[34] along with the other 15 regional water plans.

The 2001 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 IH-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 plan identified the biggest challenge to many communities in the Brazos G Area is financing the construction of conveyance and treatment facilities, rather than securing new water sources.

[31] Freese and Nichols, August 2004, West Central Brazos River Basin Regional Water Treatment and Distribution Facility Plan.
[32] HDR and eHT, September 2004, Evaluation of Breckenridge Reservoir (Cedar Ridge Site) and Other Water Supply Alternatives, Draft, report to the City of Abilene and West Central Texas MWD.
[33] HDR and eHT, April 2008, Evaluation of Cedar Ridge Reservoir and Possum Kingdom Lake Water Supply Options for City of Abilene, Final Report to the City of Abilene.
[34] Texas Water Development Board, January 2002, Texas State Water Plan.

The major recommended strategies in the 2001 Plan include 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 for the City of Stamford and 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), and
- Breckenridge Reservoir (long-term strategy).

The 2001 Plan was incorporated by the TWDB into the 2002 State Water Plan.

1.11.2 2006 Brazos G Regional Water Plan and 2007 State Water Plan

In 2006, the Brazos G RWPG revised the Brazos G Plan. The 2006 Plan incorporated updated population and water demand estimates, and evaluation of new water management strategies. While the focus of the 2006 Plan is similar to that of the 2001 Plan, the 2006 Plan recommended a number of water management strategies different from those in the 2001 Plan. The 2006 Plan includes recommendations for advanced conservation as a water management strategy to meet about 45,000 acft/yr of needs for numerous municipal and non-municipal WUGs; 43,000 acft/yr of reuse supplies for seven WUGs and WWPs; 69,000 acft/yr of supplies from other regions; and augmentation of existing surface water supplies (increasing supplies by 38,000 acft/yr) including Lake Palo Pinto Off-Channel Reservoir, Millers Creek Augmentation, Raising the Level of Gibbons Creek Reservoir and Lake Granger Augmentation (conjunctive use with groundwater). The West Central Brazos System Optimization Plan would develop up to 59,150 acft/yr of new supplies through a combination of projects including priority calls agreements, Cedar Ridge Reservoir and reuse. Two new reservoirs were recommended beside Cedar Ridge Reservoir: Wheeler Branch Off-Channel and Brushy Creek Reservoir. The Wheeler Branch Off-Channel Reservoir has since been constructed. A major water management strategy in the 2006 Plan is the BRA System Operation, which would develop 89,850 acft/yr of supplies for 10 WUGs and/or WWPs in the Brazos G Area, and additional supplies for WUGs and WWPs in Region H. The 2006 Plan also includes over 66,000 acft/yr of additional development of groundwater resources, primarily from the Carrizo-Wilcox Aquifer in Brazos, Burleson, Lee, Limestone, Milam and Robertson Counties. In total, the 2006 Plan includes a little more than 590,000 acft/yr of new supplies from water management strategies to meet future needs of Brazos G entities, at a cost of over $1.03 billion (2nd Quarter 2002 prices).

The 2006 Plan has been amended multiple times since initial adoption to reflect the specific updated water supply plans of entities in the Brazos G Area.

1.11.3 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.

1.11.4 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 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.

1.11.5 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

1.11.6 Cedar Park – Round Rock – LCRA/Leander Regional Water Supply Project, Preliminary Engineering Report

The Cities of Cedar Park, Round Rock and Leander are participants in the Brushy Creek Regional Utility Authority, and are developing a regional water system to utilize supplies from the Lower Colorado River Authority (Lake Travis). This preliminary engineering report was completed in January 2007, and details the supplies and facilities necessary to treat and deliver the water to the three member cities.

1.11.7 Bell/Williamson Regional Water Supply Facility Plan

In October 2009, the Texas Water Development Board and several project participants began funding a study led by the Jarrell Schwertner WSC to develop a water supply facility plan for numerous entities along the IH 35 corridor in Bell and Williamson Counties. This study is still being conducted.

1.11.8 Phase 1 Studies for the 2011 Brazos G Regional Water Plan

In order to provide information for the development of the 2011 Plan, the Brazos G RWPG completed five studies during phase 1. The studies, completed in April 2009, are listed below and can be downloaded from the Brazos G and TWDB websites at the following web addresses:

http://www.brazosgwater.org/400.html

http://www.twdb.state.tx.us/wrpi/rwp/rwp_study.htm

Study 1 – Updated Drought of Record and Water Quality Implications for Reservoirs Upstream of Possum Kingdom Reservoir

Study 2 – Groundwater Availability Model of the Edwards-Trinity (Plateau) and Dockum Aquifer in Western Nolan and Eastern Mitchell Counties, Texas

Study 3 – Regionalization Strategies to Assist Small Water Systems in Meeting New SDWA Requirements

Study 4 – Brazos G Activities in Support of Region C's Water Supply Study for Ellis, Johnson, Southern Dallas, and Southern Tarrant Counties (Four County Study)

Study 5 – Updated Water Management Strategies for Water User Groups in McLennan County

Brief descriptions of these studies are included in Appendix M.

1.12 Water Loss Audits

In accordance with 31 TAC 357.7(a)(1)(M), the 2011 Brazos G Regional Water Plan includes water loss information below that was compiled by the TWDB from water loss audits performed by retail public utilities of the Brazos G Regional Water Planning Area pursuant to §358.6 of this title (relating to Water Loss Audits). In addition, in accordance with 31 TAC 357.7(a)(7)(A)(iv), the regional water planning group has considered strategies to address issues identified in the information compiled by the TWDB from the water loss audits performed by retail public utilities pursuant to §358.6 of this title (relating to Water Loss Audits).

The 2009 Water Loss Data presented herein were submitted to the Texas Water Development Board (TWDB) by water utilities in Texas as required by HB 3338 of the 78th

Texas Legislature. HB 3338 required the TWDB to compile the information included in the water audits by type of retail public utility and by regional water planning area, and provide that information to the regional planning groups for use in identifying appropriate water management strategies in the development of their regional water plan. The water loss data presented below were acquired as part of the 2005 Water Loss Audit reporting requirements. The methodology used relies upon self-reporting data provided by public utilities, and due to this, the self-reported data discussed in the TWDB Water Loss Report indicates that some of the data may be suspect and in need of further refinement.[35]

The TWDB provided the list of 254 public utilities of the Brazos G Planning Region that filed a water loss audit report, including the reported information for each of the following 27 factors: (1) population served, (2) quantity of water delivered, (3) percent of master meter accuracy, (4) quantity of water billed and metered, (5) quantity of water billed and unmetered, (6) quantity of water unbilled and metered, (7) quantity of water unbilled and unmetered, (8) total quantity of authorized consumption, (9) percent of customer meter accuracy, (10) quantity of customer meter accuracy loss, (11) quantity of unauthorized consumption, (12) quantity of apparent loss, (13) quantity of main line leaks, (14) quantity of customer line leaks, (15) quantity of storage tank overflows, (16) quantity of real loss, (17) quantity of total loss, (18) quantity of total water loss plus authorized consumption, (19) number of service connections, (20) number of miles of main lines, (21) number of connections per mile of main lines, (22) quantity of loss per mile of main lines, (23) quantity of loss per connection, (24) production water cost, (25) dollar value of real loss, (26) retail water cost, and (27) dollar value of apparent loss. On December 15, 2009, staff of TWDB informed the Technical Consultants that the TWDB "methodology used in calculating percentage water loss for water systems that receive TWDB loans is as follows: (Balancing Error + Total Water Loss) divided by (Corrected input volume) equals Percentage Water Loss." Data for each of the factors presented in the previous sentence (Balancing Error, Total Water Loss, and Corrected input volume) were included in the data provided by the TWDB, and are represented in Table 1-13. In Table 1-13, Corrected input volume is "Water Produced" and "Water Loss" is the sum of Balancing Error and Total Water Loss.

[35] Alan Plummer Associates, Inc. and Water Prospecting and Resource Consulting, LLC, "An Analysis of Water Loss, as Reported by Water Suppliers in Texas," Texas Water Development Board, Austin, Texas, January, 2007.

The TWDB requires a minimum delivery of 280 acft in the year 2000 for a water utility to be included as a Water User Group (WUG) in the current regional plan. Of the 254 public utilities that responded to the water loss survey, 171 reported having delivered less than 280 acft in 2005, and 83 reported having delivered more than 280 acft in 2005.

The 254 water utilities that responded to the water loss survey, reported having served 1,322,695 people in 2005. Total reported quantity of water produced was 235,128 acre-feet, with a reported quantity of water loss of 13,343 acre-feet. The quantity of water loss, as a percent of estimated total water originating at the source is calculated at about 5.7 percent. Table 1-13, below, presents summary statistics for the combined entities with water deliveries under 280 acft and water deliveries above 280 acft.

Table 1-13.
Water Loss Audit – 2005
Brazos G Water Planning Region

	Percent Loss	*Water Produced (acft)*	*Water Delivered (acft)*	*Water Loss (acft)*	*Population Served*	*Per Capita Use (gpcd)*
Total for Region	5.67%	235,128	221,785	13,343	1,322,695	159
Utilities with Deliveries More Than 280 acft						
Minimum	0.00%	467	467	0	6,700	62
Maximum[1]	28.89%	1,097	780	317	3,874	253
Mean	7.53%	2,642	2,498	143	14,251	157
Median[1]	5.00%	846	764	58	5,436	141
Utilities with Deliveries Less Than 280 acft						
Minimum	0.00%	222	222	0	2,534	78
Maximum[1]	35.68%	87	56	31	207	377
Mean	7.02%	1,459	1,373	86	8,503	108
Median[1]	4.24%	68	60	2	587	100

[1]The statistical values for Water Produced, Water Loss, Population Served, and Per Capita Use all correlate to the Percent Loss.

Section 2
Current and Projected Population and Water Demand Data for the Region

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 2000, water supply corporations and special utility districts using volumes of 280 acft or more in 2000, 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 226 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 and steam-electric water demand projections. Revisions to the population and municipal water demand projections for cities resulted from requests from individual cities and faster growth rates than projected in the 2006 Plan. Water demand projections for 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 1,621,961 in 2000 to 3,448,981 in 2060, an increase of 113 percent (1.27 percent annual growth). This is somewhat less than the projected statewide population growth during the same period of 117 percent, (1.30 percent annually). In 2060, it is projected that 32 percent of the Brazos G Area population will live in Williamson County, 13 percent in Bell County, 10 percent in Johnson County, 9 percent in McLennan County, 8 percent in Brazos County, 4 percent in Coryell County, 4 percent in Taylor County, and less than 3 percent in each of the remaining counties. Projections and growth rates for each of the 37 counties and 226 cities, other utilities, and 'County-Other' in the region are presented in Table 2-1.

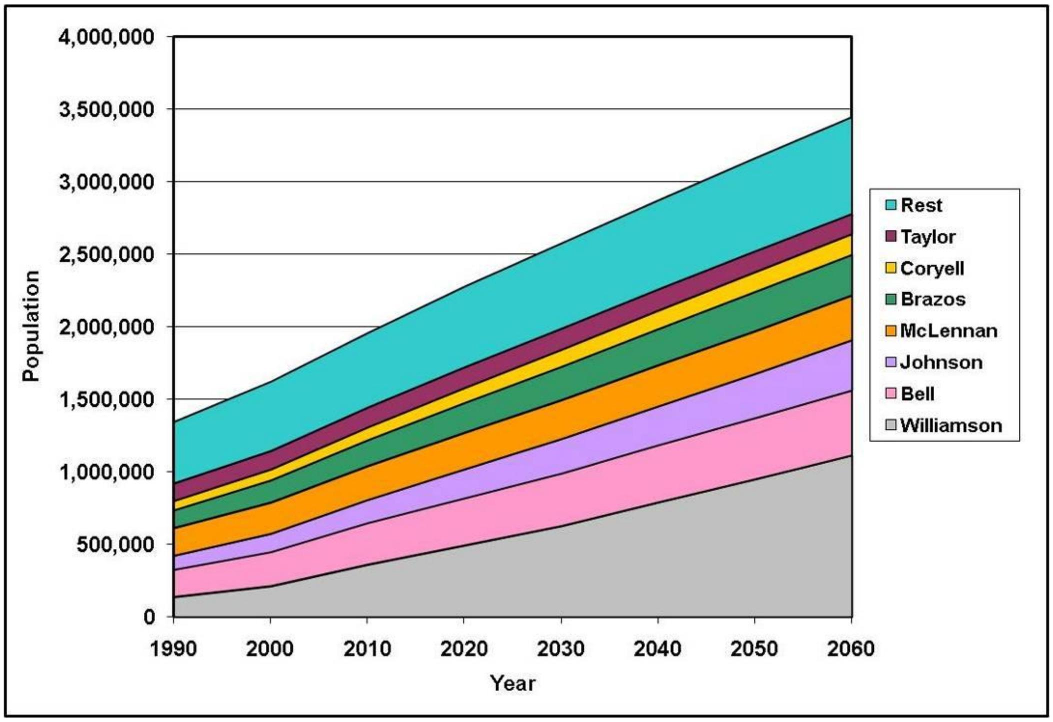

Figure 2-1. Population Projections

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

City/County	*Historical*		*Projections[1]*						*Percent Growth[2] 1990-00*	*Percent Growth 2000-60*
	1990	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*		
Bell County										
439 WSC		5,274	6,765	7,802	8,740	9,345	9,735	10,018	NA	1.08%
Bartlett (P)	621	818	932	1,011	1,083	1,129	1,159	1,181	2.79%	0.61%
Bell-Milam-Falls WSC (P)		1,980	2,350	2,607	2,840	2,990	3,087	3,157	NA	0.78%
Belton	12,476	14,623	17,633	20,399	22,914	24,617	25,815	26,116	1.60%	0.97%
Chisholm Trail SUD (P)		454	649	784	906	985	1,036	1,073	NA	1.44%
Dog Ridge WSC		3,534	4,434	5,060	5,626	5,991	6,226	6,397	NA	0.99%
East Bell County WSC (P)		2,274	2,502	2,661	2,805	2,898	2,958	3,001	NA	0.46%
Elm Creek WSC (P)		1,445	1,824	2,088	2,326	2,480	2,579	2,651	NA	1.02%
Fort Hood CDP (P)	17,021	17,282	17,282	17,282	17,282	17,282	17,282	17,282	0.15%	0.00%
Harker Heights	12,841	17,308	23,869	30,952	36,978	42,090	43,640	44,407	3.03%	1.58%
Holland	1,118	1,102	1,102	1,102	1,102	1,102	1,102	1,102	-0.14%	0.00%
Jarrell-Schwertner WSC (P)		1,231	1,518	1,717	1,897	2,013	2,088	2,142	NA	0.93%
Kempner WSC (P)		2,671	3,388	3,887	4,338	4,629	4,816	4,952	NA	1.03%
Killeen	63,535	86,911	113,217	126,985	141,148	154,641	169,132	184,064	3.18%	1.26%
Little River-Academy	1,390	1,645	1,793	1,896	1,989	2,049	2,088	2,116	1.70%	0.42%
Moffat WSC		3,732	4,434	4,922	5,364	5,649	5,832	5,965	NA	0.78%
Morgans Point Resort	1,766	2,989	4,219	4,781	5,290	5,617	5,828	5,981	5.40%	1.16%
Nolanville	1,834	2,150	2,611	2,753	2,882	2,965	3,019	3,058	1.60%	0.59%

Table 2-1 (Continued)

City/County	Historical		Projections[1]						Percent Growth[2] 1990-00	Percent Growth 2000-60
	1990	2000	2010	2020	2030	2040	2050	2060		
Pendleton WSC		2,431	2,785	3,031	3,254	3,398	3,491	3,558	NA	0.64%
Rogers	1,131	1,117	1,117	1,117	1,117	1,117	1,117	1,117	-0.12%	0.00%
Salado WSC		3,847	4,743	5,366	5,930	6,294	6,528	6,698	NA	0.93%
Temple	46,109	54,514	62,382	71,350	80,830	89,247	97,774	105,519	1.69%	1.11%
Troy	1,395	1,378	1,378	1,378	1,378	1,378	1,378	1,378	-0.12%	0.00%
West Bell County WSC		5,456	5,456	5,456	5,456	5,456	5,456	5,456	NA	0.00%
County-Other	29,851	1,808	1,289	1,223	1,157	1,116	1,089	1,071	-24.45%	-0.87%
Bell County Total	*191,088*	*237,974*	*289,672*	*327,610*	*364,632*	*396,478*	*424,255*	*449,460*	2.22%	1.07%
Bosque County										
Childress Creek WSC		2,091	2,459	2,853	3,130	3,234	3,276	3,327	NA	0.78%
Clifton	3,195	3,542	3,980	4,450	4,780	4,904	4,955	5,016	1.04%	0.58%
Cross Country WSC (P)		178	226	277	313	327	333	340	NA	1.08%
Lake Whitney Water Company (P)		3,294	3,374	3,459	3,519	3,541	3,550	3,561	NA	0.13%
Meridian	1,390	1,491	1,619	1,756	1,852	1,888	1,903	1,921	0.70%	0.42%
Morgan			569	668	784	920	1,080	1,268	NA	1.62%
Valley Mills (P)	1,085	1,120	1,279	1,449	1,568	1,613	1,631	1,653	0.32%	0.65%
Walnut Springs		755	804	857	894	908	914	921	NA	0.33%
County-Other	9,455	4,733	5,521	6,877	7,782	8,029	8,025	8,025	-6.69%	0.88%
Bosque County Total	*15,125*	*17,204*	*19,831*	*22,646*	*24,622*	*25,364*	*25,667*	*26,032*	1.30%	0.69%
Brazos County										
Bryan	55,002	65,660	74,650	84,038	92,672	99,339	107,239	109,881	1.79%	0.86%
College Station	52,456	67,890	80,920	94,526	107,040	116,703	128,152	131,981	2.61%	1.11%
Wellborn SUD		6,550	8,448	10,430	12,253	13,660	15,328	15,886	NA	1.49%
Wickson Creek SUD (P)		5,743	8,304	10,978	13,437	15,336	17,586	18,339	NA	1.95%
County-Other	14,404	6,572	5,865	5,127	4,448	3,924	3,303	3,095	-7.55%	-1.25%
Brazos County Total	*121,862*	*152,415*	*178,187*	*205,099*	*229,850*	*248,962*	*271,608*	*279,182*	2.26%	1.01%
Burleson County										
Caldwell	3,181	3,449	3,638	3,844	3,993	4,108	4,192	4,266	0.81%	0.35%
Milano WSC (P)		1,447	1,667	1,907	2,081	2,214	2,312	2,398	NA	0.85%
Snook		568	624	685	729	763	788	810	NA	0.59%
Somerville	1,542	1,704	1,818	1,942	2,032	2,101	2,152	2,197	1.00%	0.42%
Southwest Milam WSC (P)		293	354	420	468	505	532	556	NA	1.07%
County-Other	8,902	9,009	10,376	11,865	12,946	13,774	14,382	14,919	0.12%	0.84%
Burleson County Total	*13,625*	*16,470*	*18,477*	*20,663*	*22,249*	*23,465*	*24,358*	*25,146*	1.91%	0.71%
Callahan County										
Baird	1,658	1,623	1,623	1,623	1,623	1,623	1,623	1,623	-0.21%	0.00%
Clyde	3,002	3,344	3,733	3,787	3,706	3,615	3,514	3,430	1.08%	0.04%
Coleman County WSC (P)		392	378	405	363	316	264	221	NA	-0.95%
Cross Plains	1,063	1,068	1,068	1,069	1,068	1,067	1,066	1,065	0.05%	0.00%
Potosi WSC (P)		70	69	72	68	63	58	54	NA	-0.43%
County-Other	6,136	6,408	5,958	6,024	5,922	5,808	5,681	5,575	0.43%	-0.23%
Callahan County Total	*11,859*	*12,905*	*12,829*	*12,980*	*12,750*	*12,492*	*12,206*	*11,968*	0.85%	-0.13%
Comanche County										
Comanche	4,087	4,482	4,561	4,704	4,749	4,734	4,634	4,488	0.93%	0.00%
De Leon	2,190	2,433	2,476	2,554	2,578	2,570	2,516	2,436	1.06%	0.00%
County-Other	7,104	7,111	7,236	7,463	7,533	7,512	7,353	7,121	0.01%	0.00%
Comanche County Total	*13,381*	*14,026*	*14,273*	*14,721*	*14,860*	*14,816*	*14,503*	*14,045*	0.47%	0.00%

Table 2-1 (Continued)

City/County	Historical		Projections[1]						Percent Growth[2] 1990-00	Percent Growth 2000-60
	1990	2000	2010	2020	2030	2040	2050	2060		
Coryell County										
Copperas Cove (P)	24,079	29,455	34,762	40,893	46,866	51,092	54,790	57,765	2.04%	1.13%
Elm Creek WSC (P)		320	470	643	812	931	1,036	1,120	NA	2.11%
Fort Gates WSC		2,000	2,279	2,602	2,916	3,138	3,333	3,490	NA	0.93%
Fort Hood CDP (P)	18,559	16,429	16,429	16,429	16,429	16,429	16,429	16,429	-1.21%	0.00%
Gatesville	11,492	15,591	19,637	24,312	28,866	32,088	34,908	37,177	3.10%	1.46%
Kempner WSC		3,409	5,039	6,922	8,756	10,054	11,190	12,104	NA	2.13%
County-Other	10,083	7,774	9,091	10,613	12,096	13,146	14,063	14,801	-2.57%	1.08%
Coryell County Total	*64,213*	*74,978*	*87,707*	*102,414*	*116,741*	*126,878*	*135,749*	*142,886*	1.56%	1.08%
Eastland County										
Cisco	3,813	3,851	3,859	3,869	3,801	3,697	3,576	3,415	0.10%	-0.20%
Eastland	3,690	3,769	4,017	4,028	3,957	3,849	3,723	3,555	0.21%	-0.10%
Gorman	1,290	1,236	1,239	1,242	1,220	1,187	1,148	1,096	-0.43%	-0.20%
Ranger	2,803	2,584	2,590	2,596	2,551	2,481	2,399	2,292	-0.81%	-0.20%
Rising Star	859	835	837	839	824	802	775	740	-0.28%	-0.20%
Stephens County Rural WSC (P)		13	13	13	13	12	12	12	NA	-0.13%
County-Other	6,033	6,009	5,781	5,795	5,695	5,538	5,356	5,116	-0.04%	-0.27%
Eastland County Total	*18,488*	*18,297*	*18,336*	*18,382*	*18,061*	*17,566*	*16,989*	*16,226*	-0.10%	-0.20%
Erath County										
Dublin	3,190	3,754	4,167	4,611	5,011	5,413	6,479	7,149	1.64%	1.08%
Stephenville	13,502	14,921	15,959	17,076	18,082	19,094	21,775	23,462	1.00%	0.76%
County-Other	11,299	14,326	16,540	18,922	21,067	23,227	28,946	32,544	2.40%	1.38%
Erath County Total	*27,991*	*33,001*	*36,666*	*40,609*	*44,160*	*47,734*	*57,200*	*63,155*	1.66%	1.09%
Falls County										
Bell-Milam Falls WSC (P)		915	1,223	1,609	2,004	2,351	2,627	2,952	NA	1.97%
Bruceville-Eddy (P)		2	4	6	8	10	12	14	NA	3.30%
East Bell County WSC (P)		612	729	876	1,026	1,158	1,263	1,386	NA	1.37%
Elm Creek WSC (P)		32	46	64	83	99	112	127	NA	2.32%
Lott		724	724	724	724	724	724	724	NA	0.00%
Marlin	6,386	6,628	6,862	7,155	7,455	7,718	7,927	8,173	0.37%	0.35%
Rosebud	1,638	1,493	1,493	1,493	1,493	1,493	1,493	1,493	-0.92%	0.00%
Tri-County SUD (P)		2,614	2,975	3,428	3,891	4,298	4,622	5,003	NA	1.09%
West Brazos WSC (P)		1,820	2,298	2,898	3,511	4,050	4,478	4,982	NA	1.69%
County-Other	9,688	3,736	3,246	2,631	2,001	1,449	1,009	492	-9.09%	-3.32%
Falls County Total	*17,712*	*18,576*	*19,600*	*20,884*	*22,196*	*23,350*	*24,267*	*25,346*	0.48%	0.52%
Fisher County										
Bitter Creek WSC (P)		1,150	1,165	1,166	1,196	1,219	1,230	1,266	NA	0.16%
Roby	616	673	682	683	702	716	723	745	0.89%	0.17%
Rotan	1,913	1,611	1,562	1,559	1,461	1,385	1,347	1,230	-1.70%	-0.45%
County-Other	2,313	910	855	851	738	652	610	476	-8.91%	-1.07%
Fisher County Total	*4,842*	*4,344*	*4,264*	*4,259*	*4,097*	*3,972*	*3,910*	*3,717*	-1.08%	-0.26%
Grimes County										
Navasota	6,296	6,789	7,111	7,470	7,753	7,950	8,107	8,262	0.76%	0.33%
Wickson Creek SUD (P)		2,792	4,614	6,646	8,249	9,363	10,253	11,128	NA	2.33%
County-Other	12,532	13,971	14,910	15,957	16,783	17,357	17,816	18,267	1.09%	0.45%
Grimes County Total	*18,828*	*23,552*	*26,635*	*30,073*	*32,785*	*34,670*	*36,176*	*37,657*	2.26%	0.79%

Table 2-1 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060	Percent Growth[2] 1990-00	Percent Growth 2000-60
Hamilton County										
Hamilton	2,937	2,977	2,942	2,933	2,926	2,928	2,919	2,918	0.14%	-0.03%
Hico	1,342	1,341	1,417	1,417	1,417	1,417	1,417	1,417	-0.01%	0.09%
County-Other	3,454	3,911	3,431	3,331	3,253	3,279	3,176	3,169	1.25%	-0.35%
Hamilton County Total	*7,733*	*8,229*	*7,790*	*7,681*	*7,596*	*7,624*	*7,512*	*7,504*	0.62%	-0.15%
Haskell County										
Haskell	3,362	3,106	3,024	2,982	2,925	2,895	2,842	2,752	-0.79%	-0.20%
Rule	783	698	671	657	638	628	610	580	-1.14%	-0.31%
Stamford (P)	36	43	45	46	48	49	50	52	1.79%	0.32%
County-Other	2,639	2,246	2,120	2,056	1,969	1,924	1,843	1,705	-1.60%	-0.46%
Haskell County Total	*6,820*	*6,093*	*5,860*	*5,741*	*5,580*	*5,496*	*5,345*	*5,089*	-1.12%	-0.30%
Hill County										
Brandon-Irene WSC (P)		2,009	2,059	2,128	2,207	2,285	2,369	2,462	NA	0.34%
Fills Valley WSC (P)		1,963	1,997	2,045	2,100	2,154	2,212	2,277	NA	0.25%
Hillsboro	7,072	8,232	8,923	9,284	9,692	10,099	10,534	11,017	1.53%	0.49%
Hubbard	1,589	1,586	1,713	1,713	1,713	1,713	1,713	1,713	-0.02%	0.13%
Itasca	1,523	1,503	1,736	1,729	1,722	1,715	1,707	1,697	-0.13%	0.20%
Johnson County SUD (P)		177	191	211	233	255	279	305	NA	0.91%
Lake Whitney Water Company (P)		5,374	5,396	5,426	5,460	5,494	5,530	5,570	NA	0.06%
Parker WSC (P)		371	391	419	451	483	517	555	NA	0.67%
White Bluff Community WS		1,000	1,211	1,507	1,841	2,175	2,531	2,927	NA	1.81%
Whitney	1,626	1,833	2,157	2,227	2,306	2,385	2,470	2,564	1.21%	0.56%
Woodrow-Osceola WSC		5,396	5,671	6,056	6,491	6,925	7,389	7,904	NA	0.64%
County-Other	15,336	2,877	2,074	2,305	2,566	2,827	3,104	3,411	-15.41%	0.28%
Hill County Total	*27,146*	*32,321*	*33,519*	*35,050*	*36,782*	*38,510*	*40,355*	*42,402*	1.76%	0.45%
Hood County										
Acton MUD (P)		12,222	15,036	18,435	21,599	24,913	29,088	33,909	NA	1.72%
Cresson (P)			295	360	439	536	654	799	NA	2.01%
DeCordova			3,074	3,125	3,177	3,230	3,283	3,337	NA	0.16%
Granbury	4,045	5,718	8,073	10,083	11,954	13,914	16,383	19,234	3.52%	2.04%
Lipan			599	844	1,189	1,675	2,359	3,323	NA	3.49%
Oak Trail Shores Subdivision		2,985	3,512	3,512	3,512	3,512	3,512	3,512	NA	0.27%
Tolar		504	749	958	1,153	1,357	1,614	1,911	NA	2.25%
County-Other	24,936	19,671	17,869	21,047	23,865	26,677	30,166	34,020	-2.34%	0.92%
Hood County Total	*28,981*	*41,100*	*49,207*	*58,364*	*66,888*	*75,814*	*87,059*	*100,045*	3.56%	1.49%
Johnson County										
Acton MUD (P)		101	133	171	211	255	309	376	NA	2.21%
Alvarado	2,918	3,288	4,204	4,627	5,071	5,556	6,158	6,897	1.20%	1.24%
Bethany WSC		3,000	3,373	3,813	4,275	4,780	5,406	6,174	NA	1.21%
Bethesda WSC (P)		14,650	19,035	24,199	29,625	35,552	42,905	51,926	NA	2.13%
Burleson (P)	14,153	17,514	27,206	42,037	52,747	52,747	52,747	52,747	2.15%	1.85%
Cleburne	22,205	26,005	30,572	34,467	38,558	43,027	48,353	52,812	1.59%	1.19%
Cresson (P)			78	95	116	141	172	210	NA	2.00%
Godley		879	1,136	1,439	1,757	2,105	2,536	3,065	NA	2.10%
Grandview	1,245	1,358	1,600	2,000	2,500	2,500	2,500	2,500	0.87%	1.02%
Johnson County SUD (P)		33,656	43,983	56,147	68,926	82,885	100,205	121,454	NA	2.16%
Joshua	3,828	4,528	5,503	6,247	7,028	7,881	8,940	10,239	1.69%	1.37%
Keene	3,944	5,003	5,882	6,917	8,004	9,192	10,666	12,474	2.41%	1.53%

Table 2-1 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060	Percent Growth[2] 1990-00	Percent Growth 2000-60
Mansfield (P)	617	622	626	631	636	642	649	658	0.08%	0.09%
Mountain Peak WSC (P)		1,200	1,733	2,360	3,019	3,739	4,632	5,728	NA	2.64%
Parker WSC (P)		1,753	2,187	2,697	3,233	3,818	4,545	5,436	NA	1.90%
Rio Vista		656	751	863	981	1,110	1,270	1,466	NA	1.35%
Venus (P)	979	1,892	2,435	2,435	2,435	2,435	2,435	2,435	6.81%	0.42%
County-Other	47,276	10,706	9,014	9,236	9,468	9,717	10,026	10,402	-13.80%	-0.05%
Johnson County Total	*97,165*	*126,811*	*159,451*	*200,381*	*238,590*	*268,082*	*304,454*	*346,999*	2.70%	1.69%
Jones County										
Abilene (P)	797	5,488	5,600	5,737	5,728	5,641	5,476	5,263	21.28%	-0.07%
Anson	2,644	2,556	2,608	2,672	2,668	2,627	2,550	2,451	-0.34%	-0.07%
Hamlin	2,788	2,248	2,294	2,350	2,346	2,311	2,243	2,156	-2.13%	-0.07%
Hawley		646	659	675	674	664	645	620	NA	-0.07%
Hawley WSC (P)		5,006	5,109	5,233	5,225	5,146	4,995	4,801	NA	-0.07%
Stamford (P)	3,781	3,593	3,667	3,756	3,750	3,693	3,585	3,446	-0.51%	-0.07%
County-Other	6,480	1,248	1,274	1,306	1,304	1,284	1,244	1,196	-15.19%	-0.07%
Jones County Total	*16,490*	*20,785*	*21,211*	*21,729*	*21,695*	*21,366*	*20,738*	*19,933*	2.34%	-0.07%
Kent County										
Jayton	608	513	501	489	434	352	310	270	-1.68%	-1.06%
County-Other	402	346	339	332	299	250	225	202	-1.49%	-0.89%
Kent County Total	*1,010*	*859*	*840*	*821*	*733*	*602*	*535*	*472*	-1.61%	-0.99%
Knox County										
Knox City	1,440	1,219	1,198	1,239	1,241	1,245	1,243	1,226	-1.65%	0.01%
Munday	1,600	1,527	1,520	1,534	1,535	1,536	1,535	1,530	-0.47%	0.00%
County-Other	1,797	1,507	1,479	1,532	1,534	1,540	1,538	1,516	-1.74%	0.01%
Knox County Total	*4,837*	*4,253*	*4,197*	*4,305*	*4,310*	*4,321*	*4,316*	*4,272*	-1.28%	0.01%
Lampasas County										
Copperas Cove (P)		137	213	293	351	394	422	440	NA	1.96%
Kempner		1,004	1,286	1,584	1,800	1,960	2,065	2,131	NA	1.26%
Kempner WSC (P)		3,081	3,836	4,633	5,211	5,639	5,920	6,098	NA	1.14%
Lampasas	6,382	6,786	8,222	9,225	9,952	10,491	10,845	10,325	0.62%	0.70%
Lometa		782	869	961	1,028	1,078	1,110	1,130	NA	0.62%
County-Other	7,139	5,972	5,688	5,900	6,054	6,169	6,244	7,036	-1.77%	0.27%
Lampasas County Total	*13,521*	*17,762*	*20,114*	*22,596*	*24,396*	*25,731*	*26,606*	*27,160*	2.77%	0.71%
Lee County										
Aqua WSC (P)		2,604	2,949	3,365	3,708	3,985	4,226	4,430	NA	0.89%
Giddings	4,093	5,105	5,875	6,804	7,569	8,187	8,725	9,180	2.23%	0.98%
Lee County WSC (P)		4,125	4,913	5,864	6,648	7,280	7,831	8,297	NA	1.17%
Lexington	953	1,178	1,349	1,556	1,726	1,863	1,983	2,084	2.14%	0.96%
Manville WSC (P)		102	143	193	234	267	296	320	NA	1.92%
Southwest Milam WSC (P)		227	271	324	368	403	434	460	NA	1.18%
County-Other	7,808	2,316	2,289	2,256	2,230	2,209	2,190	2,175	-11.44%	-0.10%
Lee County Total	*12,854*	*15,657*	*17,789*	*20,362*	*22,483*	*24,194*	*25,685*	*26,946*	1.99%	0.91%
Limestone County										
Biston MWSD		552	552	552	552	552	552	552	NA	0.00%
Coolidge		848	957	1,096	1,172	1,230	1,287	1,362	NA	0.79%
Groesbeck	3,185	4,291	5,303	6,595	7,299	7,838	8,373	9,068	3.03%	1.25%
Kosse			500	503	506	509	512	515	NA	0.06%
Mexia	6,933	6,563	6,892	7,237	7,600	7,980	8,380	8,800	-0.55%	0.49%

Table 2-1 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060	Percent Growth[2] 1990-00	Percent Growth 2000-60
Thornton		524	524	524	524	524	524	524	NA	0.00%
Tri-County SUD (P)		1,059	1,210	1,403	1,508	1,588	1,668	1,772	NA	0.86%
County-Other	10,828	8,214	7,384	7,034	6,667	6,284	5,881	5,457	-2.73%	-0.68%
Limestone County Total	*20,946*	*22,051*	*23,322*	*24,944*	*25,828*	*26,505*	*27,177*	*28,050*	0.52%	0.40%
McLennan County										
Bellmead	8,336	9,214	9,875	10,541	11,102	11,684	12,054	12,591	1.01%	0.52%
Beverly Hills	2,048	2,113	2,162	2,211	2,253	2,296	2,323	2,363	0.31%	0.19%
Bruceville-Eddy (P)	1,074	1,488	1,800	2,114	2,379	2,653	2,827	3,080	3.31%	1.22%
Chalk Bluff WSC		2,700	3,487	4,280	4,948	5,641	6,081	6,720	NA	1.53%
Crawford		705	761	817	864	913	944	989	NA	0.57%
Cross Country WSC (P)		2,372	2,757	3,146	3,473	3,812	4,028	4,341	NA	1.01%
Elm Creek WSC (P)		1,343	1,822	2,305	2,712	3,134	3,402	3,791	NA	1.74%
Gholson		922	1,095	1,270	1,417	1,569	1,666	1,807	NA	1.13%
Hallsburg		518	569	621	664	709	738	780	NA	0.68%
Hewitt	8,983	11,085	12,667	14,262	15,606	16,999	17,884	19,170	2.12%	0.92%
Lacy-Lakeview	3,617	5,764	7,380	9,009	10,382	11,805	12,709	14,023	4.77%	1.49%
Lorena	1,158	1,433	1,640	1,849	2,025	2,207	2,323	2,491	2.15%	0.93%
Mart	2,004	2,273	2,475	2,679	2,851	3,029	3,142	3,307	1.27%	0.63%
McGregor	4,683	4,727	4,760	4,793	4,821	4,850	4,869	4,896	0.09%	0.06%
Moody	1,329	1,400	1,453	1,507	1,552	1,599	1,629	1,672	0.52%	0.30%
North Bosque WSC		1,350	1,818	2,290	2,688	3,100	3,362	3,743	NA	1.71%
Riesel		973	1,074	1,176	1,262	1,351	1,407	1,489	NA	0.71%
Robinson	7,111	7,845	9,592	11,353	12,837	14,375	15,352	16,772	0.99%	1.27%
Tri-County SUD (P)		112	136	160	180	201	214	234	NA	1.24%
Valley Mills (P)	10	3	3	3	3	3	3	3	-11.34%	0.00%
Waco	103,590	113,726	121,355	129,046	135,528	142,247	146,514	152,715	0.94%	0.49%
West	2,515	2,692	2,825	2,959	3,072	3,189	3,264	3,372	0.68%	0.38%
West Brazos WSC (P)		1,614	1,944	2,277	2,558	2,849	3,034	3,303	NA	1.20%
Western Hills WS		2,744	3,569	4,401	5,102	5,829	6,290	6,961	NA	1.56%
Woodway	8,695	8,733	8,762	8,791	8,815	8,840	8,856	8,879	0.04%	0.03%
County-Other	33,970	25,668	26,101	26,538	26,908	27,293	27,534	27,886	-2.76%	0.14%
McLennan County Total	*189,123*	*213,517*	*231,882*	*250,398*	*266,002*	*282,177*	*292,449*	*307,378*	1.22%	0.61%
Milam County										
Bell-Milam Falls WSC (P)		1,327	1,683	2,024	2,255	2,408	2,477	2,522	NA	1.08%
Cameron	5,580	5,634	6,231	6,900	7,331	7,596	7,663	7,693	0.10%	0.52%
Milano WSC (P)		1,568	1,829	2,079	2,248	2,360	2,411	2,444	NA	0.74%
Rockdale	5,235	5,439	5,596	5,746	5,848	5,915	5,946	5,966	0.38%	0.15%
Southwest Milam WSC (P)		5,419	6,643	7,813	8,606	9,130	9,368	9,521	NA	0.94%
Thorndale	1,092	1,278	1,421	1,558	1,651	1,712	1,740	1,758	1.59%	0.53%
County-Other	11,039	3,573	2,650	1,966	1,457	1,080	800	592	-10.67%	-2.95%
Milam County Total	*22,946*	*24,238*	*26,053*	*28,086*	*29,396*	*30,201*	*30,405*	*30,496*	0.55%	0.38%
Nolan County										
Bitter Creek WSC (P)		1,150	1,205	1,250	1,271	1,267	1,219	1,161	NA	0.02%
Roscoe	1,446	1,378	1,443	1,498	1,523	1,518	1,460	1,391	-0.48%	0.02%
Sweetwater	11,967	11,415	11,955	12,408	12,616	12,578	12,098	11,525	-0.47%	0.02%
County-Other	3,181	1,859	1,947	2,021	2,054	2,049	1,970	1,877	-5.23%	0.02%
Nolan County Total	*16,594*	*15,802*	*16,550*	*17,177*	*17,464*	*17,412*	*16,747*	*15,954*	-0.49%	0.02%

Table 2-1 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060	Percent Growth[2] 1990-00	Percent Growth 2000-60
Palo Pinto County										
Fort Belknapp WSC (P)		11	17	24	30	36	43	51	NA	2.59%
Graford		578	594	613	629	645	664	686	NA	0.29%
Mineral Wells (P)	14,388	14,770	15,074	16,200	17,123	17,955	18,873	19,901	0.26%	0.50%
Stephens County Rural WSC (P)		13	13	13	13	13	13	13	NA	0.00%
Strawn		739	767	801	830	858	891	929	NA	0.38%
County-Other	10,667	10,915	12,430	13,496	14,423	15,390	16,590	18,009	0.23%	0.84%
Palo Pinto County Total	*25,055*	*27,026*	*28,895*	*31,147*	*33,048*	*34,897*	*37,074*	*39,589*	0.76%	0.64%
Robertson County										
Bremond	1,110	876	876	876	876	876	876	876	-2.34%	0.00%
Calvert	1,536	1,426	1,426	1,426	1,426	1,426	1,426	1,426	-0.74%	0.00%
Franklin	1,336	1,470	1,592	1,754	1,856	1,925	1,934	1,927	0.96%	0.45%
Hearne	5,132	4,690	4,690	4,690	4,690	4,690	4,690	4,690	-0.90%	0.00%
Robertson County WSC		2,529	3,195	4,076	4,631	5,009	5,057	5,019	NA	1.15%
Tri-County SUD (P)		838	909	1,003	1,062	1,102	1,107	1,103	NA	0.46%
Wickson Creek SUD (P)		93	151	227	275	308	312	309	NA	2.02%
County-Other	6,397	4,078	4,325	4,652	4,858	4,999	5,017	5,003	-4.40%	0.34%
Robertson County Total	*15,511*	*16,000*	*17,164*	*18,704*	*19,674*	*20,335*	*20,419*	*20,353*	0.31%	0.40%
Shackelford County										
Albany	1,962	1,921	2,011	2,116	2,096	1,982	1,744	1,464	-0.21%	-0.45%
Hawley WSC (P)		61	64	67	67	63	55	46	NA	-0.47%
Stephens County Rural WSC (P)		13	14	14	14	13	12	10	NA	-0.44%
County-Other	1,354	1,307	1,367	1,441	1,426	1,348	1,186	996	-0.35%	-0.45%
Shackelford County Total	*3,316*	*3,302*	*3,456*	*3,638*	*3,603*	*3,406*	*2,997*	*2,516*	-0.04%	-0.45%
Somervell County										
Glen Rose	1,949	2,122	2,672	3,009	3,287	3,469	3,543	3,568	0.85%	0.87%
County-Other	3,411	4,687	4,870	5,384	5,807	6,085	6,197	6,236	3.23%	0.48%
Somervell County Total	*5,360*	*6,809*	*7,542*	*8,393*	*9,094*	*9,554*	*9,740*	*9,804*	2.42%	0.61%
Stephens County										
Breckenridge	5,665	5,868	5,989	6,084	6,128	6,069	5,838	5,654	0.35%	-0.06%
Fort Belknapp WSC (P)		35	36	36	37	36	35	34	NA	-0.05%
Stephens County Rural WSC (P)		2,482	2,533	2,573	2,592	2,567	2,469	2,391	NA	-0.06%
County-Other	3,345	1,289	1,315	1,337	1,345	1,333	1,282	1,242	-9.10%	-0.06%
Stephens County Total	*9,010*	*9,674*	*9,873*	*10,030*	*10,102*	*10,005*	*9,624*	*9,321*	0.71%	-0.06%
Stonewall County										
Aspermont	1,214	1,021	1,017	985	937	877	823	771	-1.72%	-0.47%
County-Other	799	672	670	649	618	578	542	508	-1.72%	-0.47%
Stonewall County Total	*2,013*	*1,693*	*1,687*	*1,634*	*1,555*	*1,455*	*1,365*	*1,279*	-1.72%	-0.47%
Taylor County										
Abilene (P)	105,857	110,438	119,007	124,483	127,092	127,873	125,467	121,572	0.42%	0.16%
Coleman County WSC (P)		140	151	158	161	162	159	154	NA	0.16%
Hawley WSC (P)		677	730	763	779	784	769	745	NA	0.16%
Merkel	2,469	2,637	2,842	2,972	3,035	3,053	2,996	2,903	0.66%	0.16%
Potosi WSC (P)		3,430	3,696	3,866	3,947	3,971	3,897	3,776	NA	0.16%
Steamboat Mountain WSC		3,342	3,601	3,767	3,846	3,870	3,797	3,679	NA	0.16%
Tuscola		714	769	804	822	827	812	786	NA	0.16%

Table 2-1 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060	Percent Growth[2] 1990-00	Percent Growth 2000-60
Tye	1,088	1,158	1,248	1,305	1,333	1,341	1,316	1,275	0.63%	0.16%
County-Other	10,241	4,015	4,326	4,527	4,619	4,648	4,559	4,419	-8.94%	0.16%
Taylor County Total	*119,655*	*126,551*	*136,370*	*142,645*	*145,634*	*146,529*	*143,772*	*139,309*	0.56%	0.16%
Throckmorton County										
Fort Belknapp WSC (P)		105	105	102	97	90	84	80	NA	-0.45%
Stephens County Rural WSC (P)		79	79	77	73	68	63	60	NA	-0.46%
Throckmorton	1,036	905	905	877	838	775	725	688	-1.34%	-0.46%
County-Other	844	761	762	737	705	651	611	579	-1.03%	-0.45%
Throckmorton County Total	*1,880*	*1,850*	*1,851*	*1,793*	*1,713*	*1,584*	*1,483*	*1,407*	-0.16%	-0.46%
Washington County										
Brenham	11,952	13,507	14,313	15,306	15,940	16,285	16,594	16,844	1.23%	0.37%
County-Other	14,202	16,866	18,246	19,947	21,033	21,623	22,153	22,582	1.73%	0.49%
Washington County Total	*26,154*	*30,373*	*32,559*	*35,253*	*36,973*	*37,908*	*38,747*	*39,426*	1.51%	0.44%
Williamson County										
Aqua WSC (P)		420	504	603	721	849	989	1,139	NA	1.68%
Bartlett (P)	818	857	893	936	987	1,043	1,103	1,168	0.47%	0.52%
Bell-Milam Falls WSC (P)		274	362	467	592	727	874	1,032	NA	2.23%
Blockhouse MUD		4,452	7,197	10,452	14,322	18,530	23,108	28,018	NA	3.11%
Brushy Creek MUD		11,322	16,270	22,138	23,823	23,823	23,823	23,823	NA	1.25%
Cedar Park (P)	5,161	25,508	58,665	81,731	88,823	108,018	108,018	108,018	17.33%	2.43%
Chisholm Trail SUD (P)		11,202	19,019	28,290	39,312	51,297	64,336	78,320	NA	3.29%
Fern Bluff MUD		5,319	9,801	15,117	21,437	28,309	35,785	43,803	NA	3.58%
Florence		1,054	1,364	1,632	1,951	2,298	2,675	3,079	NA	1.80%
Georgetown	14,842	28,339	49,112	66,987	88,239	111,348	136,489	163,453	6.68%	2.96%
Granger	1,190	1,299	1,561	1,695	1,854	2,027	2,215	2,417	0.88%	1.04%
Hutto		1,250	12,479	17,153	22,709	28,750	35,317	42,363	NA	6.05%
Jarrell			1,433	1,474	1,517	1,561	1,606	1,652	NA	0.28%
Jarrell-Schwertner WSC (P)		2,720	2,362	3,596	5,068	6,672	8,420	10,297	NA	2.24%
Jonah Water SUD		7,962	10,685	13,915	17,755	21,930	26,472	31,344	NA	2.31%
Leander	3,398	7,596	22,675	31,803	42,654	54,454	67,291	81,059	8.38%	4.02%
Liberty Hill		1,409	2,440	3,663	5,117	6,698	8,418	10,263	NA	3.36%
Manville WSC (P)		5,273	7,979	11,188	15,003	19,151	23,664	28,504	NA	2.85%
Round Rock (P)	30,923	60,060	104,696	143,328	189,257	239,199	293,531	351,804	6.86%	2.99%
Southwest Milam WSC (P)		1,245	1,584	1,986	2,464	2,984	3,550	4,157	NA	2.03%
Taylor	11,472	13,575	17,935	20,613	23,797	27,259	31,025	35,065	1.70%	1.59%
Thrall		710	976	1,176	1,415	1,674	1,956	2,258	NA	1.95%
Weir		591	936	1,345	1,831	2,360	2,935	3,552	NA	3.03%
Wells Branch MUD (P)		168	168	168	168	168	168	168	NA	0.00%
Williamson-Travis County MUD #1 (P)		4,179	6,611	9,495	12,924	16,653	20,710	25,061	NA	3.03%
County-Other	68,991	14,690	2,379	1,750	2,551	11,961	24,831	32,693	-14.33%	1.34%
Williamson County Total	*136,795*	*211,474*	*360,086*	*492,701*	*626,291*	*789,743*	*949,309*	*1,114,510*	4.45%	2.81%
Young County										
Fort Belknapp WSC (P)		3,349	3,382	3,455	3,460	3,420	3,370	3,339	NA	0.00%
Graham	8,986	8,716	8,800	8,993	9,006	8,903	8,772	8,690	-0.30%	0.00%
Newcastle		575	581	593	594	587	579	573	NA	-0.01%
Stephens County Rural WSC (P)		13	13	13	13	13	13	13	NA	0.00%

Table 2-1 (Concluded)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	Projections[1] 2020	Projections[1] 2030	Projections[1] 2040	Projections[1] 2050	Projections[1] 2060	Percent Growth[2] 1990-00	Percent Growth 2000-60
County-Other	5,621	1,336	1,349	1,379	1,380	1,364	1,345	1,332	-13.38%	0.00%
Young County Total	*14,607*	*13,989*	*14,125*	*14,433*	*14,453*	*14,287*	*14,079*	*13,947*	-0.43%	-0.01%
Total For Region	**1,344,536**	**1,621,961**	**1,957,870**	**2,278,346**	**2,576,886**	**2,873,485**	**3,164,880**	**3,448,981**	**1.89%**	**1.27%**

Notes:
[1] Projections from Texas Water Development Board.
[2] Compound annual growth rate.
(P) Partial
'NA' indicates no data available in 1990.

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 2000 and 2060, growing at 2.81 percent annually. Bell, Brazos, Coryell, Erath, Hood, and Johnson 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.

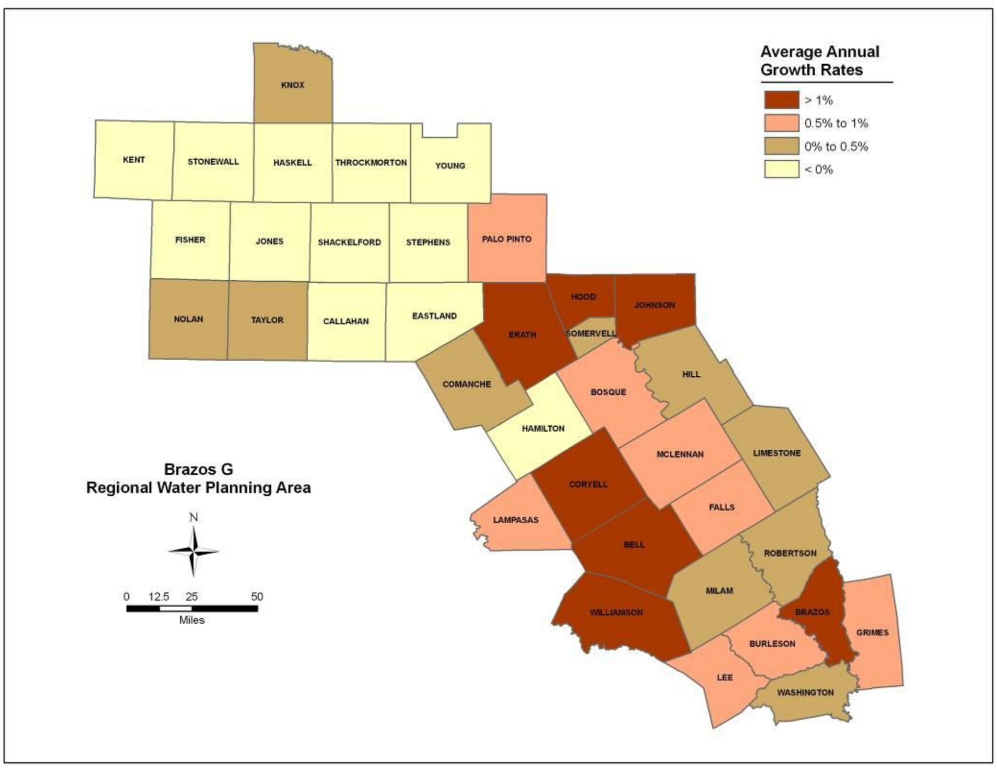

Figure 2-2. Projected Annual County Growth Rates in the Brazos G Regional Water Planning Area

2.2.1 Revisions to the 2006 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 2011 Plan. Approved population revisions are detailed in Table 2-2. WUGs with suggested revisions can be classified into three categories:

1. New WUGs. These are city WUGs whose populations have grown sufficiently to be included as WUGs in the 2011 Plan. There are six proposed new WUGs, based on information provided by the TWDB, including Morgan (Bosque County), DeCordova (Hood County), Lipan (Hood County), Cresson (Hood and Johnson Counties), Jarrell (Williamson County) and Kosse (Limestone County). Cresson is located primarily in Region C. All of the population projections were able to be drawn from County-Other except for the City of Jarrell, for which the population was drawn from the Jarrell-Schwertner WSC.

2. 5 percent WUGs. These are city WUGs for which the 2007 population estimated by the Texas State Data Center exceeds by 5 percent or more the 2007 population estimated with a straight-line interpolation between the 2000 and 2010 decadal estimates used in the 2006 Plan. There are twenty-seven 5 percent WUGs located outside of Johnson County. The revised population projections for these WUGS were generated by TWDB staff.

3. Johnson County WUGs[1]. These are city WUGs located in Johnson County for which the recently completed Four-County Study conducted by Region C (assisted by Brazos G) recommends increases in the population projections. A few of these WUGs also meet the "5 percent in 2007" criteria, but are excluded from the list of 5 percent WUGs because they are located in Johnson County and are part of the Four-County Study.

Projections were not revised for non-city WUGs, except for reductions to County-Other and Jarrell-Schwertner WSC, from which some population increases were drawn.

[1] Since the 2006 Plan, Johnson County SUD has merged with Johnson County FWSD, reducing the number of WUGs by one in Johnson County.

Table 2-2.
TWDB Approved Revisions to the 2006 Population Projections

Plan	County	WUG	2006 and Revised (2011) Population Projection 2010	2020	2030	2040	2050	2060
2006 RWP	BELL	BELL COUNTY-OTHER	1,810	1,813	1,810	1,809	1,808	1,809
2011 RWP	BELL	BELL COUNTY-OTHER	1,289	1,223	1,157	1,116	1,089	1,071
2006 RWP	BELL	HARKER HEIGHTS	22,477	29,147	34,822	39,636	41,096	41,818
2011 RWP	BELL	HARKER HEIGHTS	23,869	30,952	36,978	42,090	43,640	44,407
2006 RWP	BELL	KILLEEN	104,528	117,239	130,315	142,772	156,151	169,937
2011 RWP	BELL	KILLEEN	113,217	126,985	141,148	154,641	169,132	184,064
2006 RWP	BELL	MORGANS POINT RESORT	3,698	4,191	4,637	4,924	5,109	5,243
2011 RWP	BELL	MORGANS POINT RESORT	4,219	4,781	5,290	5,617	5,828	5,981
2006 RWP	BELL	NOLANVILLE	2,333	2,460	2,575	2,649	2,697	2,732
2011 RWP	BELL	NOLANVILLE	2,611	2,753	2,882	2,965	3,019	3,058
2006 RWP	BOSQUE	BOSQUE COUNTY-OTHER	19,831	22,646	24,622	25,364	25,667	26,032
2011 RWP	BOSQUE	BOSQUE COUNTY-OTHER	5,521	6,877	7,782	8,029	8,025	8,025
2006 RWP	BOSQUE	MORGAN	1,164	1,211	1,244	1,256	1,261	1,267
2011 RWP	BOSQUE	MORGAN	569	668	784	920	1,080	1,268
2006 RWP	BOSQUE	VALLEY MILLS	804	857	894	908	914	921
2011 RWP	BOSQUE	VALLEY MILLS	1,279	1,449	1,568	1,613	1,631	1,653
2006 RWP	CALLAHAN	CALLAHAN COUNTY-OTHER	6,371	6,443	6,332	6,208	6,070	5,955
2011 RWP	CALLAHAN	CALLAHAN COUNTY-OTHER	5,958	6,024	5,922	5,808	5,681	5,575
2006 RWP	CALLAHAN	CLYDE	3,320	3,368	3,296	3,215	3,125	3,050
2011 RWP	CALLAHAN	CLYDE	3,733	3,787	3,706	3,615	3,514	3,430
2006 RWP	EASTLAND	EASTLAND	3,777	3,787	3,720	3,618	3,500	3,342
2011 RWP	EASTLAND	EASTLAND	4,017	4,028	3,957	3,849	3,723	3,555
2006 RWP	EASTLAND	EASTLAND COUNTY-OTHER	6,021	6,036	5,932	5,769	5,579	5,329
2011 RWP	EASTLAND	EASTLAND COUNTY-OTHER	5,781	5,795	5,695	5,538	5,356	5,116
2006 RWP	HAMILTON	HAMILTON COUNTY-OTHER	3,507	3,407	3,329	3,355	3,252	3,245
2011 RWP	HAMILTON	HAMILTON COUNTY-OTHER	3,431	3,331	3,253	3,279	3,176	3,169
2006 RWP	HAMILTON	HICO	1,341	1,341	1,341	1,341	1,341	1,341
2011 RWP	HAMILTON	HICO	1,417	1,417	1,417	1,417	1,417	1,417
2006 RWP	HILL	HILL COUNTY-OTHER	2,892	3,144	3,428	3,712	4,014	4,349
2011 RWP	HILL	HILL COUNTY-OTHER	2,074	2,305	2,566	2,827	3,104	3,411
2006 RWP	HILL	HILLSBORO	8,477	8,820	9,208	9,595	10,008	10,467
2011 RWP	HILL	HILLSBORO	8,923	9,284	9,692	10,099	10,534	11,017
2006 RWP	HILL	HUBBARD	1,586	1,586	1,586	1,586	1,586	1,586
2011 RWP	HILL	HUBBARD	1,713	1,713	1,713	1,713	1,713	1,713
2006 RWP	HILL	ITASCA	1,499	1,493	1,487	1,481	1,474	1,466
2011 RWP	HILL	ITASCA	1,736	1,729	1,722	1,715	1,707	1,697
2006 RWP	HILL	WHITNEY	2,046	2,112	2,187	2,262	2,343	2,432
2011 RWP	HILL	WHITNEY	2,157	2,227	2,306	2,385	2,470	2,564
2006 RWP	HOOD	CRESSON	0	0	0	0	0	0
2011 RWP	HOOD	CRESSON	295	360	439	536	654	799
2006 RWP	HOOD	DECORDOVA	0	0	0	0	0	0
2011 RWP	HOOD	DECORDOVA	3,074	3,125	3,177	3,230	3,283	3,337
2006 RWP	HOOD	GRANBURY	6,843	8,202	9,467	10,792	12,461	14,388
2011 RWP	HOOD	GRANBURY	8,073	10,083	11,954	13,914	16,383	19,234
2006 RWP	HOOD	HOOD COUNTY-OTHER	23,312	27,711	31,806	36,093	41,494	47,732
2011 RWP	HOOD	HOOD COUNTY-OTHER	17,869	21,047	23,865	26,677	30,166	34,020

Table 2-2 (Continued)

Plan	County	WUG	2006 and Revised (2011) Population Projection					
			2010	2020	2030	2040	2050	2060
2006 RWP	HOOD	LIPAN	0	0	0	0	0	0
2011 RWP	HOOD	LIPAN	599	844	1,189	1,675	2,359	3,323
2006 RWP	HOOD	TOLAR	504	504	504	504	504	504
2011 RWP	HOOD	TOLAR	749	958	1,153	1,357	1,614	1,911
2006 RWP	JOHNSON	ALVARADO	3,595	3,957	4,337	4,752	5,267	5,899
2011 RWP	JOHNSON	ALVARADO	4,204	4,627	5,071	5,556	6,158	6,897
2006 RWP	JOHNSON	BURLESON	20,303	23,588	27,039	30,809	35,486	41,224
2011 RWP	JOHNSON	BURLESON	27,206	42,037	52,747	52,747	52,747	52,747
2006 RWP	JOHNSON	CLEBURNE	29,158	32,872	36,774	41,036	46,324	52,812
2011 RWP	JOHNSON	CLEBURNE	30,572	34,467	38,558	43,027	48,353	52,812
2006 RWP	JOHNSON	CRESSON	0	0	0	0	0	0
2011 RWP	JOHNSON	CRESSON	78	95	116	141	172	210
2006 RWP	JOHNSON	GRANDVIEW	1,452	1,562	1,678	1,805	1,962	2,155
2011 RWP	JOHNSON	GRANDVIEW	1,600	2,000	2,500	2,500	2,500	2,500
2006 RWP	JOHNSON	JOHNSON COUNTY-OTHER	11,115	11,596	12,102	12,653	13,338	14,177
2011 RWP	JOHNSON	JOHNSON COUNTY-OTHER	9,014	9,236	9,468	9,717	10,026	10,402
2006 RWP	JOHNSON	JOSHUA	5,114	5,805	6,531	7,324	8,308	9,515
2011 RWP	JOHNSON	JOSHUA	5,503	6,247	7,028	7,881	8,940	10,239
2006 RWP	JOHNSON	VENUS	1,892	1,892	1,892	1,892	1,892	1,892
2011 RWP	JOHNSON	VENUS	2,435	2,435	2,435	2,435	2,435	2,435
2006 RWP	LAMPASAS	LAMPASAS	7,010	7,246	7,417	7,544	7,627	7,680
2011 RWP	LAMPASAS	LAMPASAS	8,222	9,225	9,952	10,491	10,845	10,325
2006 RWP	LAMPASAS	LAMPASAS COUNTY-OTHER	6,900	7,879	8,589	9,116	9,462	9,681
2011 RWP	LAMPASAS	LAMPASAS COUNTY-OTHER	5,688	5,900	6,054	6,169	6,244	7,036
2006 RWP	LIMESTONE	KOSSE	0	0	0	0	0	0
2011 RWP	LIMESTONE	KOSSE	500	503	506	509	512	515
2006 RWP	LIMESTONE	LIMESTONE COUNTY-OTHER	7,884	7,537	7,173	6,793	6,393	5,972
2011 RWP	LIMESTONE	LIMESTONE COUNTY-OTHER	7,384	7,034	6,667	6,284	5,881	5,457
2006 RWP	MCLENNAN	MCLENNAN COUNTY-OTHER	27,296	28,937	30,322	31,758	32,667	33,990
2011 RWP	MCLENNAN	MCLENNAN COUNTY-OTHER	26,101	26,538	26,908	27,293	27,534	27,886
2006 RWP	MCLENNAN	ROBINSON	8,397	8,954	9,423	9,910	10,219	10,668
2011 RWP	MCLENNAN	ROBINSON	9,592	11,353	12,837	14,375	15,352	16,772
2006 RWP	MILAM	CAMERON	5,634	5,634	5,634	5,634	5,634	5,634
2011 RWP	MILAM	CAMERON	6,231	6,900	7,331	7,596	7,663	7,693
2006 RWP	SOMERVELL	GLEN ROSE	2,210	2,312	2,396	2,451	2,473	2,481
2011 RWP	SOMERVELL	GLEN ROSE	2,672	3,009	3,287	3,469	3,543	3,568
2006 RWP	SOMERVELL	SOMERVELL COUNTY-OTHER	5,332	6,081	6,698	7,103	7,267	7,323
2011 RWP	SOMERVELL	SOMERVELL COUNTY-OTHER	4,870	5,384	5,807	6,085	6,197	6,236
2006 RWP	WILLIAMSON	CEDAR PARK	52,700	73,421	102,705	128,373	154,089	187,931
2011 RWP	WILLIAMSON	CEDAR PARK	58,665	81,731	88,823	108,018	108,018	108,018
2006 RWP	WILLIAMSON	FLORENCE	1,263	1,511	1,806	2,127	2,476	2,850
2011 RWP	WILLIAMSON	FLORENCE	1,364	1,632	1,951	2,298	2,675	3,079
2006 RWP	WILLIAMSON	GEORGETOWN	40,888	55,770	73,463	92,702	113,633	136,082
2011 RWP	WILLIAMSON	GEORGETOWN	49,112	66,987	88,239	111,348	136,489	163,453
2006 RWP	WILLIAMSON	GRANGER	1,400	1,520	1,663	1,818	1,987	2,168
2011 RWP	WILLIAMSON	GRANGER	1,561	1,695	1,854	2,027	2,215	2,417

Table 2-2 (Concluded)

Plan	County	WUG	2006 and Revised (2011) Population Projection 2010	2020	2030	2040	2050	2060
2006 RWP	WILLIAMSON	HUTTO	1,826	2,510	3,323	4,207	5,168	6,199
2011 RWP	WILLIAMSON	HUTTO	12,479	17,153	22,709	28,750	35,317	42,363
2006 RWP	WILLIAMSON	JARRELL	0	0	0	0	0	0
2011 RWP	WILLIAMSON	JARRELL	1,433	1,474	1,517	1,561	1,606	1,652
2006 RWP	WILLIAMSON	JARRELL-SCHWERTNER WSC	3,795	5,070	6,585	8,233	10,026	11,949
2011 RWP	WILLIAMSON	JARRELL-SCHWERTNER WSC	2,362	3,596	5,068	6,672	8,420	10,297
2006 RWP	WILLIAMSON	LEANDER	11,499	16,128	21,631	27,615	34,125	41,107
2011 RWP	WILLIAMSON	LEANDER	22,675	31,803	42,654	54,454	67,291	81,059
2006 RWP	WILLIAMSON	ROUND ROCK	87,187	119,358	157,606	199,196	244,442	292,970
2011 RWP	WILLIAMSON	ROUND ROCK	104,696	143,328	189,257	239,199	293,531	351,804
2006 RWP	WILLIAMSON	TAYLOR	15,530	17,849	20,606	23,604	26,865	30,363
2011 RWP	WILLIAMSON	TAYLOR	17,935	20,613	23,797	27,259	31,025	35,065
2006 RWP	WILLIAMSON	THRALL	859	1,035	1,245	1,473	1,721	1,987
2011 RWP	WILLIAMSON	THRALL	976	1,176	1,415	1,674	1,956	2,258
2006 RWP	WILLIAMSON	WILLIAMSON COUNTY-OTHER	2,758	2,187	3,057	12,542	25,493	33,442
2011 RWP	WILLIAMSON	WILLIAMSON COUNTY-OTHER	2,379	1,750	2,551	11,961	24,831	32,693

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 region is projected to increase from 795,183 acft in 2000 to 1,248,514 acft in 2060, a 57 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 2000 and 2060 in Figure 2-4. The projections indicate that municipal, manufacturing, and steam-electric water use as percentages of the total water use increase from 2000 to 2060, while mining, 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 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]					
	1990	2000	2010	2020	2030	2040	2050	2060
Municipal	236,955	316,798	361,420	417,463	466,107	515,151	565,027	615,483
Manufacturing	32,240	16,939	19,787	23,201	25,077	26,962	30,191	31,942
Steam-Electric	57,657	103,330	168,193	221,696	254,803	271,271	300,859	319,884
Mining	6,944	72,854	36,664	37,591	38,037	27,251	20,744	21,243
Irrigation	200,954	233,686	232,541	227,697	222,691	217,859	213,055	208,386
Livestock	47,070	51,576	51,576	51,576	51,576	51,576	51,576	51,576
Total for Region	**581,820**	**795,183**	**870,181**	**979,224**	**1,058,291**	**1,110,070**	**1,181,452**	**1,248,514**

[1] Projections from Texas Water Development Board

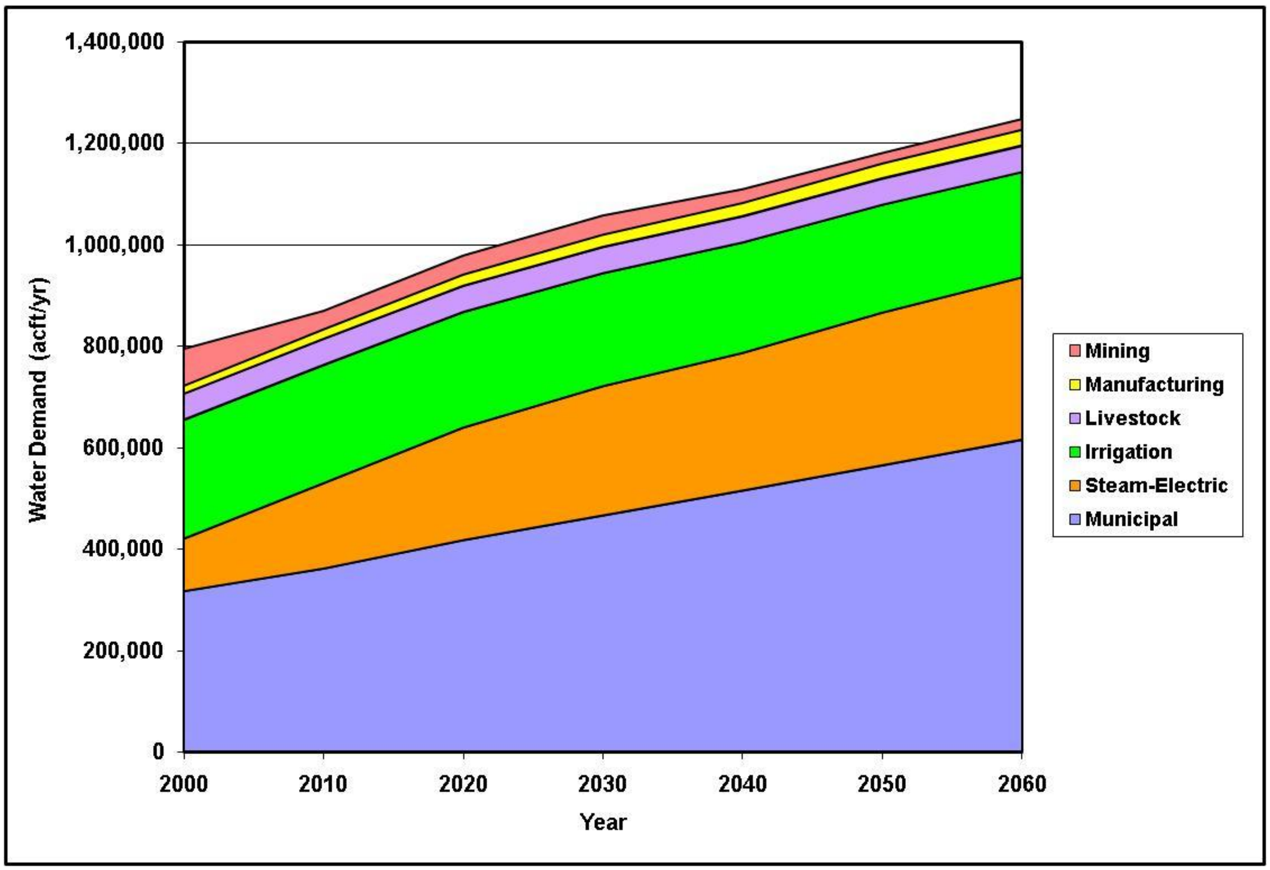

Figure 2-3. Projected Total Water Demand

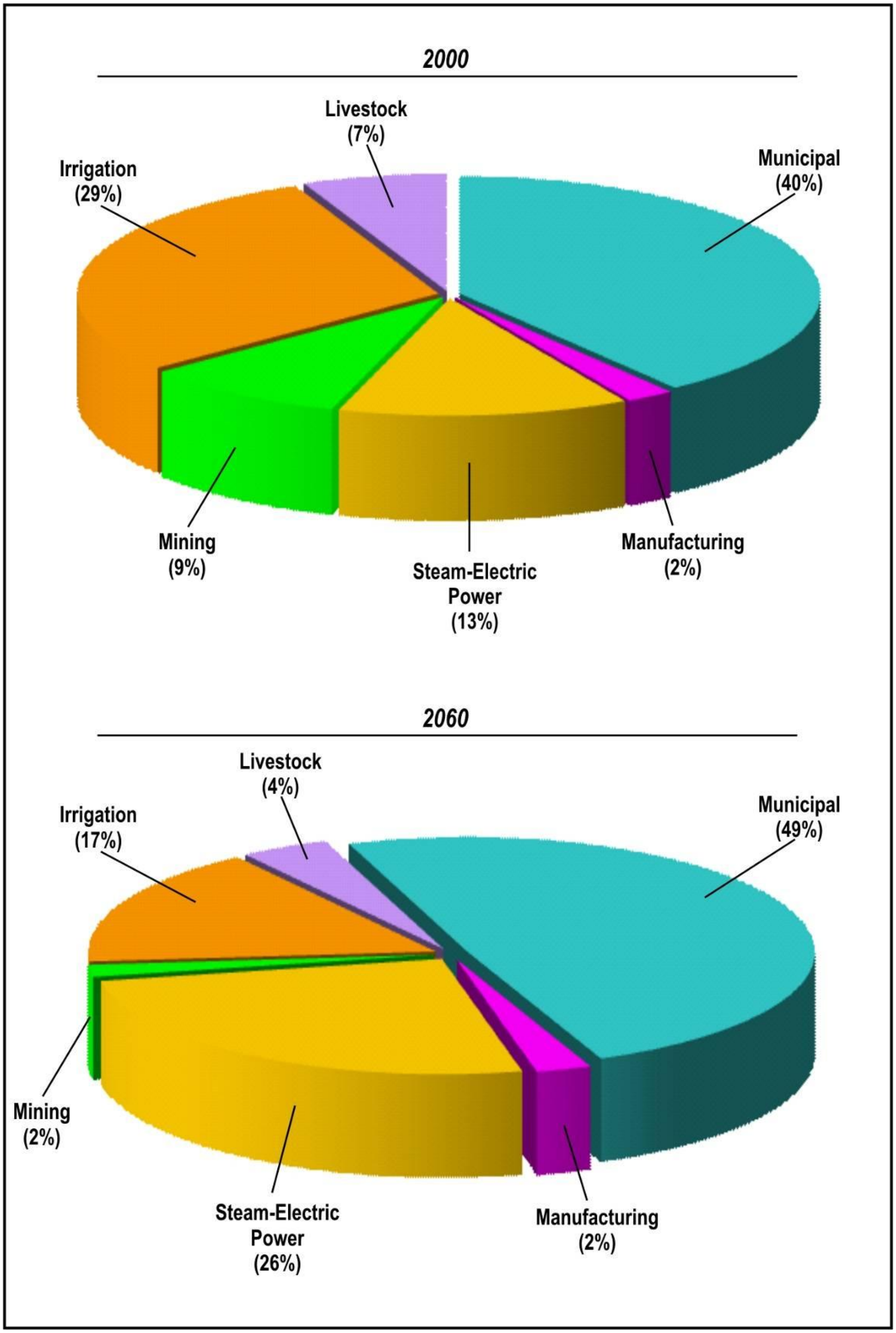

Figure 2-4. Total Water Demand by Type of Use in 2000 and 2060

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, ranging between 45 gpcd to 409 gpcd in the Brazos G Area. The Brazos G average in 2010 is projected to be 138 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. The Conservation Task Force formed by the 78th Texas Legislature has recommended a statewide target per capita water use of 140 gpcd.[2]

Annual municipal water use for the region is projected to increase by 298,685 acft between 2000 and 2060, from 316,798 acft to 615,483 acft, a 94 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 81 percent of the total municipal water use in 2060. Municipal water use projections for all 37 counties and 226 cities, other utilities, and 'County-Other' in the region are presented in Table 2-5.

The 94 percent projected increase in municipal water demand over the 60-year planning horizon is less than the projected population increase of 113 percent due to expected savings in per capita water use resulting from continued implementation of the 1991 State Water-Efficient Plumbing Act.

[2] 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[1,4]							Reduction due to Plumbing Fixtures Act (2010 to 2060)
	Base (2000)	2010	2020	2030	2040	2050	2060	
439 WSC	110	106	104	102	101	100	100	6
ABILENE	304	164	161	158	155	154	154	10
ACTON MUD	148	144	141	139	138	137	137	7
ALBANY	298	295	291	288	286	284	284	11
ALVARADO	125	121	117	115	112	111	111	10
ANSON	146	142	139	136	133	131	131	11
AQUA WSC	139	134	131	128	127	126	126	8
ASPERMONT	180	177	174	171	168	166	166	11
BAIRD	218	214	211	208	205	203	203	11
BARTLETT	180	176	173	170	167	166	166	10
BELL COUNTY-OTHER	139	139	137	134	134	132	133	6
BELLMEAD	240	237	233	231	228	227	227	10
BELL-MILAM FALLS WSC	135	130	127	125	124	123	123	7
BELTON	147	143	140	138	135	134	134	9
BETHANY WSC	100	96	93	90	88	87	87	9
BETHESDA WSC	134	129	126	124	123	122	122	7
BEVERLY HILLS	174	171	168	165	161	160	160	11
BISTONE MWSD	243	239	236	233	230	228	228	11
BITTER CREEK WSC	94	90	87	84	81	80	80	10
BLOCKHOUSE MUD	116	112	110	109	108	108	108	4
BOSQUE COUNTY-OTHER	121	116	113	111	110	109	109	7
BRANDON-IRENE WSC	113	109	106	103	100	99	99	10
BRAZOS COUNTY-OTHER	124	123	121	119	116	114	114	9
BRECKENRIDGE	149	181	179	177	175	174	174	7
BREMOND	163	160	157	154	151	149	149	11
BRENHAM	195	192	188	185	182	181	181	11
BRUCEVILLE-EDDY	413	409	406	404	402	401	401	8
BRUSHY CREEK MUD	150	145	145	145	145	145	145	0
BRYAN	147	143	140	137	135	134	134	9
BURLESON	150	146	142	140	138	137	137	9
BURLESON COUNTY-OTHER	102	98	95	93	91	90	90	8
CALDWELL	163	198	194	191	188	187	187	11
CALLAHAN COUNTY-OTHER	82	79	76	73	71	69	69	10
CALVERT	208	205	202	199	196	194	194	11
CAMERON	233	230	227	224	221	219	219	11
CEDAR PARK	185	182	181	180	180	180	180	2
CHALK BLUFF WSC	117	113	110	108	107	106	106	7
CHILDRESS CREEK WSC	121	117	113	111	109	108	108	9
CHISHOLM TRAIL SUD	110	142	145	147	150	152	152	0
CISCO	172	169	166	163	160	158	158	11
CLEBURNE	143	176	173	170	168	167	167	9

Table 2-4 (Continued)

Water User Group	Per Capita Use Rates[1,4] Base (2000)	2010	2020	2030	2040	2050	2060	Reduction due to Plumbing Fixtures Act (2010 to 2060)
CLIFTON	163	159	155	153	150	149	149	10
CLYDE	76	73	70	67	64	62	62	11
COLEMAN COUNTY WSC	116	115	113	109	106	106	105	10
COLLEGE STATION	225	221	217	215	213	212	212	9
COMANCHE	110	124	120	117	114	113	113	11
COMANCHE COUNTY-OTHER	117	113	110	107	104	102	102	11
COOLIDGE	93	89	84	82	80	79	79	10
COPPERAS COVE	98	93	90	87	85	84	84	9
CORYELL COUNTY-OTHER	248	244	240	237	235	234	234	10
CRAWFORD	80	76	73	70	67	66	66	10
CRESSON[3]		132	129	127	124	123	123	9
CROSS COUNTRY WSC	149	144	141	139	137	136	136	8
CROSS PLAINS	143	140	137	134	131	129	129	11
DE LEON	105	101	98	95	92	91	91	10
DECORDOVA[3]		173	169	166	164	163	163	10
DOG RIDGE WSC	148	144	141	139	138	137	137	7
DUBLIN	108	104	100	97	95	94	94	10
EAST BELL COUNTY WSC	98	94	91	88	86	85	85	9
EASTLAND	208	204	201	198	195	193	193	11
EASTLAND COUNTY-OTHER	124	121	118	115	112	110	110	11
ELM CREEK WSC	95	90	88	86	85	84	84	6
ERATH COUNTY-OTHER	96	92	89	87	85	84	84	8
FALLS COUNTY-OTHER	100	99	97	95	90	86	85	14
FERN BLUFF MUD	125	122	121	120	120	120	120	2
FILES VALLEY WSC	188	185	182	179	176	175	175	10
FISHER COUNTY-OTHER	195	193	190	188	183	181	182	11
FLORENCE	163	158	155	152	150	149	149	9
FORT BELKNAPP WSC	91	88	86	84	82	81	81	7
FORT GATES WSC	130	126	123	120	118	117	117	9
FORT HOOD (CDP)[2]	197	227	224	221	218	216	216	11
FRANKLIN	197	193	190	187	184	183	183	10
GATESVILLE	159	155	152	150	149	148	148	7
GEORGETOWN	193	188	186	184	183	183	183	5
GHOLSON	126	122	119	116	115	114	114	8
GIDDINGS	172	168	165	163	161	160	160	8
GLEN ROSE	223	220	216	213	210	209	209	11
GODLEY	135	131	128	127	125	125	125	6
GORMAN	103	99	96	93	90	88	88	11
GRAFORD	100	98	95	91	89	87	87	11
GRAHAM	159	155	152	149	146	144	144	11
GRANBURY	313	309	306	303	302	301	301	8
GRANDVIEW	132	128	125	122	119	118	118	10
GRANGER	122	118	115	113	109	108	108	10
GRIMES COUNTY-OTHER	79	76	72	70	67	66	66	10
GROESBECK	132	128	125	123	122	121	121	7

Table 2-4 (Continued)

Water User Group	Per Capita Use Rates[1,4] Base (2000)	2010	2020	2030	2040	2050	2060	Reduction due to Plumbing Fixtures Act (2010 to 2060)
HALLSBURG	222	218	216	212	209	208	208	10
HAMILTON	171	168	165	162	159	157	157	11
HAMILTON COUNTY-OTHER	114	112	109	105	102	100	100	12
HAMLIN	145	141	138	135	132	130	130	11
HARKER HEIGHTS	150	146	143	140	138	137	137	9
HASKELL	168	165	161	158	155	153	153	12
HASKELL COUNTY-OTHER	102	99	96	92	89	87	87	12
HAWLEY	232	229	225	223	220	219	217	12
HAWLEY WSC	72	70	67	65	63	62	62	8
HEARNE	218	214	211	208	205	203	203	11
HEWITT	148	143	140	137	135	134	134	9
HICO	194	190	187	184	181	180	180	10
HILL COUNTY-OTHER	117	115	112	110	109	108	108	7
HILLSBORO	185	182	179	176	173	172	172	10
HOLLAND	105	101	98	95	92	90	90	11
HOOD COUNTY-OTHER	146	143	140	138	137	136	136	7
HUBBARD	104	101	98	95	92	90	90	11
HUTTO	126	121	119	118	117	117	117	4
ITASCA	127	123	120	117	114	112	113	10
JARRELL[3]		130	127	125	124	122	112	18
JARRELL-SCHWERTNER WSC	186	181	179	177	175	175	175	6
JAYTON	204	200	197	195	190	190	188	12
JOHNSON COUNTY SUD	171	163	166	169	175	180	180	(17)
JOHNSON COUNTY-OTHER	226	223	221	219	217	216	216	7
JONAH WATER SUD	130	140	143	141	139	138	138	2
JONES COUNTY-OTHER	89	86	83	80	77	75	75	11
JOSHUA	134	130	126	123	121	120	120	10
KEENE	98	94	91	89	87	86	86	8
KEMPNER	212	208	206	204	203	202	202	6
KEMPNER WSC	305	301	298	297	296	295	295	6
KENT COUNTY-OTHER	114	111	108	107	104	99	102	9
KILLEEN	132	154	179	177	174	170	167	0
KNOX CITY	171	168	165	162	159	157	157	11
KNOX COUNTY-OTHER	134	131	128	125	122	120	120	11
KOSSE[3]		134	133	131	128	127	128	6
LACY-LAKEVIEW	105	101	98	96	95	94	94	7
LAKE WHITNEY WATER COMPANY	106	103	100	97	94	92	92	11
LAMPASAS	161	200	195	190	185	183	180	20
LAMPASAS COUNTY-OTHER	152	149	146	144	142	141	141	8
LEANDER	158	153	151	149	148	148	148	5
LEE COUNTY WSC	136	131	127	125	124	123	123	8
LEE COUNTY-OTHER	131	128	125	122	119	117	117	11
LEXINGTON	183	179	175	173	171	170	170	9
LIBERTY HILL	170	166	164	164	163	163	163	3

Table 2-4 (Continued)

Water User Group	Per Capita Use Rates[1,4] Base (2000)	2010	2020	2030	2040	2050	2060	Reduction due to Plumbing Fixtures Act (2010 to 2060)
LIMESTONE COUNTY-OTHER	104	100	97	94	91	90	90	10
LIPAN[3]		255	253	250	248	248	248	7
LITTLE RIVER-ACADEMY	141	137	134	131	128	127	127	10
LOMETA	138	134	131	128	126	125	126	8
LORENA	206	201	197	194	192	191	191	10
LOTT	122	120	116	113	110	109	109	11
MANSFIELD	212	235	243	241	241	241	242	0
MANVILLE WSC	123	119	117	115	114	114	114	5
MARLIN	350	346	343	340	337	336	336	10
MART	125	121	118	115	113	112	112	9
MCGREGOR	179	175	172	169	166	164	164	11
MCLENNAN COUNTY-OTHER	221	217	213	211	208	207	207	10
MERIDIAN	130	126	123	120	117	116	116	10
MERKEL	148	144	141	138	135	134	134	10
MEXIA	165	162	159	156	152	150	150	12
MILAM COUNTY-OTHER	138	135	132	129	126	124	124	11
MILANO WSC	99	95	91	89	87	86	86	9
MINERAL WELLS	175	171	168	166	163	162	162	9
MOFFAT WSC	84	81	78	76	74	73	73	8
MOODY	127	124	120	117	114	113	113	11
MORGAN[3]		116	115	113	112	110	110	6
MORGANS POINT RESORT	104	100	97	95	94	93	93	7
MOUNTAIN PEAK WSC	166	161	159	158	156	156	156	5
MUNDAY	161	157	154	151	148	146	146	11
NAVASOTA	182	179	175	172	169	168	168	11
NEWCASTLE	93	91	86	83	81	79	79	12
NOLAN COUNTY-OTHER	94	91	87	84	81	80	80	11
NOLANVILLE	124	119	116	113	110	109	109	10
NORTH BOSQUE WSC	185	180	177	176	175	174	174	6
OAK TRAIL SHORES SUBDIVISION	134	130	128	125	123	122	122	8
PALO PINTO COUNTY-OTHER	134	130	126	123	121	120	120	10
PARKER WSC	121	117	114	111	110	109	109	8
PENDLETON WSC	85	80	78	75	73	72	72	8
POTOSI WSC	103	100	97	95	92	91	91	9
RANGER	113	109	106	103	100	98	98	11
RIESEL	95	91	88	85	83	82	82	9
RIO VISTA	88	84	80	77	75	74	74	10
RISING STAR	82	79	76	73	70	68	68	11
ROBERTSON COUNTY WSC	77	72	69	67	66	65	65	7
ROBERTSON COUNTY-OTHER	120	117	114	112	110	109	109	8
ROBINSON	122	118	115	112	109	108	108	10
ROBY	103	99	98	95	92	91	91	8
ROCKDALE	188	200	200	200	200	200	200	0
ROGERS	159	156	153	150	147	145	145	11
ROSCOE	121	117	113	110	107	106	106	11

Table 2-4 (Continued)

Water User Group	Per Capita Use Rates[1,4] Base (2000)	2010	2020	2030	2040	2050	2060	Reduction due to Plumbing Fixtures Act (2010 to 2060)
ROSEBUD	106	102	99	96	93	91	91	11
ROTAN	161	159	155	152	149	147	147	12
ROUND ROCK	201	197	194	192	191	191	191	6
RULE	110	108	105	101	98	97	95	13
SALADO WSC	229	225	222	220	219	218	218	7
SHACKELFORD COUNTY-OTHER	194	190	186	183	181	179	179	11
SNOOK	215	210	209	205	202	202	202	8
SOMERVELL COUNTY-OTHER	92	88	86	84	82	81	81	7
SOMERVILLE	165	161	158	155	152	151	151	10
SOUTHWEST MILAM WSC	150	146	143	140	139	138	138	8
STAMFORD	159	155	152	149	146	145	145	10
STEAMBOAT MOUNTAIN WSC	70	67	64	62	60	59	59	8
STEPHENS COUNTY RURAL WSC	88	113	109	107	102	100	101	12
STEPHENS COUNTY-OTHER	167	164	161	158	155	153	153	11
STEPHENVILLE	157	152	149	146	143	142	142	10
STONEWALL COUNTY-OTHER	124	120	117	114	111	109	109	11
STRAWN	188	186	183	180	177	176	176	10
SWEETWATER	228	225	221	218	215	214	214	11
TAYLOR	150	145	142	139	137	136	136	9
TAYLOR COUNTY-OTHER	86	82	79	76	73	72	72	10
TEMPLE	317	301	288	278	269	263	259	42
THORNDALE	126	121	118	115	112	111	111	10
THORNTON	95	92	89	85	83	82	82	10
THRALL	133	128	125	124	122	120	120	8
THROCKMORTON	233	229	226	223	220	218	218	11
THROCKMORTON COUNTY-OTHER	116	112	110	106	104	102	102	10
TOLAR	174	170	167	165	162	160	160	10
TRI-COUNTY SUD	80	76	73	70	68	67	67	9
TROY	124	120	117	114	111	109	109	11
TUSCOLA	90	86	82	80	79	77	77	9
TYE	132	127	124	121	118	117	117	10
VALLEY MILLS	188	185	182	178	175	175	175	10
VENUS	135	133	131	128	126	125	125	8
WACO	183	183	183	183	183	183	183	0
WALNUT SPRINGS	111	108	104	101	98	97	97	11
WASHINGTON COUNTY-OTHER	111	107	104	101	99	98	98	9
WEIR	153	149	148	147	146	146	146	3
WELLBORN SUD	117	113	110	108	107	106	106	7
WELLS BRANCH MUD	165	165	159	159	159	154	154	11
WEST	148	145	141	138	135	134	134	11
WEST BELL COUNTY WSC	111	108	105	102	99	98	98	10
WEST BRAZOS WSC	78	74	71	68	67	66	66	8
WESTERN HILLS WS	100	96	93	91	90	89	89	7
WHITE BLUFF COMMUNITY WS	274	272	270	268	267	267	267	5
WHITNEY	154	151	148	145	142	141	141	10

Table 2-4 (Concluded)

Water User Group	*Per Capita Use Rates[1,4]* Base (2000)	2010	2020	2030	2040	2050	2060	*Reduction due to Plumbing Fixtures Act (2010 to 2060)*
WICKSON CREEK SUD	97	121	118	113	112	112	112	9
WILLIAMSON COUNTY-OTHER	141	139	136	132	129	127	127	12
WILLIAMSON-TRAVIS COUNTY MUD #1	109	104	102	101	100	100	100	4
WOODROW-OSCEOLA WSC	49	45	42	39	37	36	36	9
WOODWAY	304	300	297	294	291	289	289	11
YOUNG COUNTY-OTHER	203	199	196	193	190	188	188	11
Min.	**49**	**45**	**42**	**39**	**37**	**36**	**36**	
Max.	**413**	**409**	**406**	**404**	**402**	**401**	**401**	
Mean	**149**	**147**	**144**	**142**	**140**	**138**	**138**	

[1]Per capita use rates for years 2010 to 2060 reflect revisions requested by entities and accepted by the TWDB. Base (year 2000) rates were not revised by the TWDB and reflect the original water use rates prior to requested revisions. In some cases, the year 2000 rate is inconsistent with ensuing decades.

[2]For Fort Hood in year 2000, the 197 gpcd rate was divided into an assumed rate of 145 gpcd (Brazos G average) for personnel living on-post, with the remaining 52 gpcd assigned to personnel working on the post but living off-post. The total per capita water use rate is necessarily applied to only that population living on-post. Future increases in per capita water use reflect increased demands from Fort Hood-supplied population projections applied against the lower TWDB population projections.

[3]Cresson, Decordova, Jarrell, Kosse, Lipan and Morgan are new WUGs for the 2011 RWP. Per capita rates were not developed prior to 2010.

[4]Water User Groups represented in multiple counties may have unique water use rates in each county; however, rates shown in this table represent the total average rate calculated from each county.

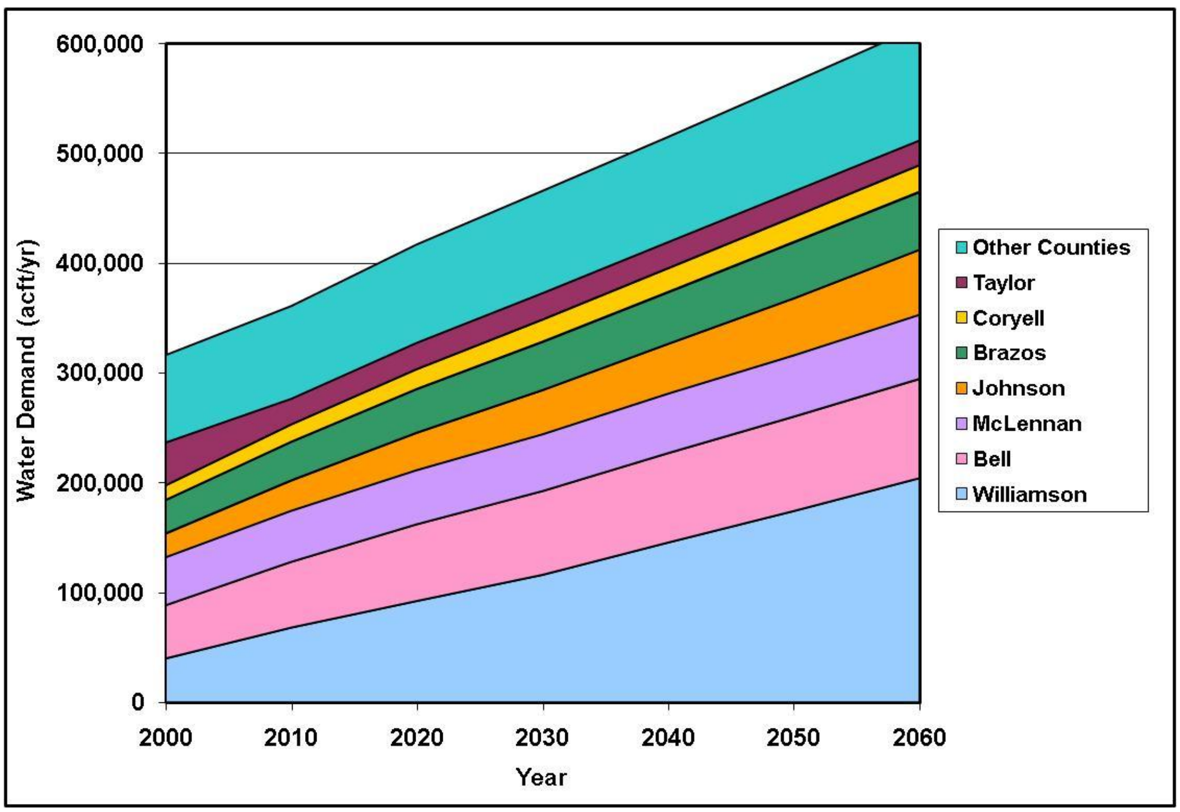

Figure 2-5. Municipal Water Demand Projections

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

City/County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
Bell County								
439 WSC		649	803	909	999	1,057	1,090	1,122
Bartlett (P)	128	165	184	196	206	211	216	220
Bell-Milam Falls WSC (P)		299	342	371	398	415	425	435
Belton	2,194	2,412	2,824	3,199	3,542	3,723	3,875	3,920
Chisholm Trail SUD (P)		56	103	127	149	166	176	183
Dog Ridge WSC		586	715	799	876	926	955	982
East Bell County WSC (P)		250	263	271	276	279	282	286
Elm Creek WSC (P)		154	184	206	224	236	243	249
Fort Hood CDP (P)	3,227	3,822	4,395	4,337	4,279	4,221	4,182	4,182
Harker Heights	1,985	2,908	3,904	4,959	5,800	6,507	6,698	6,815
Holland	115	130	125	121	117	114	111	111
Jarrell-Schwertner WSC (P)		256	308	344	376	395	409	420
Kempner WSC (P)		913	1,142	1,297	1,443	1,535	1,591	1,636
Killeen	7,953	12,882	19,530	25,462	27,985	30,141	32,207	34,432
Little River-Academy	222	260	275	285	292	294	297	301
Moffat WSC		351	402	430	457	468	477	488
Morgans Point Resort	264	348	473	520	563	591	607	623
Nolanville	233	299	349	359	365	365	369	374
Pendleton WSC		231	250	265	273	278	282	287
Rogers	203	199	195	191	188	184	181	181
Salado WSC		987	1,195	1,334	1,461	1,544	1,594	1,636
Temple	10,492	19,357	21,033	23,018	25,170	26,892	28,804	30,613
Troy	167	191	185	181	176	171	168	168
West Bell County WSC		678	660	642	623	605	599	599
County-Other	5,980	282	200	187	174	167	161	159
Bell County Total	*33,163*	*48,665*	*60,039*	*70,010*	*76,412*	*81,485*	*85,999*	*90,422*
Bosque County								
Childress Creek WSC		283	322	361	389	395	396	402
Clifton	495	647	709	773	819	824	827	837
Cross Country WSC (P)		30	36	44	49	50	51	52
Lake Whitney Water Company (P)		391	389	387	382	373	366	367
Meridian	233	217	229	242	249	247	247	250
Morgan			74	86	99	115	133	156
Valley Mills (P)	162	236	265	295	313	316	319	323
Walnut Springs		94	97	100	101	100	99	100
County-Other	1,324	641	718	871	968	990	980	981
Bosque County Total	*2,214*	*2,539*	*2,839*	*3,159*	*3,369*	*3,410*	*3,418*	*3,468*

Table 2-5 (Continued)

City/County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
Brazos County								
Bryan	9,440	10,812	11,957	13,179	14,221	15,022	16,096	16,493
College Station	14,351	17,110	20,032	22,977	25,779	27,844	30,432	31,342
Wellborn SUD		858	1,069	1,285	1,482	1,637	1,820	1,886
Wickson Creek SUD (P)		624	1,126	1,451	1,701	1,924	2,206	2,301
County-Other	1,853	913	808	695	593	510	422	395
Brazos County Total	*25,644*	*30,317*	*34,992*	*39,587*	*43,776*	*46,937*	*50,976*	*52,417*
Burleson County								
Caldwell	627	630	807	835	854	865	878	894
Milano WSC (P)		160	177	194	207	216	223	231
Snook		137	147	160	167	173	178	183
Somerville	248	315	328	344	353	358	364	372
Southwest Milam WSC (P)		49	58	67	73	79	82	86
County-Other	993	1,029	1,139	1,263	1,349	1,404	1,450	1,504
Burleson County Total	*1,868*	*2,320*	*2,656*	*2,863*	*3,003*	*3,095*	*3,175*	*3,270*
Callahan County								
Baird	270	396	389	384	378	373	369	369
Clyde	439	285	305	297	278	259	245	238
Coleman County WSC (P)		51	49	51	44	38	31	26
Cross Plains	176	171	167	164	160	157	154	154
Potosi WSC (P)		8	8	8	7	6	6	6
County-Other	694	589	527	513	484	463	440	431
Callahan County Total	*1,579*	*1,500*	*1,445*	*1,417*	*1,351*	*1,296*	*1,245*	*1,224*
Comanche County								
Comanche	575	552	634	632	622	605	587	568
De Leon	299	286	280	280	274	265	256	248
County-Other	899	932	916	920	902	875	840	814
Comanche County Total	*1,773*	*1,770*	*1,830*	*1,832*	*1,798*	*1,745*	*1,683*	*1,630*
Coryell County								
Copperas Cove (P)	2,881	3,224	3,621	4,122	4,567	4,864	5,155	5,436
Elm Creek WSC (P)		34	47	63	78	89	97	105
Fort Gates WSC		291	322	358	392	415	437	457
Fort Hood CDP (P)	3,519	3,633	4,178	4,123	4,068	4,013	3,976	3,976
Gatesville	1,715	2,777	3,409	4,139	4,850	5,356	5,787	6,163
Kempner WSC		1,165	1,699	2,311	2,913	3,334	3,698	4,000
County-Other	1,487	2,160	2,485	2,853	3,211	3,460	3,686	3,880
Coryell County Total	*9,602*	*13,284*	*15,761*	*17,969*	*20,079*	*21,531*	*22,836*	*24,017*
Eastland County								
Cisco	498	742	731	719	694	663	633	604
Eastland	845	878	918	908	878	841	806	769
Gorman	158	143	137	134	127	120	113	108
Ranger	359	327	316	308	294	278	263	252
Rising Star	78	77	74	71	67	63	59	56

Table 2-5 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060
Stephens County Rural WSC (P)		1	2	2	2	1	1	1
County-Other	1,128	835	784	767	734	696	660	631
Eastland County Total	*3,066*	*3,003*	*2,962*	*2,909*	*2,796*	*2,662*	*2,535*	*2,421*
Erath County								
Dublin	428	454	485	516	544	576	682	753
Stephenville	2,397	2,624	2,717	2,850	2,957	3,058	3,464	3,732
County-Other	1,388	1,541	1,705	1,886	2,053	2,211	2,724	3,062
Erath County Total	*4,213*	*4,619*	*4,907*	*5,252*	*5,554*	*5,845*	*6,870*	*7,547*
Falls County								
Bell-Milam Falls WSC (P)		138	178	229	281	327	362	407
Bruceville-Eddy (P)		1	2	3	4	5	5	6
East Bell County WSC (P)		67	77	89	101	112	120	132
Elm Creek WSC (P)		3	5	6	8	9	11	12
Lott		99	97	94	92	89	88	88
Marlin	1,281	2,599	2,660	2,749	2,839	2,913	2,983	3,076
Rosebud	182	177	171	166	161	156	152	152
Tri-County SUD (P)		234	253	280	305	327	347	375
West Brazos WSC (P)		159	190	230	267	304	331	368
County-Other	1,250	418	360	286	213	146	97	47
Falls County Total	*2,713*	*3,895*	*3,993*	*4,132*	*4,271*	*4,388*	*4,496*	*4,663*
Fisher County								
Bitter Creek WSC (P)		121	117	114	113	111	110	113
Roby	54	78	76	75	75	74	74	76
Rotan	214	291	278	271	249	231	222	203
County-Other	457	199	185	181	155	134	124	97
Fisher County Total	*725*	*689*	*656*	*641*	*592*	*550*	*530*	*489*
Grimes County								
Navasota	1,210	1,384	1,426	1,464	1,494	1,505	1,526	1,555
Wickson Creek SUD (P)		303	625	878	1,044	1,175	1,286	1,396
County-Other	1,564	1,236	1,269	1,287	1,317	1,303	1,317	1,351
Grimes County Total	*2,774*	*2,923*	*3,320*	*3,629*	*3,855*	*3,983*	*4,129*	*4,302*
Hamilton County								
Hamilton	637	570	554	542	531	521	513	513
Hico	241	291	302	297	292	288	285	285
County-Other	471	499	431	407	384	375	356	355
Hamilton County Total	*1,349*	*1,360*	*1,287*	*1,246*	*1,207*	*1,184*	*1,154*	*1,153*
Haskell County								
Haskell	450	585	559	538	518	503	487	472
Rule	127	86	81	77	72	69	66	62
Stamford (P)	8	8	8	8	8	8	8	8
County-Other	240	257	235	221	203	192	180	166
Haskell County Total	*825*	*936*	*883*	*844*	*801*	*772*	*741*	*708*

Table 2-5 (Continued)

City/County	Historical 1990	Historical 2000	Projections[1] 2010	2020	2030	2040	2050	2060
Hill County								
Brandon-Irene WSC (P)		254	251	253	255	256	263	273
Fills Valley WSC (P)		413	413	417	421	424	433	447
Hillsboro	1,095	1,706	1,819	1,862	1,911	1,957	2,030	2,123
Hubbard	183	185	194	188	183	177	173	173
Itasca	165	214	225	219	212	206	202	201
Johnson County SUD (P)		34	37	41	46	53	59	65
Lake Whitney Water Company (P)		638	623	608	593	578	570	574
Parker WSC (P)		50	51	53	56	59	64	68
White Bluff Community WS		307	369	456	553	650	757	875
Whitney	196	316	365	370	375	380	391	405
Woodrow-Osceola WSC		296	286	285	284	287	298	319
County-Other	2,014	377	268	289	317	345	376	413
Hill County Total	*3,653*	*4,790*	*4,901*	*5,041*	*5,206*	*5,372*	*5,616*	*5,936*
Hood County								
Acton MUD (P)		2,026	2,425	2,912	3,363	3,851	4,464	5,204
Cresson (P)			43	52	62	74	90	110
DeCordova			594	593	592	593	598	610
Granbury	851	2,005	2,795	3,456	4,058	4,708	5,524	6,485
Lipan			171	239	333	466	655	922
Oak Trail Shores Subdivision		448	511	504	492	484	480	480
Tolar		98	143	179	213	246	289	342
County-Other	2,974	3,217	2,863	3,301	3,689	4,094	4,597	5,184
Hood County Total	*3,825*	*7,794*	*9,545*	*11,236*	*12,802*	*14,516*	*16,697*	*19,337*
Johnson County								
Acton MUD (P)		17	21	27	33	39	47	58
Alvarado	310	460	570	607	654	697	766	858
Bethany WSC		336	363	397	431	471	527	602
Bethesda WSC (P)		2,199	2,751	3,415	4,115	4,898	5,863	7,096
Burleson (P)	1,760	2,943	4,449	6,687	8,272	8,153	8,096	8,095
Cleburne	3,421	4,165	6,027	6,680	7,343	8,097	9,046	9,879
Cresson (P)			12	14	17	20	24	29
Godley		133	167	206	250	295	355	429
Grandview	176	201	230	281	342	334	331	331
Johnson County SUD (P)		6,154	8,036	10,423	13,058	16,201	20,192	24,506
Joshua	347	680	801	882	968	1,068	1,202	1,377
Keene	457	549	620	705	798	896	1,028	1,202
Mansfield (P)	82	148	165	172	172	173	175	178
Mountain Peak WSC (P)		223	313	420	534	653	809	1,001
Parker WSC (P)		238	287	344	402	470	555	664
Rio Vista		65	71	77	85	93	105	122
Venus (P)	123	286	363	358	349	344	342	342
County-Other	5,595	2,710	2,252	2,287	2,323	2,363	2,427	2,517
Johnson County Total	*12,271*	*21,507*	*27,498*	*33,982*	*40,146*	*45,265*	*51,890*	*59,286*

Table 2-5 (Continued)

City/County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
Jones County								
Abilene (P)	193	1,869	1,029	1,035	1,014	979	945	908
Anson	424	418	415	416	406	391	374	360
Hamlin	640	365	362	363	355	342	327	314
Hawley		168	169	170	168	164	158	151
Hawley WSC (P)		404	401	393	380	363	347	333
Stamford (P)	783	640	637	640	626	604	582	560
County-Other	686	124	123	121	117	111	105	100
Jones County Total	*2,726*	*3,988*	*3,136*	*3,138*	*3,066*	*2,954*	*2,838*	*2,726*
Kent County								
Jayton	139	117	112	108	95	75	66	57
County-Other	49	44	42	40	36	29	25	23
Kent County Total	*188*	*161*	*154*	*148*	*131*	*104*	*91*	*80*
Knox County								
Knox City	235	233	225	229	225	222	219	216
Munday	267	275	267	265	260	255	251	250
County-Other	311	226	217	219	215	210	207	203
Knox County Total	*813*	*734*	*709*	*713*	*700*	*687*	*677*	*669*
Lampasas County								
Copperas Cove (P)		15	22	30	34	38	40	41
Kempner		238	300	366	411	446	467	482
Kempner WSC (P)		1,053	1,293	1,547	1,734	1,870	1,956	2,015
Lampasas	1,280	1,224	1,842	2,016	2,119	2,174	2,223	2,082
Lometa		121	130	141	147	152	155	159
County-Other	1,037	1,016	950	966	977	982	986	1,112
Lampasas County Total	*2,317*	*3,667*	*4,537*	*5,066*	*5,422*	*5,662*	*5,827*	*5,891*
Lee County								
Aqua WSC (P)		405	443	494	532	567	596	625
Giddings	1,299	984	1,106	1,258	1,382	1,476	1,564	1,645
Lee County WSC (P)		628	721	834	931	1,011	1,079	1,143
Lexington	226	241	270	305	334	357	378	397
Manville WSC (P)		14	19	25	30	34	38	41
Southwest Milam WSC (P)		38	44	52	58	63	67	71
County-Other	1,466	340	329	316	305	294	287	285
Lee County Total	*2,991*	*2,650*	*2,932*	*3,284*	*3,572*	*3,802*	*4,009*	*4,207*
Limestone County								
Biston MWSD		150	148	146	144	142	141	141
Coolidge		88	95	103	108	110	114	120
Groesbeck	612	634	760	923	1,006	1,071	1,135	1,229
Kosse			75	75	74	73	73	74
Mexia	989	1,213	1,250	1,289	1,328	1,358	1,408	1,479
Thornton		56	54	52	50	49	48	48
Tri-County SUD (P)		95	103	115	118	121	125	133

Table 2-5 (Continued)

City/County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
County-Other	1,372	957	828	765	703	642	594	551
Limestone County Total	*2,973*	*3,193*	*3,313*	*3,468*	*3,531*	*3,566*	*3,638*	*3,775*
McLennan County								
Bellmead	1,170	2,477	2,622	2,751	2,873	2,984	3,065	3,202
Beverly Hills	453	412	414	416	416	414	416	424
Bruceville-Eddy (P)	516	688	825	961	1,077	1,195	1,270	1,383
Chalk Bluff WSC		354	441	527	599	676	722	798
Crawford		63	65	67	68	69	70	73
Cross Country WSC (P)		396	445	497	541	585	614	661
Elm Creek WSC (P)		143	184	227	261	298	320	357
Gholson		130	150	169	184	202	213	231
Hallsburg		129	139	150	158	166	172	182
Hewitt	1,154	1,838	2,029	2,237	2,395	2,571	2,684	2,877
Lacy-Lakeview	334	678	835	989	1,116	1,256	1,338	1,477
Lorena	180	331	369	408	440	475	497	533
Mart	338	318	335	354	367	383	394	415
McGregor	904	948	933	923	913	902	894	899
Moody	181	199	202	203	203	204	206	212
North Bosque WSC		280	367	454	530	608	655	730
Riesel		104	109	116	120	126	129	137
Robinson	919	1,072	1,268	1,462	1,611	1,756	1,857	2,030
Tri-County SUD (P)		10	12	13	14	15	16	18
Valley Mills (P)	2	1	1	1	1	1	1	1
Waco	22,931	23,312	24,876	26,453	27,781	29,159	30,033	31,304
West	526	446	459	467	475	482	490	506
West Brazos WSC (P)		141	161	181	195	214	224	244
Western Hills WS		307	384	458	520	588	627	694
Woodway	2,175	2,974	2,944	2,925	2,903	2,882	2,867	2,874
County-Other	5,429	6,354	6,345	6,332	6,361	6,359	6,384	6,466
McLennan County Total	*37,212*	*44,105*	*46,914*	*49,741*	*52,122*	*54,570*	*56,158*	*58,728*
Milam County								
Bell-Milam Falls WSC (P)		201	245	288	316	334	341	347
Cameron	1,064	1,470	1,606	1,756	1,840	1,881	1,880	1,888
Milano WSC (P)		174	195	212	224	230	232	235
Rockdale	1,491	1,145	1,254	1,287	1,310	1,325	1,332	1,337
Southwest Milam WSC (P)		911	1,086	1,251	1,350	1,422	1,448	1,472
Thorndale	121	180	193	206	213	215	216	219
County-Other	1,375	552	401	291	211	152	111	82
Milam County Total	*4,051*	*4,633*	*4,980*	*5,291*	*5,464*	*5,559*	*5,560*	*5,580*
Nolan County								
Bitter Creek WSC (P)		122	122	122	120	115	109	104
Roscoe	236	187	189	190	188	182	173	165
Sweetwater	3,164	2,915	3,013	3,072	3,081	3,029	2,900	2,763

Table 2-5 (Continued)

City/County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
County-Other	602	195	199	197	193	186	177	168
Nolan County Total	*4,002*	*3,419*	*3,523*	*3,581*	*3,582*	*3,512*	*3,359*	*3,200*
Palo Pinto County								
Fort Belknapp WSC (P)		1	2	2	3	3	4	5
Graford		65	65	65	64	64	65	67
Mineral Wells (P)	2,823	2,895	2,887	3,049	3,184	3,278	3,425	3,611
Stephens County Rural WSC (P)		1	2	2	2	1	1	1
Strawn		156	160	164	167	170	176	183
County-Other	1,342	1,638	1,810	1,905	1,987	2,086	2,230	2,421
Palo Pinto County Total	*4,165*	*4,756*	*4,926*	*5,187*	*5,407*	*5,602*	*5,901*	*6,288*
Robertson County								
Bremond	133	160	157	154	151	148	146	146
Calvert	426	332	327	323	318	313	310	310
Franklin	173	324	344	373	389	397	396	395
Hearne	1,106	1,145	1,124	1,108	1,093	1,077	1,066	1,066
Robertson County WSC		218	258	315	348	370	368	365
Tri-County SUD (P)		75	77	82	83	84	83	83
Wickson Creek SUD (P)		10	20	30	35	39	39	39
County-Other	772	548	567	594	609	616	613	611
Robertson County Total	*2,610*	*2,812*	*2,874*	*2,979*	*3,026*	*3,044*	*3,021*	*3,015*
Shackelford County								
Albany	582	641	665	690	676	635	555	466
Hawley WSC (P)		5	5	5	5	4	4	3
Stephens County Rural WSC (P)		1	2	2	2	1	1	1
County-Other	206	284	291	300	292	273	238	200
Shackelford County Total	*788*	*931*	*963*	*997*	*975*	*913*	*798*	*670*
Somervell County								
Glen Rose	358	530	659	728	785	817	830	836
County-Other	413	483	481	519	547	559	562	566
Somervell County Total	*771*	*1,013*	*1,140*	*1,247*	*1,332*	*1,376*	*1,392*	*1,402*
Stephens County								
Breckenridge	1,352	979	1,214	1,220	1,215	1,190	1,138	1,102
Fort Belknapp WSC (P)		4	4	3	3	3	3	3
Stephens County Rural WSC (P)		245	318	314	308	296	279	271
County-Other	470	241	242	241	238	231	220	213
Stephens County Total	*1,822*	*1,469*	*1,778*	*1,778*	*1,764*	*1,720*	*1,640*	*1,589*
Stonewall County								
Aspermont	260	206	202	192	179	165	153	143
County-Other	96	93	90	85	79	72	66	62
Stonewall County Total	*356*	*299*	*292*	*277*	*258*	*237*	*219*	*205*
Taylor County								
Abilene (P)	25,608	37,607	21,862	22,450	22,493	22,202	21,643	20,971
Coleman County WSC (P)		18	19	20	20	19	19	18
Hawley WSC (P)		55	57	57	57	55	53	52

Table 2-5 (Continued)

City/County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
Merkel	309	437	458	469	469	462	450	436
Potosi WSC (P)		396	414	420	420	409	397	385
Steamboat Mountain WSC		262	271	270	267	260	251	243
Tuscola		72	74	74	74	73	70	68
Tye	144	171	178	181	181	177	172	167
County-Other	1,312	386	398	400	393	380	368	356
Taylor County Total	*27,373*	*39,404*	*23,731*	*24,341*	*24,374*	*24,037*	*23,423*	*22,696*
Throckmorton County								
Fort Belknapp WSC (P)		11	10	10	9	8	8	7
Stephens County Rural WSC (P)		8	10	9	9	8	7	7
Throckmorton	198	236	232	222	209	191	177	168
County-Other	91	99	96	91	84	76	70	66
Throckmorton County Total	*289*	*354*	*348*	*332*	*311*	*283*	*262*	*248*
Washington County								
Brenham	2,243	2,950	3,078	3,223	3,303	3,320	3,364	3,415
County-Other	1,781	2,097	2,187	2,323	2,379	2,397	2,431	2,478
Washington County Total	*4,024*	*5,047*	*5,265*	*5,546*	*5,682*	*5,717*	*5,795*	*5,893*
Williamson County								
Aqua WSC (P)		65	76	88	103	121	140	161
Bartlett (P)	169	173	176	181	188	195	205	217
Bell-Milam Falls WSC (P)		41	53	66	83	101	120	142
Blockhouse MUD		578	903	1,288	1,749	2,242	2,796	3,389
Brushy Creek MUD		1,902	2,643	3,596	3,869	3,869	3,869	3,869
Cedar Park (P)	566	5,286	11,961	16,571	17,910	21,779	21,779	21,780
Chisholm Trail SUD (P)		1,380	3,025	4,595	6,473	8,619	10,954	13,335
Fern Bluff MUD		745	1,339	2,049	2,882	3,805	4,810	5,888
Florence		192	242	283	332	386	447	515
Georgetown	3,369	6,127	10,342	13,956	18,187	22,826	27,979	33,506
Granger	168	178	207	219	234	248	268	293
Hutto		176	1,689	2,290	3,001	3,766	4,627	5,550
Jarrell			208	210	212	216	219	207
Jarrell-Schwertner WSC (P)		567	479	722	1,006	1,308	1,651	2,019
Jonah Water SUD		1,159	1,676	2,229	2,804	3,415	4,092	4,845
Leander	574	1,344	3,887	5,380	7,119	9,028	11,156	13,439
Liberty Hill		268	454	673	940	1,223	1,537	1,874
Manville WSC (P)		732	1,064	1,466	1,933	2,446	3,022	3,640
Round Rock (P)	6,055	13,522	23,103	31,146	40,704	51,176	62,801	75,268
Southwest Milam WSC (P)		209	259	318	386	465	549	643
Taylor	2,038	2,281	2,913	3,279	3,705	4,183	4,727	5,342
Thrall		106	140	165	196	228	263	304
Weir		101	156	223	301	386	480	581
Wells Branch MUD (P)		31	31	30	30	30	29	29
Williamson-Travis County MUD #1 (P)		510	770	1,085	1,462	1,865	2,320	2,807

Table 2-5 (Concluded)

City/County	Historical		Projections[1]					
	1990	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County-Other	10,813	2,320	371	267	378	1,729	3,533	4,651
Williamson County Total	*23,752*	*39,993*	*68,167*	*92,375*	*116,187*	*145,655*	*174,373*	*204,294*
Young County								
Fort Belknapp WSC (P)		342	334	333	325	314	306	303
Graham	1,666	1,552	1,528	1,531	1,503	1,456	1,415	1,402
Newcastle		60	59	57	55	53	51	51
Stephens County Rural WSC (P)		1	2	2	2	1	1	1
County-Other	809	304	301	302	298	291	283	280
Young County Total	*2,475*	*2,259*	*2,224*	*2,225*	*2,183*	*2,115*	*2,056*	*2,037*
Total for Region	**236,955**	**316,798**	**361,420**	**417,463**	**466,107**	**515,151**	**565,027**	**615,483**

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

2.3.2 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.

Manufacturing use is projected to increase 89 percent, from 16,939 acft in 2000 to 31,942 acft in 2060 (Table 2-6 and Figure 2-6). The trend in manufacturing use by county is shown in Figure 2-6. Bosque, Johnson, McLennan, Milam, and Williamson Counties account for 76 percent of the total use in 2060.

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

	Historical		Projections[1]					
County	1990	2000	2010	2020	2030	2040	2050	2060
Bell	966	800	980	1,085	1,180	1,273	1,355	1,463
Bosque	766	794	1,005	1,151	1,285	1,417	1,531	1,664
Brazos	168	244	316	365	413	462	506	549
Burleson	117	150	196	233	270	307	340	370
Callahan	0	0	0	0	0	0	0	0
Comanche	23	26	31	34	37	39	41	44
Coryell	8	7	9	10	11	12	13	14
Eastland	15	36	43	47	50	53	55	59
Erath	86	57	73	82	90	98	105	114
Falls	0	2	2	2	2	2	2	2
Fisher	129	158	192	225	255	284	310	336
Grimes	248	197	257	297	336	375	410	445
Hamilton	0	3	4	5	6	7	8	9
Haskell	0	0	0	0	0	0	0	0
Hill	62	67	85	97	108	119	129	140
Hood	9	20	25	28	30	32	34	37
Johnson	948	1,533	2,121	2,517	2,903	3,295	3,646	3,994
Jones	306	0	0	0	0	0	0	0
Kent	0	0	0	0	0	0	0	0
Knox	0	0	0	0	0	0	0	0
Lampasas	106	108	129	142	153	164	174	187
Lee	5	11	13	14	15	16	17	18
Limestone	368	39	48	53	58	63	67	72
McLennan	2,698	2,804	3,526	4,068	4,577	5,096	5,561	6,022
Milam	22,047	6,820	6,820	8,250	8,250	8,250	9,800	9,800
Nolan	499	643	779	915	1,038	1,159	1,266	1,372
Palo Pinto	56	23	29	33	36	39	42	46
Robertson	34	65	85	101	117	134	150	163
Shackelford	0	0	0	0	0	0	0	0
Somervell	0	5	6	7	8	9	10	11
Stephens	7	6	7	8	9	10	11	12
Stonewall	0	0	0	0	0	0	0	0
Taylor	1,638	789	972	1,081	1,177	1,270	1,349	1,462
Throckmorton	0	0	0	0	0	0	0	0
Washington	470	334	414	461	504	547	585	633
Williamson	326	1,171	1,587	1,854	2,120	2,388	2,630	2,856
Young	135	27	33	36	39	42	44	48
Total for Region	**32,240**	**16,939**	**19,787**	**23,201**	**25,077**	**26,962**	**30,191**	**31,942**

[1] Projections from Texas Water Development Board

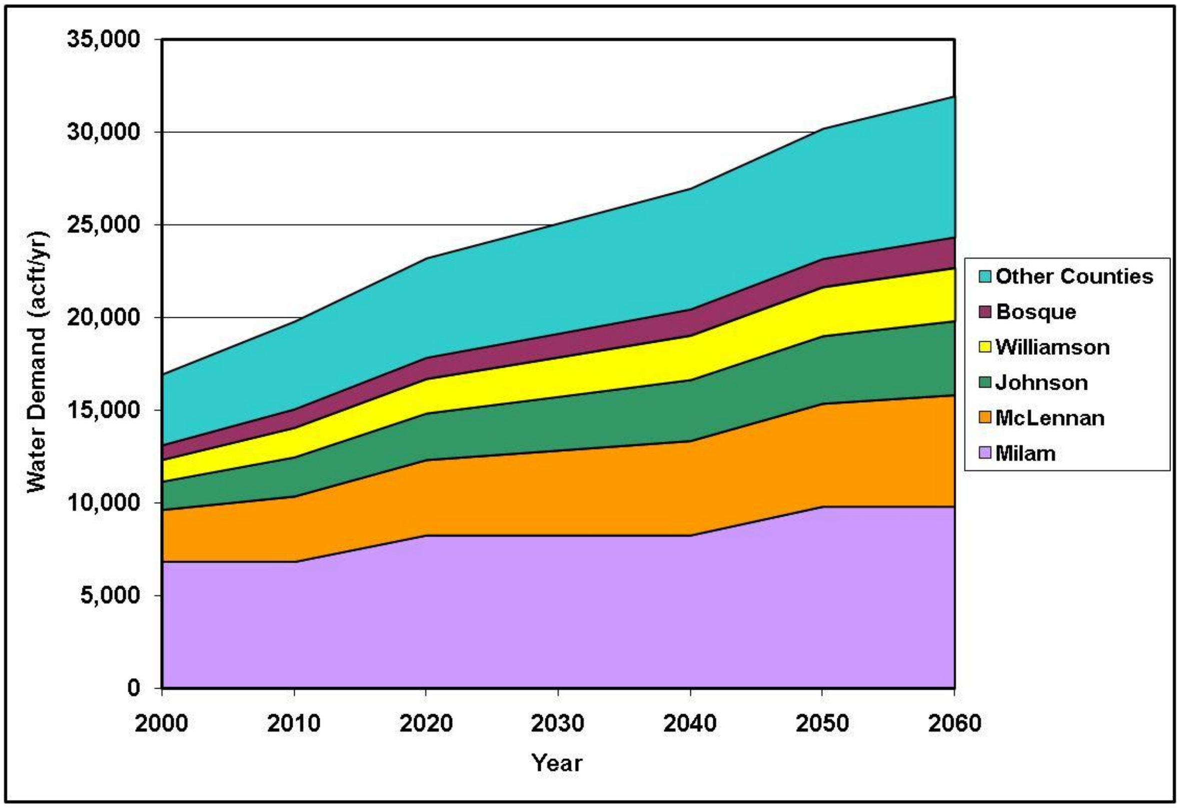

Figure 2-6. Manufacturing Water Demand Projections

2.3.3 Steam-Electric Water Demand

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 steam-electric generation process uses water in boilers and for cooling. Grimes, Hood, Limestone, McLennan, Robertson, and Somervell Counties account for 78 percent of total steam-electric water use in 2060. The reported use in the year 2000 was 103,330 acft, and is projected to increase to 319,884 acft by 2060, a 210 percent increase (Table 2-7). This almost threefold increase (Figure 2-7) in water use is attributable to the growing population in the State, and increased energy needs for manufacturing. In addition to expansion of existing plant capacity to meet the increased needs, there are new generating plants slated to open in Bell, Bosque, and McLennan Counties.

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

County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
Bell	0	0	0	3,674	4,296	5,053	5,977	7,102
Bosque	0	521	4,323	6,188	7,235	8,510	10,065	11,961
Brazos	3,953	545	526	488	394	446	303	393
Burleson	0	0	0	0	0	0	0	0
Callahan	0	0	0	0	0	0	0	0
Comanche	0	0	0	0	0	0	0	0
Coryell	0	0	0	0	0	0	0	0
Eastland	0	0	0	0	0	0	0	0
Erath	0	0	0	0	0	0	0	0
Falls	0	0	0	0	0	0	0	0
Fisher	0	0	0	0	0	0	0	0
Grimes	11,088	4,405	12,000	31,760	33,160	34,660	36,660	39,660
Hamilton	0	0	0	0	0	0	0	0
Haskell	546	507	422	336	393	462	547	650
Hill	0	0	0	0	0	0	0	0
Hood	4,212	2,573	4,000	5,862	6,853	8,062	9,535	11,331
Johnson	0	0	3,500	7,000	7,000	7,000	7,000	7,000
Jones	2,041	1,510	359	333	294	396	364	484
Kent	0	0	0	0	0	0	0	0
Knox	0	0	0	0	0	0	0	0
Lampasas	0	0	0	0	0	0	0	0
Lee	0	0	0	0	0	0	0	0
Limestone	4,692	22,065	22,332	22,598	26,420	31,079	36,758	43,681
McLennan	14,366	24,412	3,808	11,217	14,305	15,538	17,901	19,142
Milam	2,716	8,680	12,500	12,500	12,500	12,500	16,000	16,000
Nolan	0	1,093	807	11,311	20,000	20,000	20,000	20,000
Palo Pinto	1,898	1,378	840	4,000	4,000	4,000	4,000	4,000
Robertson	0	15,000	15,789	17,882	31,113	36,369	48,118	50,319
Shackelford	0	0	0	0	0	0	0	0
Somervell	9,845	18,000	84,817	84,817	84,817	84,817	84,817	84,817
Stephens	0	0	0	0	0	0	0	0
Stonewall	0	0	0	0	0	0	0	0
Taylor	0	31	0	0	0	0	0	0
Throckmorton	0	0	0	0	0	0	0	0
Washington	0	0	0	0	0	0	0	0
Williamson	0	0	0	0	0	0	0	0
Young	2,300	2,610	2,170	1,730	2,023	2,379	2,814	3,344
Total for Region	**57,657**	**103,330**	**168,193**	**221,696**	**254,803**	**271,271**	**300,859**	**319,884**

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

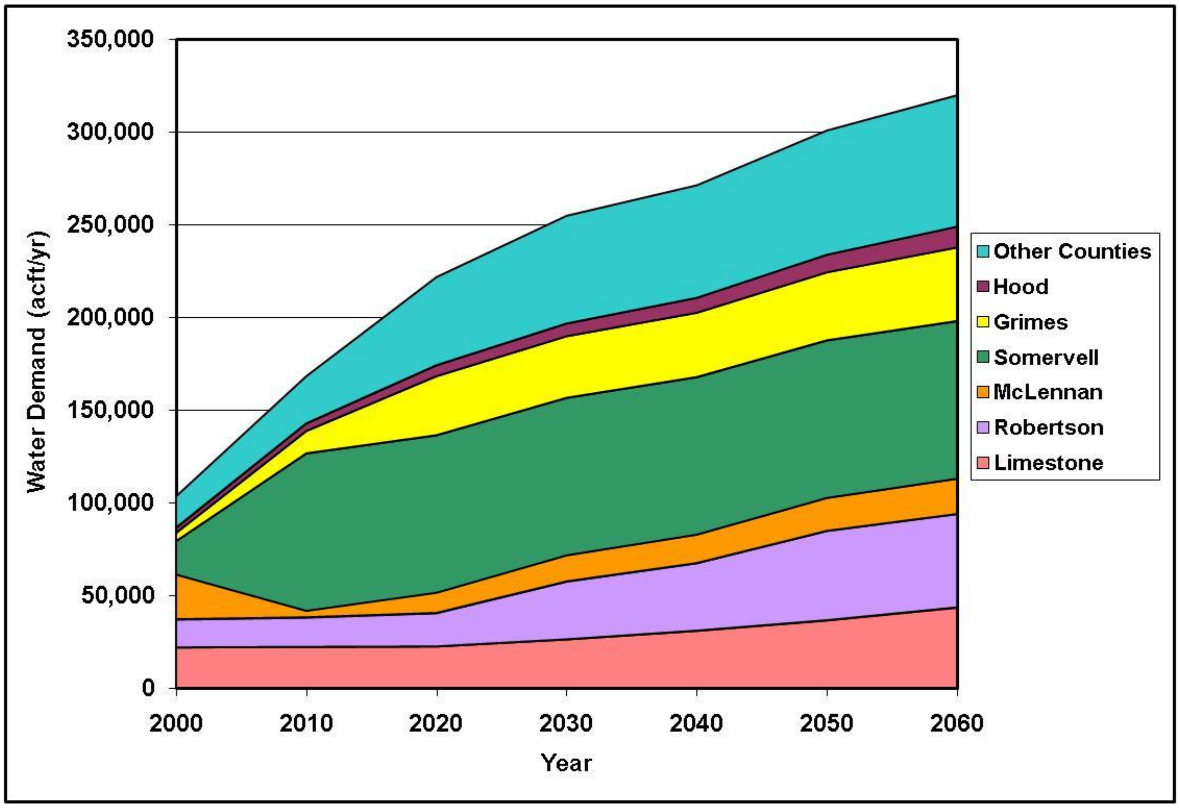

Figure 2-7. Steam-Electric Water Demand Projections

2.3.4 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 decrease 71 percent between 2000 and 2060, from 72,854 acft to 21,243 acft, largely due to the projected closure of the Sandow Mine in Milam County (Table 2-8). Stephens and Williamson Counties account for 64 percent of total mining water use in 2060 (Figure 2-8).

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

	Historical		Projections[1]					
County	1990	2000	2010	2020	2030	2040	2050	2060
Bell	0	174	155	150	147	144	141	139
Bosque	61	276	210	197	189	182	176	172
Brazos	21	25	27	28	29	30	31	31
Burleson	11	29	25	24	24	24	24	24
Callahan	137	81	92	96	98	100	101	103
Comanche	74	80	54	51	50	49	48	47
Coryell	86	100	108	111	113	115	117	118
Eastland	295	79	95	102	105	108	111	115
Erath	0	0	0	0	0	0	0	0
Falls	55	133	101	95	91	88	85	83
Fisher	278	468	375	359	354	349	344	337
Grimes	0	158	166	169	171	173	174	175
Hamilton	0	0	0	0	0	0	0	0
Haskell	141	101	93	91	90	89	88	87
Hill	0	118	100	96	94	92	90	89
Hood	73	167	162	161	160	159	158	157
Johnson	27	324	370	390	403	415	427	436
Jones	169	290	300	303	304	305	306	307
Kent	799	686	464	436	427	418	410	399
Knox	11	26	26	26	26	26	26	26
Lampasas	87	193	152	144	139	135	131	128
Lee	0	20,000	5,450	5,450	5,450	5,450	13	13
Limestone	0	360	380	387	392	396	400	403
McLennan	0	481	416	399	389	380	371	366
Milam	7	30,008	4,000	4,000	4,000	3,000	1,500	1,500
Nolan	378	277	278	278	278	278	278	278
Palo Pinto	1	2	2	2	2	2	2	2
Robertson	20	7,500	10,300	10,300	10,300	78	77	76
Shackelford	279	524	656	724	752	779	806	845
Somervell	330	393	304	287	278	270	263	257
Stephens	660	7,315	8,715	9,328	9,567	9,798	10,024	10,347
Stonewall	410	14	15	15	15	15	15	15
Taylor	170	242	285	304	313	322	330	340
Throckmorton	20	40	49	53	55	57	59	61
Washington	93	157	185	198	206	213	220	226
Williamson	1,713	1,874	2,354	2,615	2,795	2,972	3,149	3,280
Young	538	159	200	222	231	240	249	261
Total for Region	**6,944**	**72,854**	**36,664**	**37,591**	**38,037**	**27,251**	**20,744**	**21,243**

[1] Projections from Texas Water Development Board

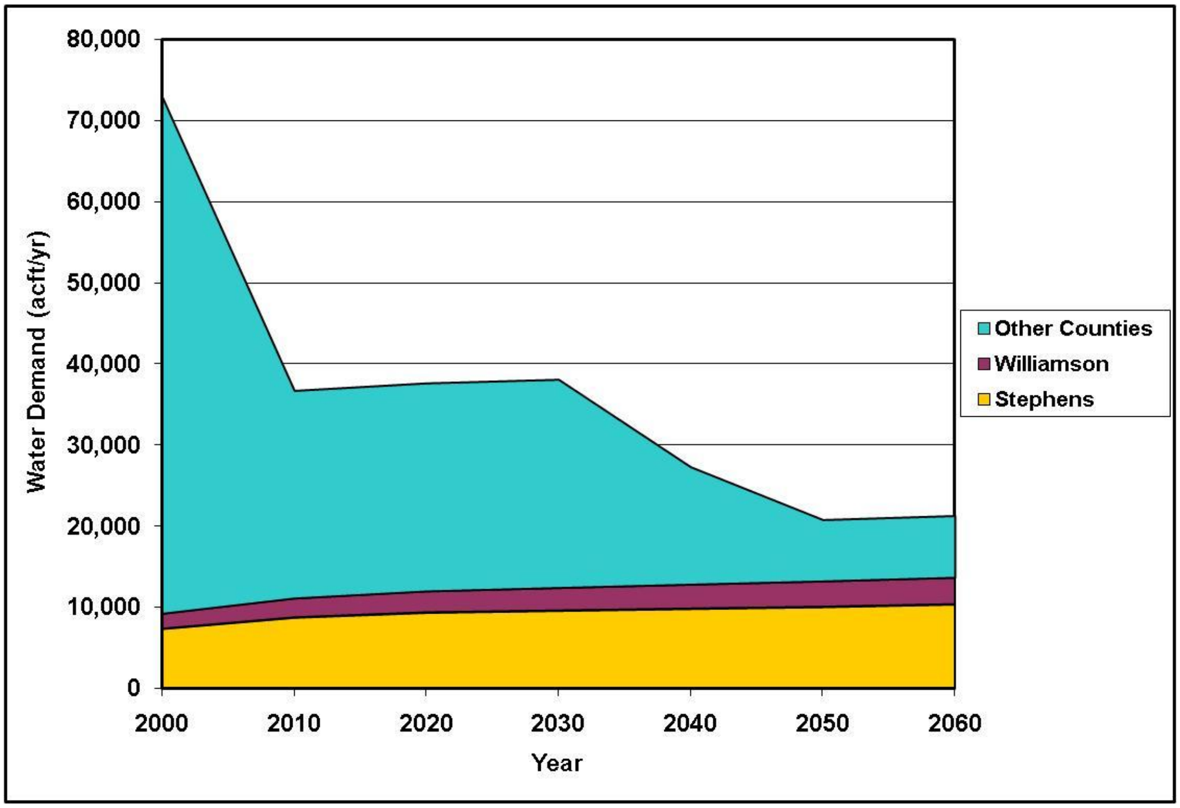

Figure 2-8. Mining Water Demand Projections

2.3.5 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.

Major crops grown in the region include feed grains, small grains, cotton, pecans, and peanuts. Table 2-9 shows that irrigation water demand will decline 11 percent from 2000 to 2060. This is 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 Comanche, Eastland, Haskell, and Knox Counties accounting for 62 percent of total irrigation water use in 2060.

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

	Historical		Projections[1]					
County	1990	2000	2010	2020	2030	2040	2050	2060
Bell	755	1,679	1,656	1,634	1,611	1,591	1,569	1,546
Bosque	1,134	2,543	2,504	2,466	2,427	2,388	2,352	2,316
Brazos	9,875	6,918	6,584	6,267	5,964	5,676	5,403	5,142
Burleson	6,900	18,239	17,480	16,749	16,052	15,431	14,741	14,082
Callahan	662	819	806	793	780	767	755	742
Comanche	50,625	35,969	35,598	35,230	34,867	34,507	34,151	33,798
Coryell	330	0	0	0	0	0	0	0
Eastland	12,200	16,274	16,302	16,327	16,352	16,370	16,377	16,385
Erath	9,705	10,816	10,658	10,502	10,349	10,197	10,048	9,901
Falls	6,425	1,928	1,866	1,806	1,748	1,691	1,637	1,584
Fisher	2,591	2,459	2,386	2,314	2,245	2,178	2,113	2,049
Grimes	125	241	241	241	241	241	241	241
Hamilton	1,659	483	475	467	464	456	434	413
Haskell	22,320	50,820	49,309	47,844	46,422	45,040	43,702	42,405
Hill	283	43	43	42	42	42	42	41
Hood	6,926	3,240	3,179	3,120	3,062	3,005	2,948	2,893
Johnson	0	164	240	240	240	240	240	240
Jones	3,940	4,381	4,250	4,124	4,000	3,881	3,765	3,653
Kent	665	532	517	503	488	475	462	449
Knox	32,323	43,124	42,065	41,033	40,025	39,041	38,082	37,147
Lampasas	180	170	168	166	164	162	160	159
Lee	283	965	940	916	891	867	842	818
Limestone	0	0	0	0	0	0	0	0
McLennan	3,070	2,819	2,816	2,814	2,812	2,809	2,806	2,803
Milam	1,412	2,391	2,372	2,352	2,333	2,312	2,294	2,275
Nolan	1,885	5,276	5,138	5,003	4,871	4,741	4,618	4,497
Palo Pinto	479	947	935	923	911	901	889	877
Robertson	21,253	16,572	16,175	16,019	15,561	15,115	14,682	14,261
Shackelford	237	195	189	183	178	173	168	163
Somervell	350	475	474	471	468	467	464	461
Stephens	500	802	791	781	771	760	750	740
Stonewall	538	347	336	326	317	307	298	290
Taylor	486	174	170	166	162	158	154	150
Throckmorton	0	0	4,000	4,000	4,000	4,000	4,000	4,000
Washington	205	1,724	1,724	1,724	1,724	1,724	1,724	1,724
Williamson	160	80	80	80	80	80	80	80
Young	473	77	74	71	69	66	64	61
Total for Region	**200,954**	**233,686**	**232,541**	**227,697**	**222,691**	**217,859**	**213,055**	**208,386**

[1] Projections from Texas Water Development Board

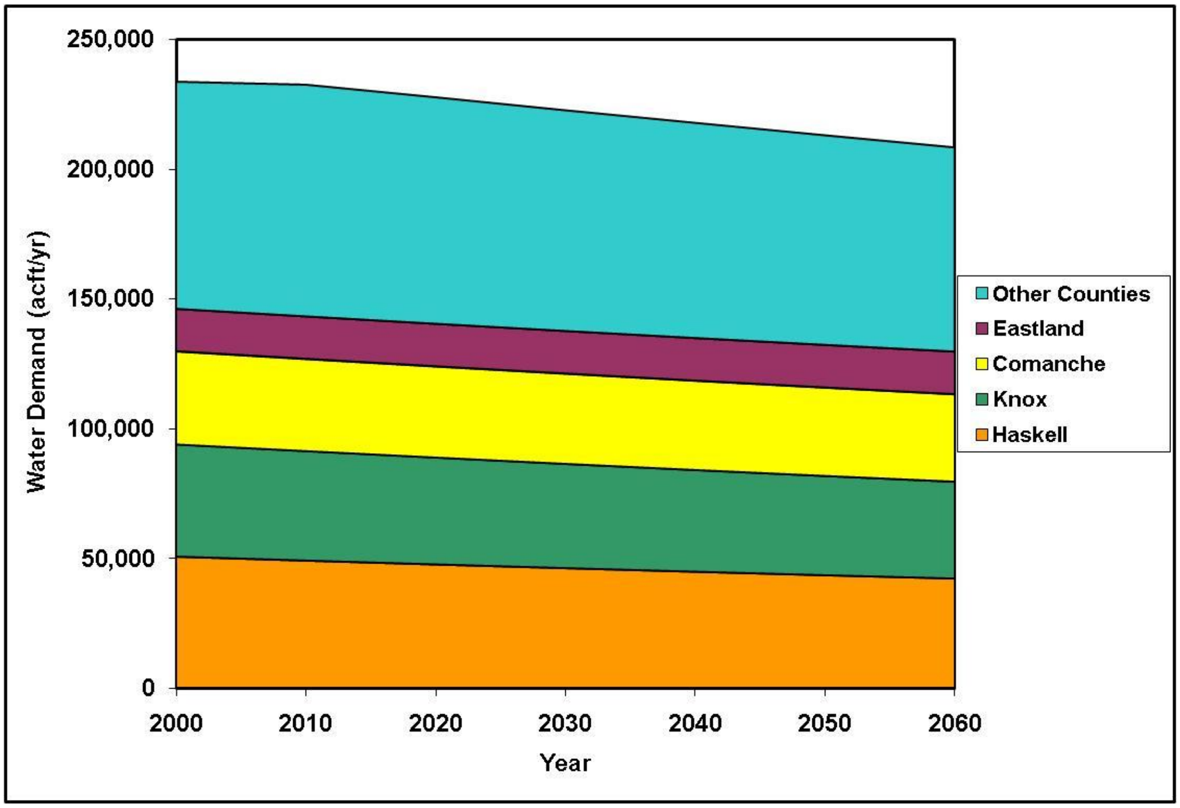

Figure 2-9. Irrigation Water Demand Projections

2.3.6 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 operation 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 annual livestock water demand will remain constant at 51,576 acft for the 60-year planning horizon. Figure 2-10 shows the trend in livestock use, with Comanche, Erath, and Johnson Counties accounting for 30.4 percent of total livestock water use in 2060.

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

County	Historical		Projections[1]					
	1990	2000	2010	2020	2030	2040	2050	2060
Bell	982	953	953	953	953	953	953	953
Bosque	1,228	1,048	1,048	1,048	1,048	1,048	1,048	1,048
Brazos	1,603	1,032	1,032	1,032	1,032	1,032	1,032	1,032
Burleson	1,060	1,422	1,422	1,422	1,422	1,422	1,422	1,422
Callahan	1,018	976	976	976	976	976	976	976
Comanche	2,355	4,253	4,253	4,253	4,253	4,253	4,253	4,253
Coryell	1,176	1,339	1,339	1,339	1,339	1,339	1,339	1,339
Eastland	915	1,121	1,121	1,121	1,121	1,121	1,121	1,121
Erath	5,898	9,321	9,321	9,321	9,321	9,321	9,321	9,321
Falls	1,773	1,626	1,626	1,626	1,626	1,626	1,626	1,626
Fisher	907	585	585	585	585	585	585	585
Grimes	1,734	1,554	1,554	1,554	1,554	1,554	1,554	1,554
Hamilton	1,468	1,961	1,961	1,961	1,961	1,961	1,961	1,961
Haskell	340	492	492	492	492	492	492	492
Hill	1,288	1,401	1,401	1,401	1,401	1,401	1,401	1,401
Hood	560	623	623	623	623	623	623	623
Johnson	1,936	2,117	2,117	2,117	2,117	2,117	2,117	2,117
Jones	521	786	786	786	786	786	786	786
Kent	264	459	459	459	459	459	459	459
Knox	927	1,040	1,040	1,040	1,040	1,040	1,040	1,040
Lampasas	660	688	688	688	688	688	688	688
Lee	1,398	1,547	1,547	1,547	1,547	1,547	1,547	1,547
Limestone	1,733	1,487	1,487	1,487	1,487	1,487	1,487	1,487
McLennan	1,588	1,151	1,151	1,151	1,151	1,151	1,151	1,151
Milam	1,901	1,779	1,779	1,779	1,779	1,779	1,779	1,779
Nolan	625	464	464	464	464	464	464	464
Palo Pinto	468	909	909	909	909	909	909	909
Robertson	1,587	1,508	1,508	1,508	1,508	1,508	1,508	1,508
Shackelford	768	760	760	760	760	760	760	760
Somervell	128	166	166	166	166	166	166	166
Stephens	608	576	576	576	576	576	576	576
Stonewall	415	469	469	469	469	469	469	469
Taylor	1,906	1,305	1,305	1,305	1,305	1,305	1,305	1,305
Throckmorton	1,166	752	752	752	752	752	752	752
Washington	1,605	1,554	1,554	1,554	1,554	1,554	1,554	1,554
Williamson	1,507	1,344	1,344	1,344	1,344	1,344	1,344	1,344
Young	1,054	1,008	1,008	1,008	1,008	1,008	1,008	1,008
Total for Region	**47,070**	**51,576**	**51,576**	**51,576**	**51,576**	**51,576**	**51,576**	**51,576**

[1] Projections from Texas Water Development Board

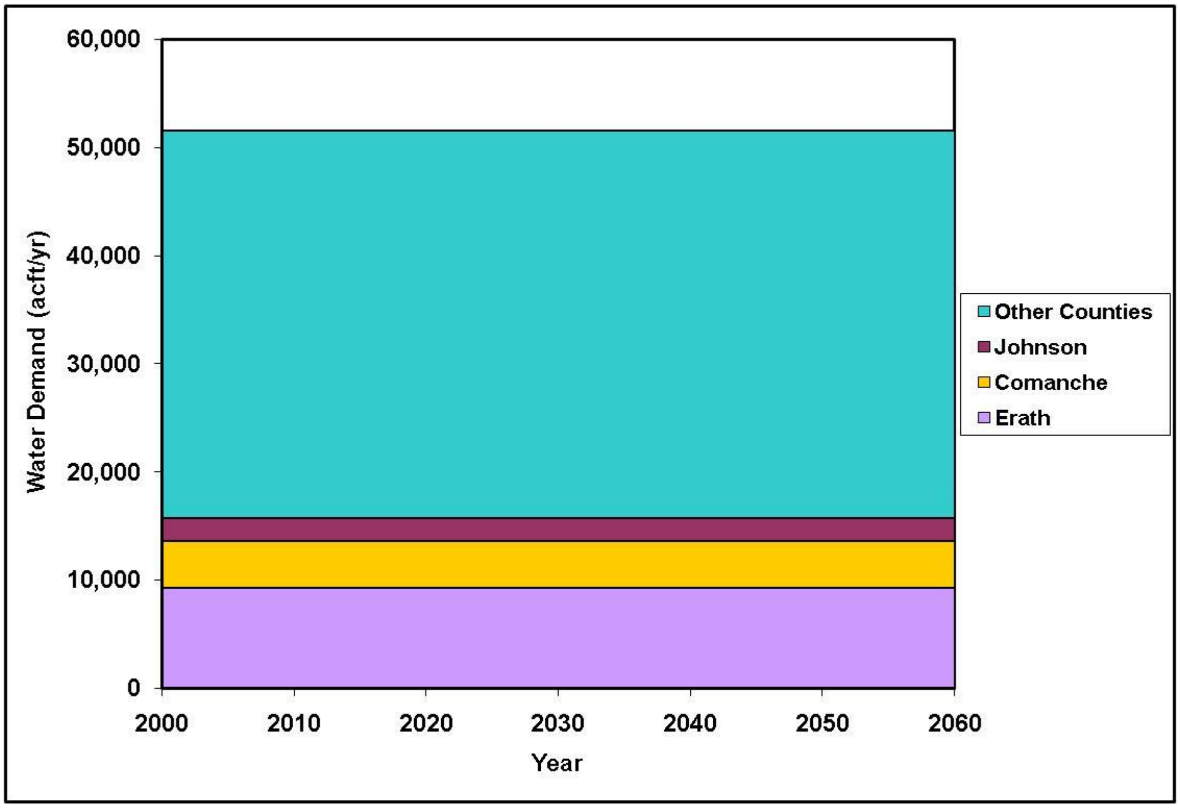

Figure 2-10. Livestock Water Demand Projections

Section 3
Evaluation of Current Water Supplies in the Region

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 that merged 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 April 2009 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 1,095 water rights exist in the Brazos River Basin, with a total authorized diversion of 2,586,000 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 2,319,000 acft/yr (89.7 percent) of the authorized diversion volume. The remaining 1,055 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 964 water rights exist in the Brazos G portion of the Brazos River Basin, with a total authorized diversion of 1,323,000 acft/yr. In the Brazos G portion of the Brazos River Basin, 28 water rights (2.9 percent) make up 1,097,000 acft/yr (82.9 percent) of the authorized diversion volume. The remaining 936 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 39 water rights (3.6 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,

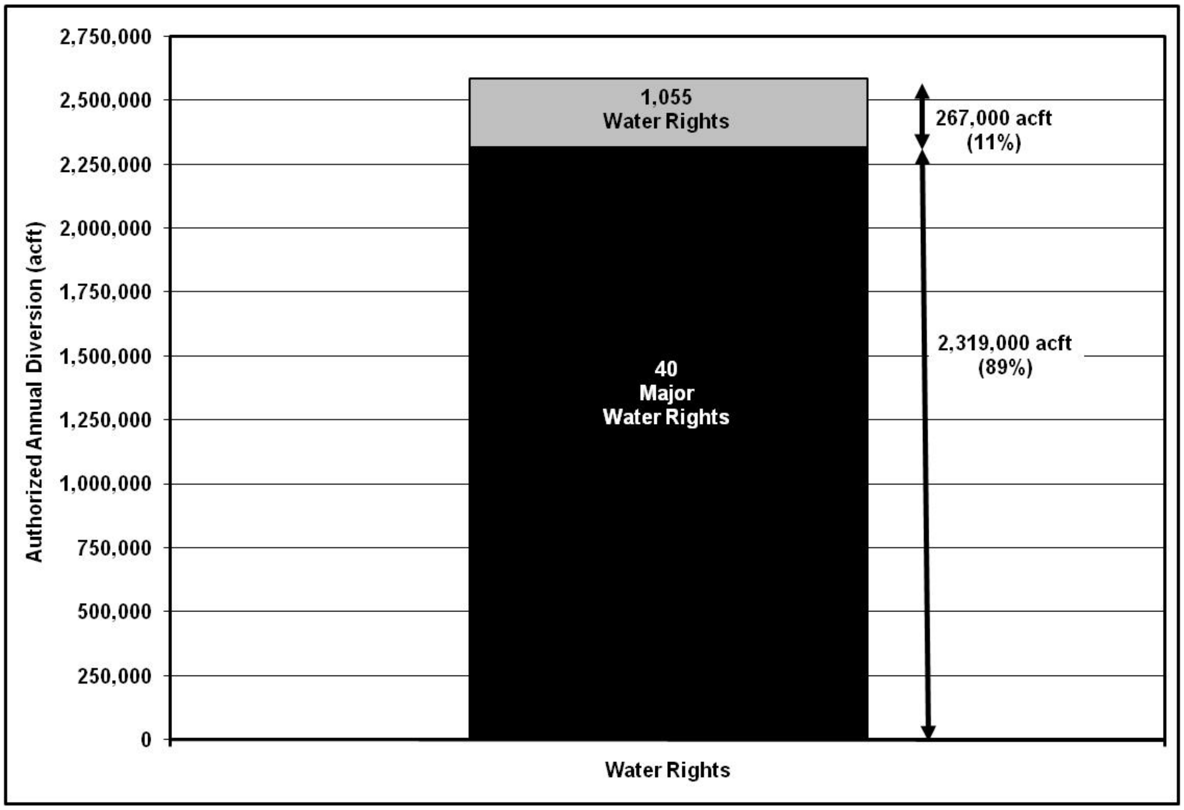

Figure 3.1-1. Comparison of Water Rights in the Brazos River Basin

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.

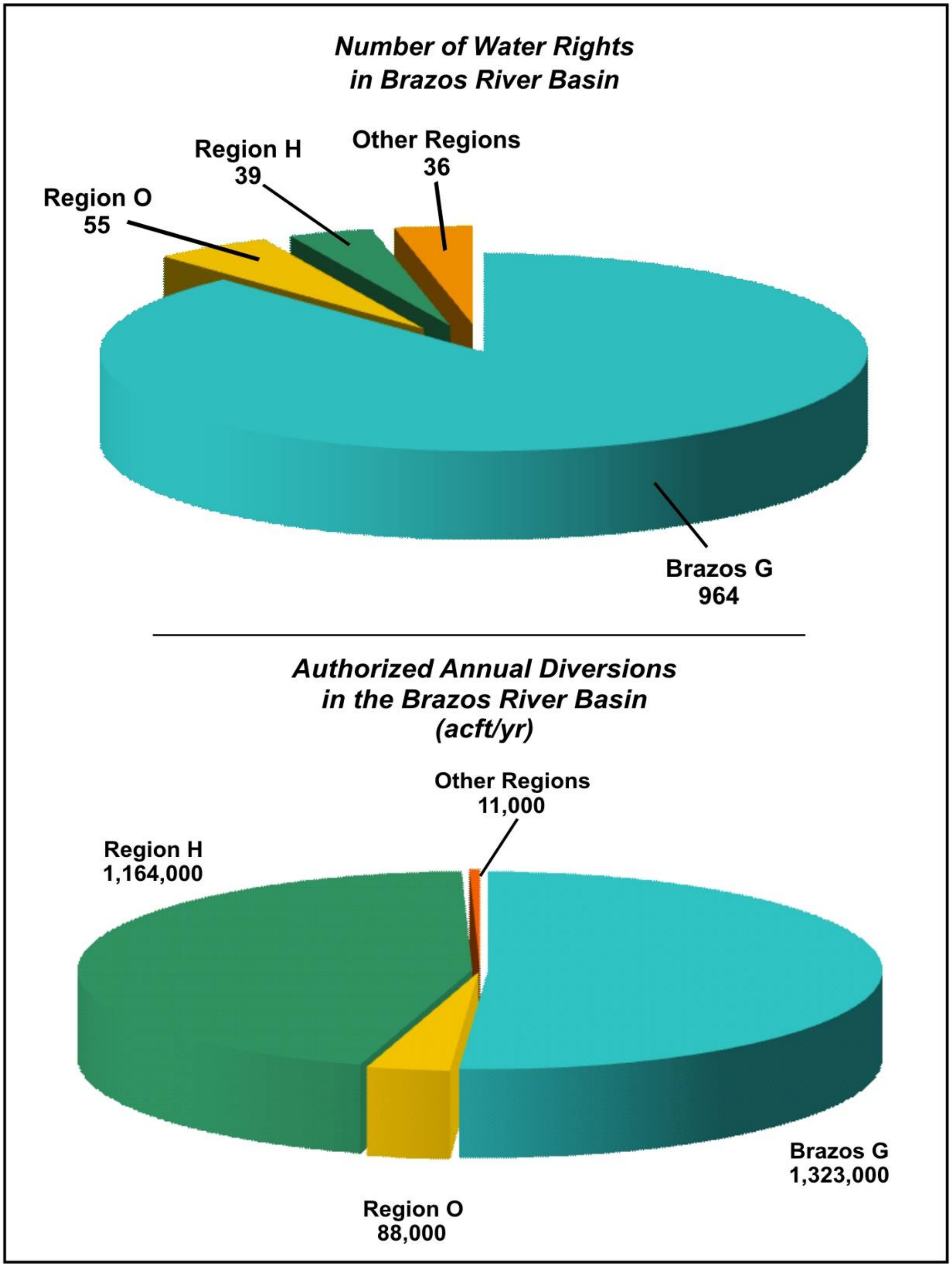

Figure 3.1-2. Comparison of Significant Water Rights in the Brazos River Basin by Number of Rights and Diversion Volume

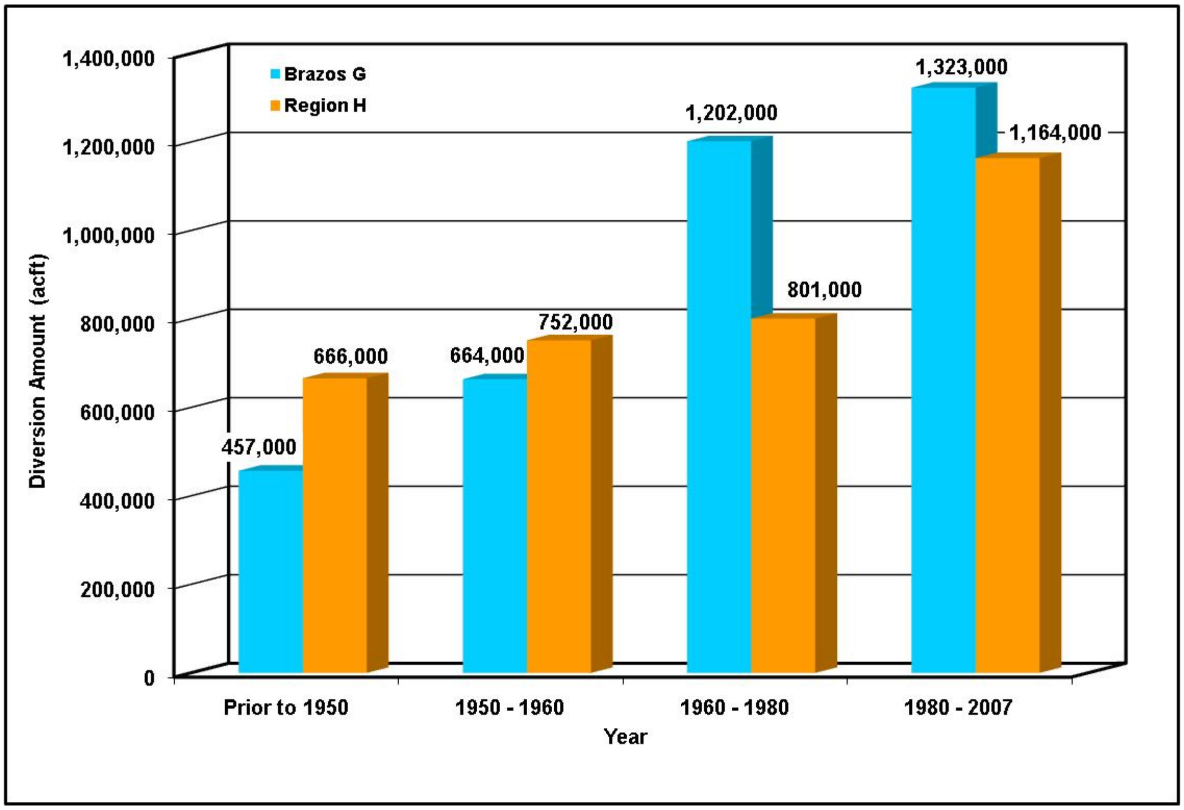

Figure 3.1-3. Comparison of Cumulative Diversion Volume and Priority Date for the Brazos G Area and Region H

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.

Water Right	Name	Diversion Amount (acft)	Storage Capacity (acft)	Priority Date
2315	City of Waco	39,100	104,100	01/10/1929
2315	City of Waco	19,100		04/16/1958
2315	City of Waco	900		02/21/1979
5094	City of Waco	20,770	87,962	09/12/1986
2936	U.S. Dept. of the Army	10,000	12,000	01/24/1953
2936	U.S. Dept. of the Army	2,000		08/23/1954
2938	City of Temple	15,804	500	10/30/1915
2938	City of Temple	20,000		01/11/1957
2939	Brazos Electric Cooperative	38,800		02/07/1949
3758	Aluminum Co. of America	18,000		12/12/1951
4031	Palo Pinto Co. MWD 1	16,000	44,100	07/03/1962
4031	Palo Pinto Co. MWD 1	2,500	24	09/08/1964
4097	Texas Utilities Electric Co.	23,180	151,500	04/25/1973
4139	City of Abilene		608	08/03/1949
4155	City of Lubbock	56,200	115,937	10/05/1981
4161	City of Abilene	30,690	73,960	03/25/1937
4213	West Central Texas MWD	52,800	317,750	05/28/1957
4213	West Central Texas MWD	3,200		08/14/1972
4340	City of Lubbock	22,910		03/07/1983
4342	Texas Utilities Electric Co.	12,000	37,800	08/21/1926
4342	Texas Utilities Electric Co.	15,000		09/16/1966
4345	Texas Utilities Electric Co.	10,000	8,500	03/06/1951
5155	Brazos River Authority	230,750	724,739	04/06/1938
5156	Brazos River Authority	61,562	155,000	02/13/1964
5157	Brazos River Authority	8,336	50,000	08/30/1982
5158	Brazos River Authority	7,943	52,400	10/25/1976
5159	Brazos River Authority	19,658	59,400	12/16/1963
5160	Brazos River Authority	100,157	457,600	12/16/1963
5161	Brazos River Authority	67,768	235,700	12/16/1963
5162	Brazos River Authority	13,610	37,100	02/12/1968
5163	Brazos River Authority	19,840	65,500	02/12/1968
5164	Brazos River Authority	48,000	160,110	12/16/1968
5164	Millsap Water Supply Corp.	90	215	12/11/1987
5165	Brazos River Authority	65,074	225,400	05/06/1974
5168	Gulf Coast Water Authority	99,932		01/15/1926
5168	Gulf Coast Water Authority		7,308	03/17/1947
5171	Gulf Coast Water Authority	75,000		02/01/1939
5171	Gulf Coast Water Authority	50,000		12/12/1950
5272	Aluminum Co. of America	14,000	15,650	12/12/1951
5272	City of Gilmer	750		12/14/1989
5287	Bistone Municipal WSD	2,952	9,600	04/15/1957
5298	Texas Utilities Electric Co.	30,319	30,319	07/01/1974
5320	Richmond Irrigation Co.	40,000		10/23/2026
5322	Chocolate Bayou Co.	155,000	864	02/08/1929
5325	Houston L&P Co - Parish	28,711	18,750	12/16/1955
5328	Dow Chemical Co.	85,000	21,973	02/28/1929
5328	Dow Chemical Co.	150,000	10,200	02/14/1942
5328	Dow Chemical Co.	7,500	600	04/03/1951

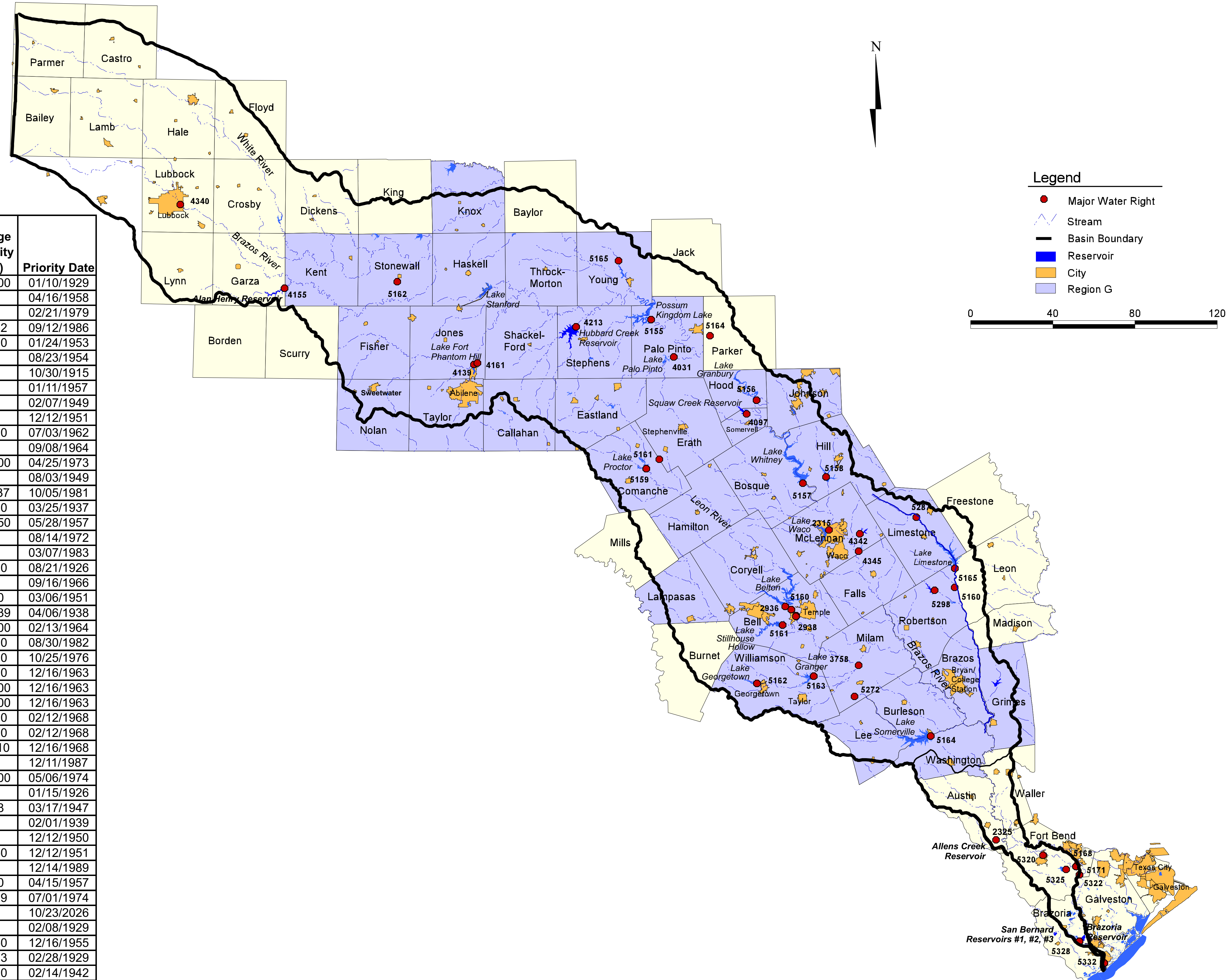

Figure 3.1-4. Major Water Rights and Reservoirs in the Brazos River Basin

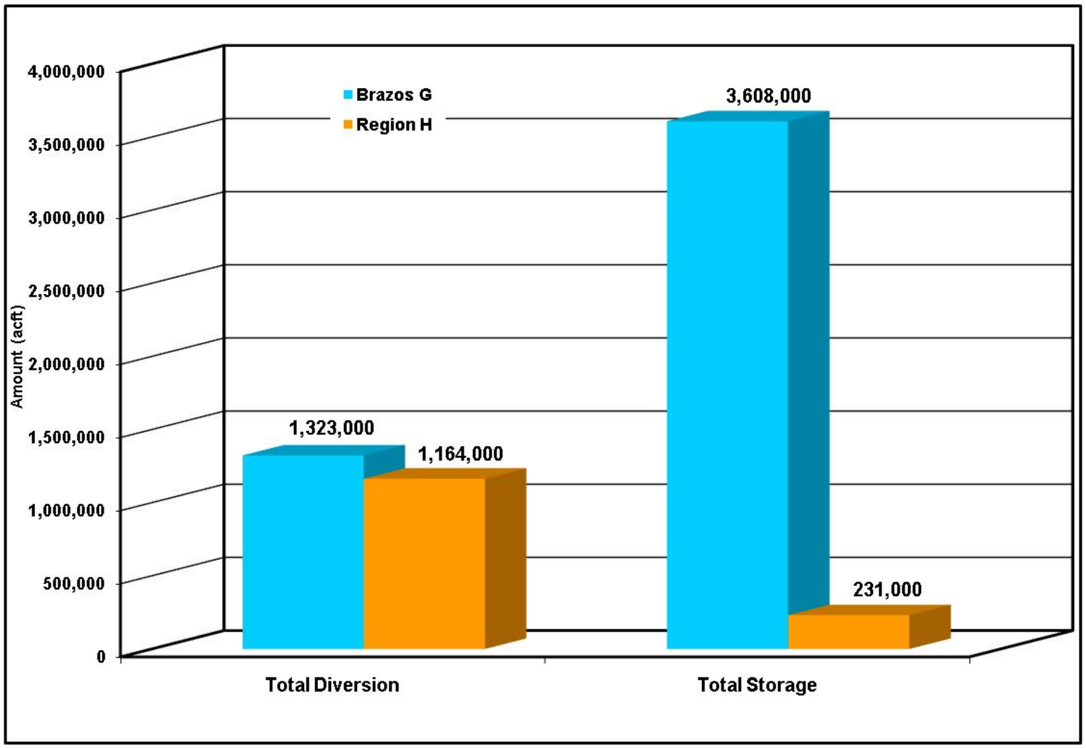

Figure 3.1-5. Comparison of Storage and Diversion Volume for Brazos G and Region H

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. Other major reservoirs in the basin that provide municipal, industrial, and irrigation water supply are owned by the BRA, City of Waco, 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	1/23/18	Taylor	G
Alcoa Lake	Aluminum Co. of America	15,650	14,000	12/12/51	Milam	G
Alan Henry	Brazos River Authority	115,937	35,200	10/5/81	Garza	O
Allens Creek	Brazos River Authority City of Houston TWDB	145,553	99,650	9/1/99	Austin	H
Aquilla	Brazos River Authority	52,400	13,896	10/25/76	Hill	G
Belton	Brazos River Authority	457,600	100,257	12/16/63	Bell	G
Brazoria Reservoir–Off-Channel	Dow Chemical	21,700	0	4/7/52	Brazoria	H
Brushy Creek	City of Marlin	6,560	0	6/16/86	Falls	G
Camp Creek	Camp Creek Water Co.	8,400	0	6/14/48	Robertson	G
Cisco	City of Cisco	45,000	1,971 56	4/16/20 9/5/78	Eastland	G
Daniel	City of Breckenridge	11,400	2,100	4/26/46	Stephens	G
Dansby Power Plant	City of Bryan	15,227	850	5/30/72	Brazos	G
Davis	League Ranch	4,477 918	2,000	6/13/58 5/15/72	Knox	G
Eagle Nest Lake	T L Smith Trust Et Al	18,000 11,315	4,000 1,800	1/15/48 9/9/93	Brazoria	H
Fort Phantom Hill	City of Abilene	73,960	30,690	3/25/37	Jones	G
GCWA	Gulf Coast Water Auth.	7,308	0	3/17/47	Fort Bend	H
Georgetown	Brazos River Authority	37,100	13,610	2/12/68	Williamson	G
Gibbons Creek Power	Texas Municipal Power	26,824 5,260	9,740	2/22/77 3/9/89	Grimes	G
Graham/Eddleman	City of Graham	4,503 39,000 8,883	5,000 15,000	11/21/27 11/15/54 9/16/57	Young	G
Granbury	Brazos River Authority	155,000	64,712	2/13/64	Hood	G
Granger	Brazos River Authority	65,500	19,840	2/12/68	Williamson	G
Harris Reservoir–Off-Channel	Dow Chemical	10,200	0	2/14/42	Brazoria	H
Hubbard Creek Lake	West Central Texas MWD	317,750	52,800 3,200	5/28/57 8/14/72	Stephens	G
Kirby	City of Abilene	8,500	3,880	10/10/27	Taylor	G
Lake Creek	Luminant Generation Co	8,500	10,000	3/6/1951	McLennan	G
Leon	Eastland Co WSD	28,000	1,265 2,438 2,598	5/17/31 3/21/52 3/25/86	Eastland	G
Limestone	Brazos River Authority	217,494 7,906	65,450	5/1/74 9/4/79	Robertson	G
Mexia	Bistone Municipal WSD	9,600	2,952	4/15/57	Limestone	G
Miller's Creek	North Central Texas MWA	30,696	5,000	10/1/58	Baylor	G / B
Mineral Wells	City of Mineral Wells	7,065	1,680 840	11/15/20 3/22/43	Parker	C
Palo Pinto	Palo Pinto Co. MWD 1	34,250 9,874	10,000 2,500 6,000	7/3/62 9/8/64 7/3/62	Palo Pinto	G
Pat Cleburne Reservoir	City of Cleburne	25,600	5,760 240	8/6/62 3/29/76	Johnson	G

Table 3.1-1 (Concluded)

Reservoir	*Water Right Owner*	*Authorized Storage (acft)*	*Authorized Diversion (acft)*	*Priority Date*	*County*	*Planning Region*
Post	**White River MWD**	**57,420**	**10,600**	**1/20/70**	**Garza**	**O**
Proctor	**Brazos River Authority**	**59,400**	**19,658**	**12/16/63**	**Comanche**	**G**
Somerville	**Brazos River Authority**	**160,110**	**48,000**	**12/16/63**	**Washington**	**G**
Squaw Creek Reservoir	**Texas Utilities Electric Co.**	**151,500**	**23,180**	**4/25/73**	**Somervell**	**G**
Stamford	**City of Stamford**	**60,000**	**10,000**	**6/8/49**	**Haskell**	**G**
Stillhouse Hollow	**Brazos River Authority**	**235,700**	**67,768**	**12/16/63**	**Bell**	**G**
Sweetwater	**City of Sweetwater**	**10,000**	**3,740**	**10/17/27**	**Nolan**	**G**
Tradinghouse Steam	**Texas Utilities Electric Co.**	**37,800**	**12,000**	**8/21/26**	**McLennan**	**G**
			15,000	**9/16/66**		
Twin Oak Steam Electric	**Texas Utilities Electric Co.**	**30,319**	**13,200**	**7/1/74**	**Robertson**	**G**
Waco	**City of Waco**	**104,100**	**39,100**	**1/10/29**	**McLennan**	**G**
			19,100	**4/16/58**		
			900	**2/21/79**		
	City of Waco	**87,962**	**20,770**	**9/12/86**		
Whitney	**Brazos River Authority**	**50,000**	**18,336**	**8/30/82**	**Hill**	**G**
White River Reservoir	**White River MWD**	**33,160**	**6,000**	**9/22/58**	**Crosby**	**O**
		5,072		**11/21/60**		
		6,665		**8/16/71**		

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

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
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 698,440 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 contracts raw water from Fort Phantom Hill Reservoir to West Texas Utilities for industrial use as well as municipal supply 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 all the contracts held by the identified Wholesale Water Providers within Brazos G. These contracts make up the bulk of 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.

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, which governs Texas' water right priority system.

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.

Table 3.1-3.
Water Supply Contracts Held by WWPs in Brazos G (all values in acft/yr)
(Note: Increasing contracts represent projected demands for "meets" contracts)

	Year					
Wholesale Water Supplier Contracts	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
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	13,795	13,795	13,795	13,795	13,795	13,795
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
East Williamson County WTP	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	7,150	7,150	7,150	7,150	7,150	7,150
Lake Proctor Irrigation Authority	2,743	2,743	2,743	2,743	2,743	2,743
Lakeside Domestic Use	27	27	27	27	27	27
Moffat WSC	500	500	500	500	500	500
North Leon River Irrigation Corporation	3,909	3,909	3,909	3,909	3,909	3,909
Salado WSC	2,400	2,400	2,400	2,400	2,400	2,400
Sun City Georgetown	15	15	15	15	15	15
The Grove WSC	400	400	400	400	400	400

Table 3.1-1 (Continued)

Wholesale Water Supplier Contracts	***Year***					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
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	**250,970**	**250,970**	**250,970**	**250,970**	**250,970**	**250,970**
BRA (Main Stem)						
Acton MUD	7,000	7,000	7,000	7,000	7,000	7,000
All Seasons Turf Grass, Inc	50	50	50	50	50	50
Basa Resources	1,000	1,000	1,000	1,000	1,000	1,000
Bluegreen Southwest One, LP	200	200	200	200	200	200
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.	175	175	175	175	175	175
City of Abilene	50	50	50	50	50	50
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 Keene	2,040	2,040	2,040	2,040	2,040	2,040
City of Lorena	1,000	1,000	1,000	1,000	1,000	1,000
City of Lubbock[1]	961	961	961	961	961	961
City of Marlin	1,200	1,200	1,200	1,200	1,200	1,200
City of Richmond	3,000	3,000	3,000	3,000	3,000	3,000
City of Rosebud	100	100	100	100	100	100
City of Rosenburg	4,500	4,500	4,500	4,500	4,500	4,500
City of Stamford[1]	1,820	1,820	1,820	1,820	1,820	1,820
City of Whitney	750	750	750	750	750	750
Decordova Bend Estates Owners	400	400	400	400	400	400
Dog Ridge WSC	1,500	1,500	1,500	1,500	1,500	1,500
Double Diamond, Inc.	2,000	2,000	2,000	2,000	2,000	2,000
Dow Pipeline Company	16,000	16,000	16,000	16,000	16,000	16,000
Fred T Owen Jr	60	60	60	60	60	60
Granbury Recreational Association	50	50	50	50	50	50
Gulf Coast Water Authority	37,668	37,668	37,668	37,668	37,668	37,668
Hill Country Harbor Village	250	250	250	250	250	250
Horizon Turf Grass, Inc.	350	350	350	350	350	350
Island Condominium Owners	20	20	20	20	20	20
Johnson County SUD	13,210	13,210	13,210	13,210	13,210	13,210
King Ranch Turfgrass, LP	1,300	1,300	1,300	1,300	1,300	1,300
Lakeside Domestic Use	399	399	399	399	399	399
LENMO, Inc.	2,000	2,000	2,000	2,000	2,000	2,000

Table 3.1-1 (Continued)

Wholesale Water Supplier Contracts	***Year***					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
LSF Development Corp.	90	90	90	90	90	90
Monarch Utilities I, L.P.	600	600	600	600	600	600
North Ridge Corporation	235	235	235	235	235	235
NRG Texas, LLC	104,837	104,837	104,837	104,837	104,837	104,837
Oak Grove Management, LLC	3,838	3,838	3,838	3,838	3,838	3,838
Parker County SUD	700	700	700	700	700	700
Patterson Petroleum, Inc.	120	120	120	120	120	120
Pecan Grove MUD	3,100	3,100	3,100	3,100	3,100	3,100
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	300	300	300	300	300	300
Shackleford WSC	353	353	353	353	353	353
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
Swan Oilfield Services, L. P.	44	44	44	44	44	44
TEXAS H20, LLC	2,700	2,700	2,700	2,700	2,700	2,700
Texas Municipal Power Agency	3,600	3,600	3,600	3,600	3,600	3,600
Texas Parks and Wildlife	1,200	1,200	1,200	1,200	1,200	1,200
TXU Electric Company	122,447	122,447	122,447	122,447	122,447	122,447
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 Inc.	1,000	1,000	1,000	1,000	1,000	1,000
Wolf Hollow I, L.P.	10,000	10,000	10,000	10,000	10,000	10,000
Total Contracts	**412,067**	**412,067**	**412,067**	**412,067**	**412,067**	**412,067**
[1] Contract represents a priority calls agreement.						
Aquilla Water Supply						
Brandon-Irene WSC	280	280	280	280	280	280
Chatt WSC (Hill C-O)	84	84	84	84	84	84
Files Valley WSC	1,125	1,125	1,125	1,125	1,125	1,125
Hill County WSC (Hill C-O)	336	336	336	336	336	336
Hillsboro	4,200	4,200	4,200	4,200	4,200	4,200
Menlow WSC (Hill C-O)	45	45	45	45	45	45
Total Contracts	**6,070**	**6,070**	**6,070**	**6,070**	**6,070**	**6,070**
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

Table 3.1-1 (Continued)

Wholesale Water Supplier Contracts	***Year***					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
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	740	740	740	740	740	740
Bell County – Other	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
Total Contracts	**62,509**	**62,509**	**62,509**	**62,509**	**62,509**	**62,509**
Bluebonnet WSC						
City of Bruceville-Eddy	827	964	1,081	1,200	1,275	1,389
Elm Creek WSC	420	502	571	632	671	723
City of McGregor	933	923	913	902	894	899
Moffat WSC	402	430	457	468	477	488
City of Moody	202	203	203	204	206	212
Pendleton WSC	250	265	273	278	282	287
Spring Valley WSC (McLennan C-O)	250	298	331	336	331	331
City of Woodway	110	110	110	110	110	110
Total Contracts	**3,394**	**3,695**	**3,939**	**4,130**	**4,246**	**4,439**
Central Texas WSC						
Armstrong WSC (Bell C-O)	92	92	92	92	92	92
Bell County WCID No. 5 (Bell C-O)	37	37	37	37	37	37
Bell-Milam-Falls WSC	446	446	446	446	446	446
City of Belton	100	100	100	100	100	100
Dog Ridge WSC	671	671	671	671	671	671
East Bell County WSC	341	341	341	341	341	341
City of Holland	258	258	258	258	258	258
Kempner WSC	2,000	2,000	2,000	2,000	2,000	2,000
Little Elm Valley WSC (Milam C-O)	147	147	147	147	147	147
City of Lott	184	184	184	184	184	184
City of Lampasas	2,000	2,000	2,000	2,000	2,000	2,000
City of Rodgers	368	368	368	368	368	368
City of Rosebud	500	500	500	500	500	500
Town of Buckholts-Water Dept. (Milam C-O)	174	174	174	174	174	174
Town of Oenaville and Belfalls (Bell C-O)	57	57	57	57	57	57
West Bell County WSC	921	921	921	921	921	921
Westphalia WSC (Falls C-O)	45	45	45	45	45	45
Total Contracts	**8,341**	**8,341**	**8,341**	**8,341**	**8,341**	**8,341**
Upper Leon MWD						
City of Comanche	634	632	622	605	587	568
City of De Leon	280	280	274	265	256	248
City of Dublin	485	516	544	576	682	753
City of Gorman	137	134	127	120	113	108

Table 3.1-1 (Continued)

Wholesale Water Supplier Contracts	*Year*					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
City of Hamilton	2,000	2,000	2,000	2,000	2,000	2,000
City of Stephenville	1,862	1,862	1,862	1,862	1,862	1,862
Total Contracts	**5,398**	**5,424**	**5,429**	**5,428**	**5,500**	**5,539**
Eastland CO MWD						
City of Eastland	1,791	1,791	1,791	1,791	1,791	1,791
City of Ranger	710	710	710	710	710	710
Total Contracts	**2,501**	**2,501**	**2,501**	**2,501**	**2,501**	**2,501**
Palo Pinto CO MWD						
City of Mineral Wells	3,653	3,802	3,928	4,008	4,151	4,337
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)	228	228	228	228	228	228
North Rural WSC (Palo Pinto C-O)	368	368	368	368	368	368
Lake Palo Pinto Area WSC (Palo Pinto C-O)	250	250	250	250	250	250
Palo Pinto County Steam-Electric	1,000	4,000	4,000	4,000	4,000	4,000
Parker County SUD (Region C)	407	407	407	407	407	407
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	**7,196**	**10,345**	**10,471**	**10,551**	**10,694**	**10,880**
West Central Texas MWD						
City of Abilene	20,587	20,514	20,441	20,369	20,296	20,223
City of Albany	2,231	2,223	2,216	2,208	2,200	2,192
City of Anson	2,443	2,434	2,426	2,417	2,408	2,400
City of Breckenridge	2,948	2,937	2,927	2,917	2,906	2,896
Total Contracts	**28,209**	**28,108**	**28,010**	**27,911**	**27,810**	**27,711**
North Central Texas MWD						
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)	55	55	55	55	55	55
City of Haskell	558	558	558	558	558	558
City of Knox City	228	228	228	228	228	228
City of Munday	235	235	235	235	235	235
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
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	**1,399**	**1,399**	**1,399**	**1,399**	**1,399**	**1,399**

Table 3.1-1 (Continued)

Wholesale Water Supplier Contracts	***Year***					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
Abilene						
City of Abilene	22,891	23,485	23,507	23,181	22,588	21,879
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
Sun WSC (Taylor C-O)	230	230	230	230	230	230
View Caps WSC (Taylor C-O)	199	199	199	199	199	199
West Texas Utilities	11,837	11,837	11,837	11,837	11,837	11,837
Taylor County Manufacturing	972	1,081	1,177	1,270	1,349	1,462
Total Contracts	**38,494**	**39,197**	**39,315**	**39,082**	**38,568**	**37,972**
Bisone MWSD						
Bistone MWSD	148	146	144	142	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
Limestone C-O	275	275	275	275	275	275
Total Contracts	**5,682**	**5,680**	**5,678**	**5,676**	**5,675**	**5,675**
Cedar Park						
City of Cedar Park	11,961	16,571	17,910	21,779	21,779	21,780
Indian Springs Subdivision (Williamson C-O)	13	13	13	13	13	13
Leander	1,219	0	0	0	0	0
Williamson-Travis Co. MUD No.1	1,022	1,022	1,022	1,022	1,022	1,022
Blockhouse MUD	1,331	1,331	1,331	1,331	1,331	1,331
Total Contracts	**15,546**	**18,937**	**20,276**	**24,145**	**24,145**	**24,146**
Round Rock						
City of Round Rock	23,103	31,146	40,704	51,176	62,801	75,268
Fern Bluff MUD	1,339	2,049	2,882	3,805	4,810	5,888
Williamson County MUD #9(Williamson C-O)	230	230	230	230	230	230
Total Contracts	**24,672**	**33,425**	**43,816**	**55,211**	**67,841**	**81,386**

Table 3.1-1 (Concluded)

Wholesale Water Supplier Contracts	Year					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
Stamford						
City of Stamford	645	648	634	612	600	568
City of Hamlin	1,120	1,120	1,120	1,120	1,120	1,120
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)	92	92	92	92	92	92
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	**4,219**	**4,222**	**4,208**	**4,186**	**4,174**	**4,142**
Sweetwater						
City of Sweetwater	3,013	3,072	3,081	3,029	2,900	2,763
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
Brian C and Garland Richards (Out of Region)	135	135	135	135	135	135
Nolan County Manufacturing	550	550	550	550	550	550
Total Contracts	**5,367**	**5,426**	**5,435**	**5,383**	**5,254**	**5,117**
Temple						
City of Temple	21,033	23,018	25,170	26,892	28,804	30,613
City of Little River-Academy	68	68	68	68	68	68
City of Morgans Point Resort	291	291	291	291	291	291
City of Troy	124	124	124	124	124	124
Rolling Hills MHP (Bell C-O)	23	23	23	23	23	23
Total Contracts	**21,539**	**23,524**	**25,676**	**27,398**	**29,310**	**31,119**
Waco						
City of Waco	24,876	26,453	27,781	29,159	30,033	31,304
City of Bellmead	2,622	2,751	2,873	2,984	3,065	3,202
City of Hewitt	2,029	2,237	2,395	2,571	2,684	2,877
City of Lacy-Lakeview	1,120	1,120	1,120	1,120	1,120	1,120
City of Woodway	2,944	2,925	2,903	2,882	2,867	2,874
City of Beverly Hills	414	416	416	414	416	424
City of West	1,120	1,120	1,120	1,120	1,120	1,120
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
McLennan County Manufacturing	2,503	2,888	3,249	3,618	3,948	4,403
Total Contracts	**38,285**	**40,567**	**42,514**	**44,525**	**45,910**	**47,981**
Bryan						
City of Bryan	11,957	13,179	14,221	15,022	16,096	16,493
Wellborn SUD	560	560	560	560	560	560
Brushy WSC (Brazos County-Other)	560	560	560	560	560	560
Total Contracts	**13,077**	**14,299**	**15,341**	**16,142**	**17,216**	**17,613**

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 location.
- 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 2000, or the most up to date reservoir survey as available, and estimated Year 2060 elevation-area-capacity information for all reservoirs authorized for greater than 5,000 acft storage capacity.
- The Brazos G WAM also 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,
    - 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.

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

Facility	Stream	Current Returns (MGD)[1]	Confirmed Estimated 2060 Discharge (MGD)[2]
Acton MUD	Brazos River	0.09	1.20
Acton MUD	Brazos River	0.11	1.00
Bell County WCID	Nolan Creek	3.27	9.25
Bell County WCID	Nolan Creek	7.87	10.44
Block House MUD	Brushy Creek	0.22	0.00
BRA CRWTF	Brazos River	2.12	2.50
BRA SLRSS	Steep Bank Creek	3.69	3.60
BRA SWATS	Brazos River	0.28	2.00
BRA TBRSS	Nolan Creek	5.32	6.88
BRA/LCRA BCRWSS West	Brushy Creek	7.07	12.27
Brushy Creek MUD	Brushy Creek	0.21	0.00
City of Abilene	Deadman Creek	11.36	0.00
City of Brenham	Hog Branch	1.61	1.43
City of Bryan[3]	Tributary to Carters Creek	4.46	0.00
City of Bryan[3]	Still Creek	1.66	0.00
City of Cedar Park	Unnamed Trib to Brushy Creek	1.51	5.00
City of College Station[3]	Carters Creek	5.45	0.00
City of Copperas Cove	Clear Creek	0.47	2.00
City of Copperas Cove	House Creek	1.42	2.00
City of Freeport	Brazos River	1.36	3.50
City of Gatesville-2	Leon River	1.21	2.10
City of Georgetown	San Gabriel River	1.67	3.25
City of Georgetown	Unnamed Trib to San Gabriel River	0.54	3.16
City of Graham	Salt Creek	0.97	0.95
City of Granbury	Brazos River	0.73	3.10
City of Harker Heights	Nolan Creek	1.15	1.87
City of Hempstead	Brazos River	0.23	0.95
City of Hillsboro	Hackberry Creek	0.90	3.20
City of Lake Jackson	Brazos River	2.50	2.50
City of Leander	Brushy Creek	0.48	15.00
City of Rosenberg	Brazos River	1.21	2.00
City of Rosenberg-1	Seabourne Creek	1.30	4.50
City of Stephenville	North Bosque River	1.17	1.46
City of Sugarland	Steep Bank Creek	3.88	3.50
City of Taylor	Mustang Creek	1.44	0.00
City of Temple	Unnamed Trib to Little Elm Ck	2.06	2.06
City of Waco WMRSS	Brazos River	21.92	0.00
City of West Columbia	Brazos River	1.02	0.76
Pecan Grove MUD	Unnamed Trib to the Brazos River	1.05	1.20
Texas A&M University	Brazos River	1.74	0.00
Texas A&M University	Unnamed Trib to White Creek	1.05	0.00
	Total:	**107.76**	**118.64**
	Total (acft/yr):	**120,691**	**132,871**

[1] Current return flow estimates developed during the development of the 2006 Brazos G Plan and approved by the discharging entities.
[2] Initial estimated assume 75% of Y2000 will continue to be discharged (assumed 25% reuse) and 50% of wastewater flows in excess of Y2000 levels will be discharged (50% reuse of any future effluent). Final estimates were refined after consultation with local dischargers.
[3] Bryan and College Station have filed applications pursuant to Tex. Water Code § 11.042, requesting authorization to reuse their current and future return flows derived from privately owned groundwater.

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. 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 are discussed 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 55 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 current drought. During the current drought, several area reservoirs have experienced record drawdowns. The year 2007 saw an end to the 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 current drought 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.

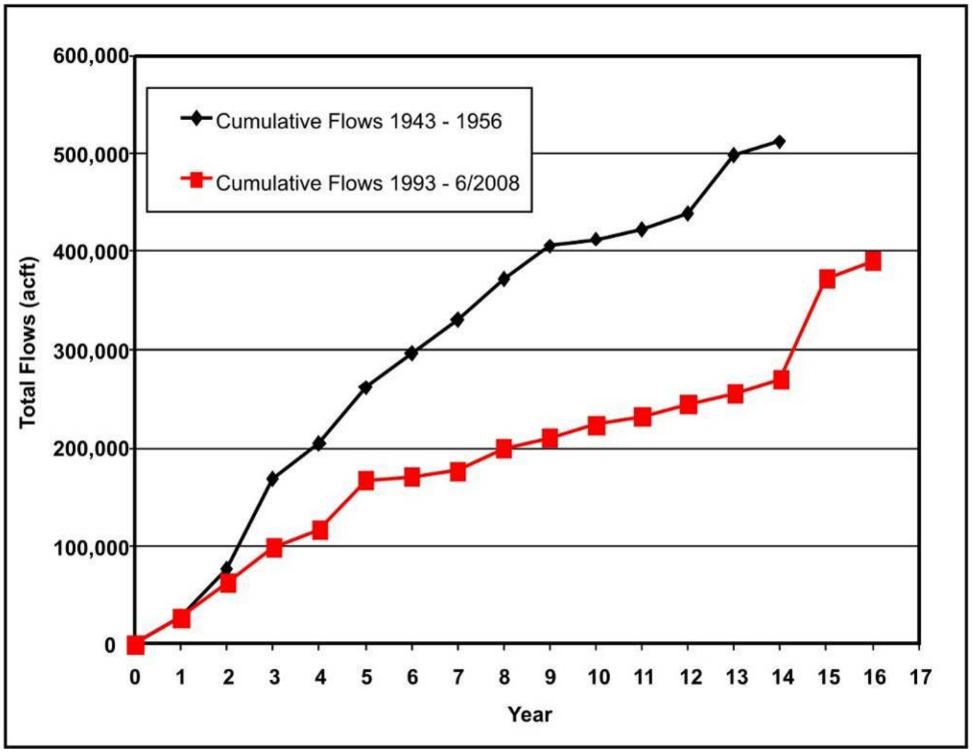

Figure 3.2-1. Comparison of Cumulative Streamflows for Two Drought Periods for the Clear Fork at Nugent, TX Streamgage (08084000)

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, 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 current drought through June 2008 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.

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 for all the reservoirs in the Brazos G Area 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 2000 or later, sediment conditions and the future condition is indicative of estimated year 2060 reservoir sedimentation conditions.

Firm and safe yield estimates were used, depending on where a specific reservoir is located. Utilization of safe yield versus 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	
		2000	2060
BRA Reservoirs (Firm Yield)			
C5155	Possum Kingdom	230,750	225,353
C5156	Granbury	64,712	59,610
C5157	Whitney	18,336	18,336
C5158	Aquilla[1]	13,746	9,490
C5159	Proctor	19,467	18,258
C5160	Belton	100,257	100,257
C5161	Stillhouse	66,205	67,768
C5162	Georgetown	11,803	12,403
C5163	Granger[1]	18,007	15,987
C5164	Somerville	42,120	39,600
C5165	Limestone	65,074	58,017
Large Non-BRA Reservoirs (Firm Yield)			
C3758, C5272	Alcoa	14,000	14,000
C5268	Dansby (Bryan Utilities)	85	85
C5311, C5307	Gibbons Creek	9,740	9,740
C4345	Lake Creek	10,000	9,950
C3440[3]	Lake Davis	220	35
C3470	Lake Leon	5,950	5,875
C40391	Lake Mineral Wells	2,520	2,426
C4031	Lake Palo Pinto[2]	10,100	7,450
C4106	Pat Cleburne	5,150	4,700
C4097	Squaw Creek	9,200	9,425
C4342	Tradinghouse	4,950	5,000
C5298	Twin Oaks	2,900	2,850
P5551, P5899	Waco	79,877	75,200
C3693	White Reservoir	2,960	10
Minor Non Mini-WAM Reservoirs (Firm Yield)			
P4135	Crawford	1	-
C3465	Eastland	505	-
C4024	Gordon	5	-
C4355	Marlin	0	-
P5000	Mart	0	-
P5085	Robinson	6,021	-
P5744	Somervell	2,000	-

[1] The Brazos River Authority has revised sedimentation rates for Aquilla and Granger, though it is too late to include these rates in the analysis.

Table 3.2-2 (Continued)

Water Right ID	Reservoir Name	Yield 2000	Yield 2060
C4019	Strawn	160	-
C3450	Throckmorton	325	-
C3450	Throckmorton (Safe Yield)	200	-
Mini-WAM Reservoirs (Safe Yield)			
C4142	Lake Abilene[1]	1,255	570
C4211	Lake Cisco	1,140	1,130
C4214	Lake Daniel	235	205
C4161	Fort Phantom Hill Reservoir[4]	12,050	10,645
C3458	Lake Graham-Eddleman	3,935	3,215
C4213	Hubbard Creek Reservoir[4]	27,708	27,370
C4150	Lake Kirby[1]	570	350
C4179	Lake Stamford	5,740	5,300
C4130	Lake Sweetwater	1,055	1,030
C4128	Sweetwater_Trammel_RC4128	540	-
C4152	Lytle Lake	460	-
C4180	City of Hamlin Lake	80	-
C4181	Anson North	65	-
C4194	Woodson	30	-
C4202	Baird	60	-
C4208	McCarty	120	-
C4207	Moran	70	-
C3462	Bryson	40	-
C3444	Millers Creek Reservoir	60	-
Mini-WAM Reservoirs (Firm Yield)			
C4142	Lake Abilene[1]	2,200	1,300
C4211	Lake Cisco	1,304	1,294
C4214	Lake Daniel	260	205
C4161	Fort Phantom Hill Reservoir	21,850	21,615
C3458	Lake Graham-Eddleman	5,335	4,815
C4213	Hubbard Creek Reservoir	42,572	41,350
C4150	Lake Kirby[1]	970	550
C4179	Lake Stamford	8,760	8,350
C4130	Lake Sweetwater	1,430	1,405
C4128	Sweetwater_Trammel_RC4128	700	-
C4152	Lytle Lake	750	-
C4180	City of Hamlin Lake	109	-
C4181	Anson North	85	-

Table 3.2-2 (Concluded)

Water Right ID	Reservoir Name	Yield 2000	Yield 2060
C4194	Woodson	38	-
C4202	Baird	82	-
C4208	McCarty	155	-
C4207	Moran	165	-
C3462	Bryson	52	-
C3444	Millers Creek Reservoir[5]	90	-

[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, 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 calculations. The 1-year safe yield estimate for Fort Phantom Hill Reservoir is 16,850 acft/yr and is 33,305 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 Table 3.2-2 and 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 supply values for the water rights are used to determine the supplies available by type of use and county for comparison with demands as described in Section 4A.1.

Minimum annual supplies for individual irrigation rights were calculated and are included as part of the results presented in Appendix G. For irrigation water rights, another definition for supply is used by the Brazos G RWPG 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. The 75/75 estimates were developed for irrigation water rights grouped by county for those in the Brazos River Basin located within Brazos G. The results of the 75/75 irrigation water availability analysis for each county are presented in Table 3.2-3. This analysis was completed for the current and future reservoir sedimentation conditions; however, only the results for the future condition are shown because most of the run-of-the-river rights are only marginally affected by the different scenarios and the values do not vary significantly when all rights in a county are aggregated. Note that supplies as determined using the 75/75 convention would not be available during extreme droughts.

3.2.5 Unappropriated Flows in the Region

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 no additional 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 show, 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

Table 3.2-3.
Summary of Irrigation Rights by County
75/75 Reliability Analysis
(Year 2060 Conditions)

County	75/75 Supply Reliability (acft/yr)
Bell	5,829
Bosque	11,140
Brazos	4,480
Burleson	8,840
Callahan	49
Comanche	19,117
Coryell	1,651
Eastland	2,404
Erath	5,230
Falls	8,188
Fisher	758
Grimes	1,678
Hamilton	4,070
Haskell	830
Hill	2,992
Hood	12,667
Johnson	1,079
Jones	2,570
Kent	345
Knox	2,951
Lampasas	1,253
Lee	181
Limestone	19
McLennan	8,868
Milam	8,823
Nolan	120
Palo Pinto	3,133
Robertson	9,081
Shackelford	85
Somervell	1,105
Stephens	3,541
Stonewall	11
Taylor	232
Throckmorton	12
Washington	2,876
Williamson	1,087
Young	954
Total	138,249

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	1,218,059	0	27,190	0	2,554,843	0	326,275	194,673	36
BRGR30	2,668,738	0	51,487	0	3,947,718	0	617,841	408,217	32
BRAQ33	2,906,261	0	69,617	439	4,437,714	0	835,404	623,870	28
BOWA40	525,033	0	20,227	0	947,194	0	243,073	191,279	28
LRCA58	1,398,154	0	72,301	1,200	3,878,336	0	867,608	654,919	27
BRBR59	4,424,667	0	206,991	16,898	10,234,346	0	2,483,895	2,107,394	26
BRHE68	5,136,258	0	249,358	24,218	12,195,215	0	2,992,300	2,685,328	26
BRRI70	5,466,122	0	303,777	60,233	13,432,834	0	3,645,321	3,320,507	26

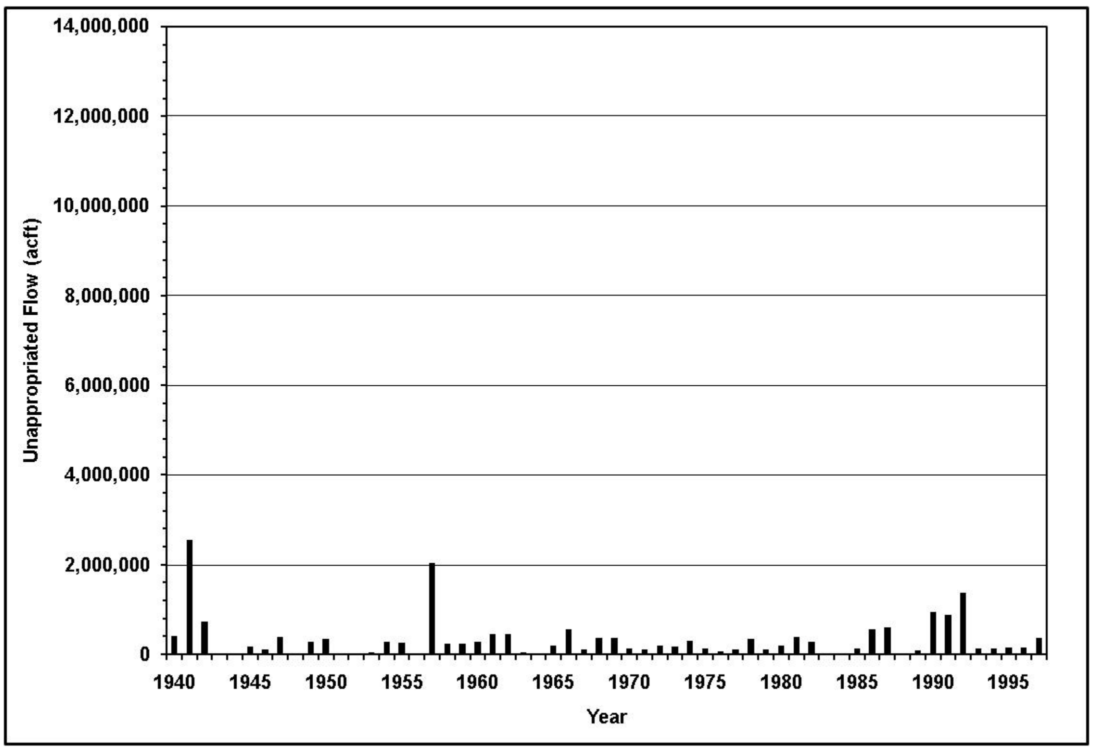

Figure 3.2-2. Estimated Annual Unappropriated Flow at Brazos River at South Bend

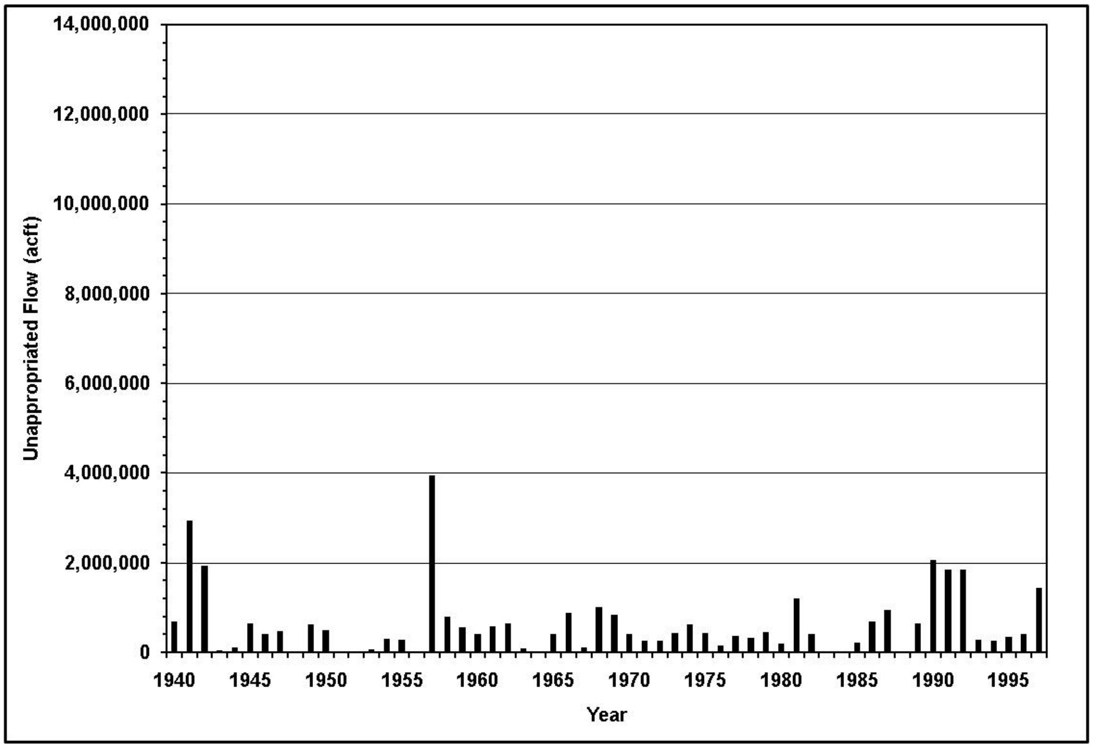

Figure 3.2-3. Estimated Annual Unappropriated Flow at Brazos River near Glen Rose

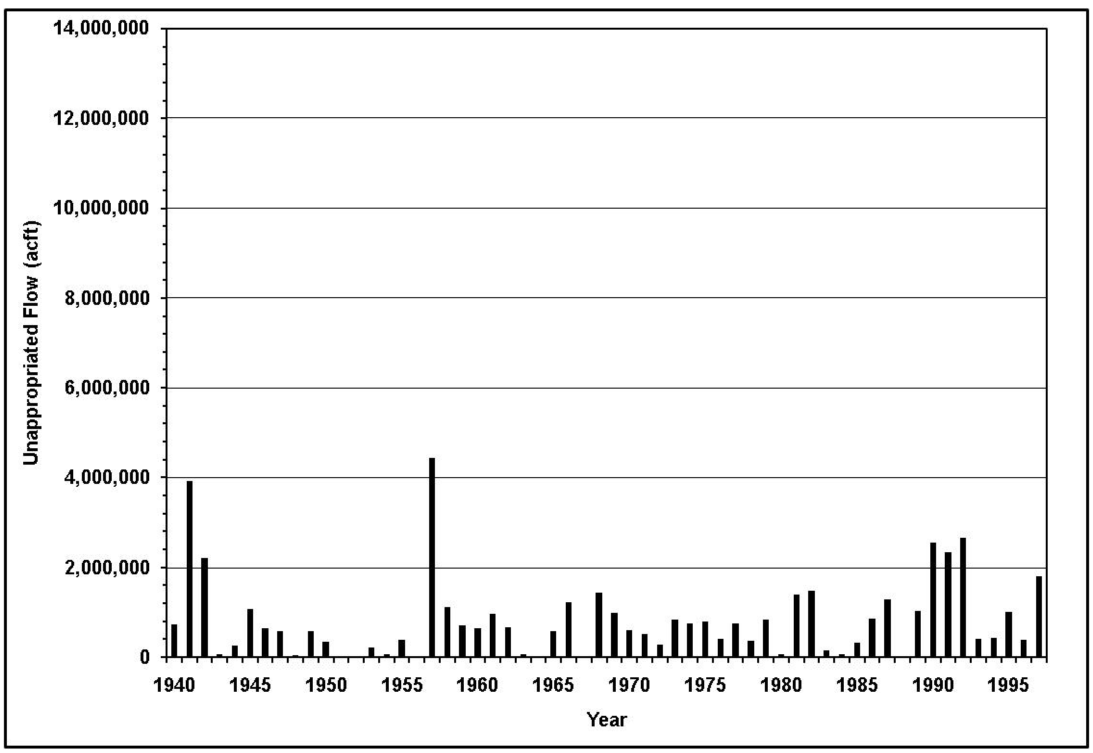

Figure 3.2-4. Estimated Annual Unappropriated Flow at Brazos River near Aquilla

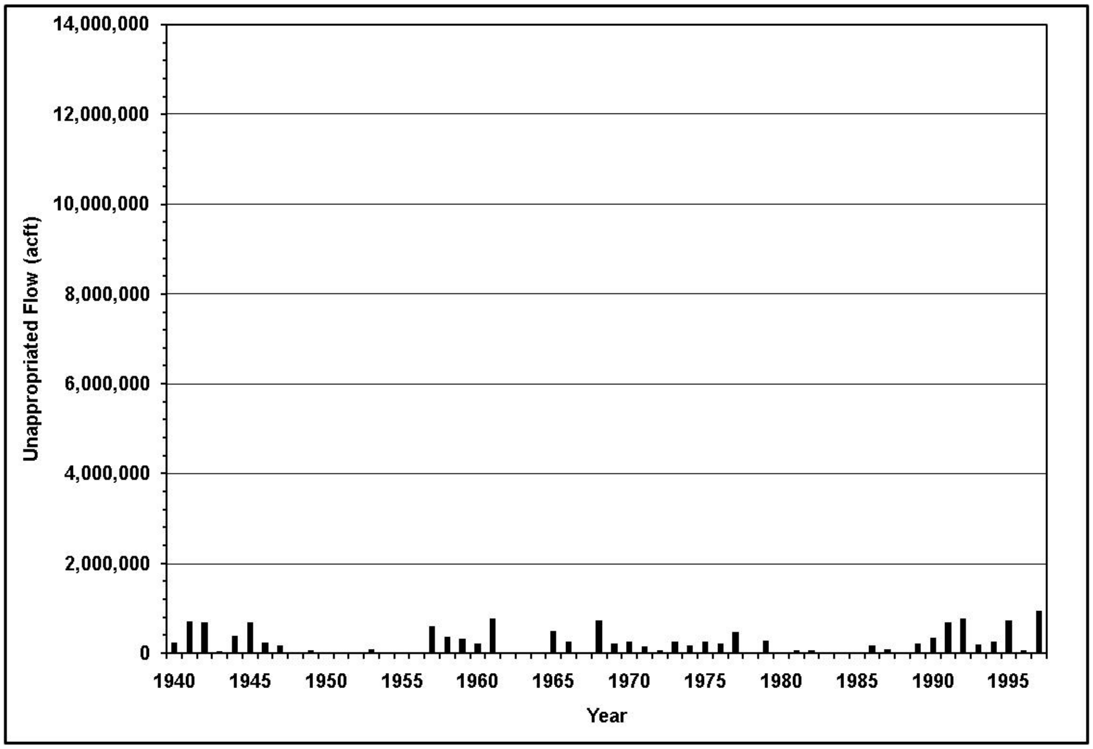

Figure 3.2-5. Estimated Annual Unappropriated Flow at Bosque River near Waco

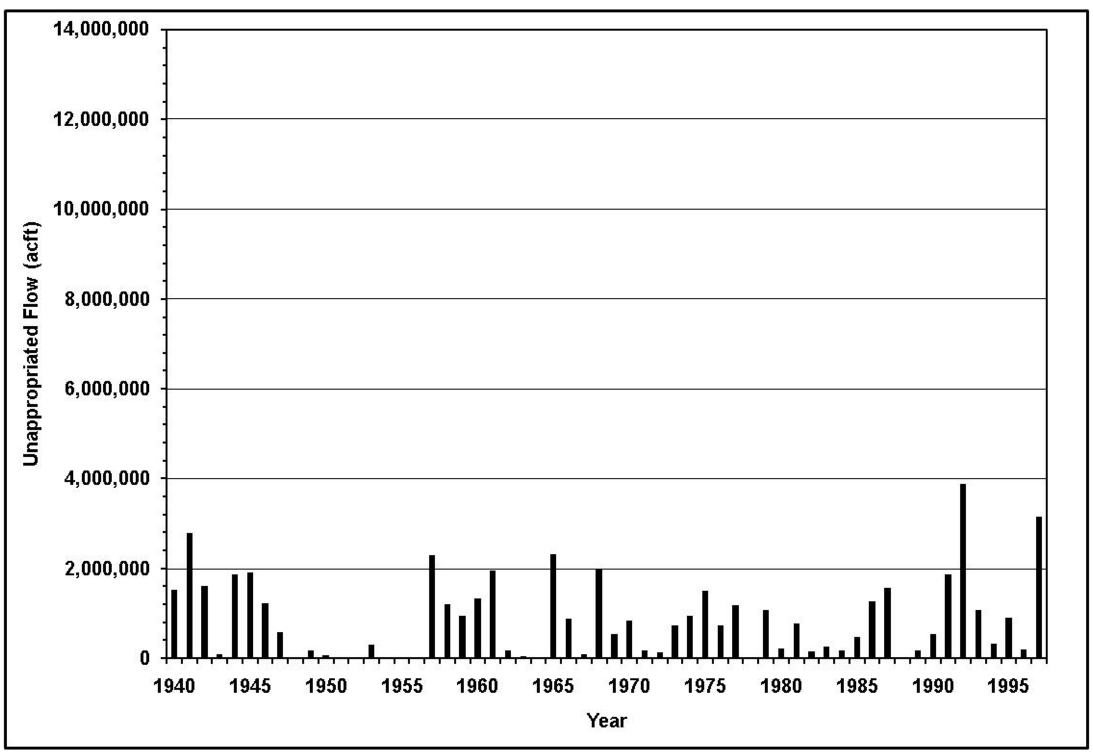

Figure 3.2-6. Estimated Annual Unappropriated Flow at Little River at Cameron

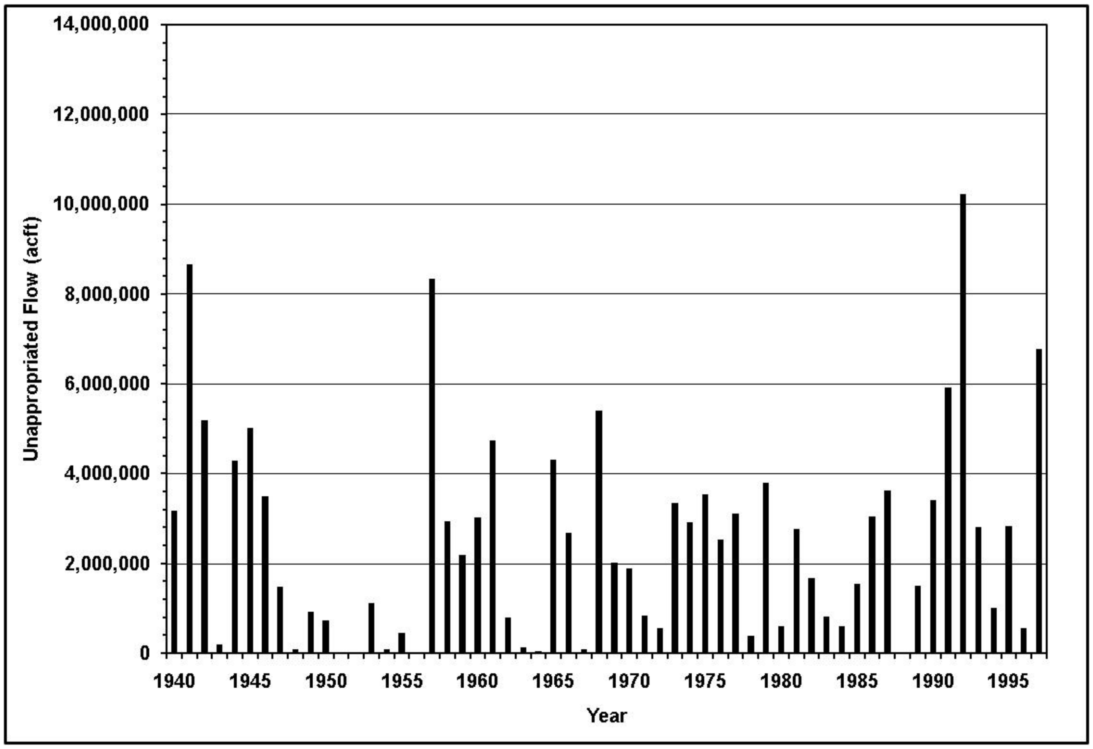

Figure 3.2-7. Estimated Annual Unappropriated Flow at Brazos River near Bryan

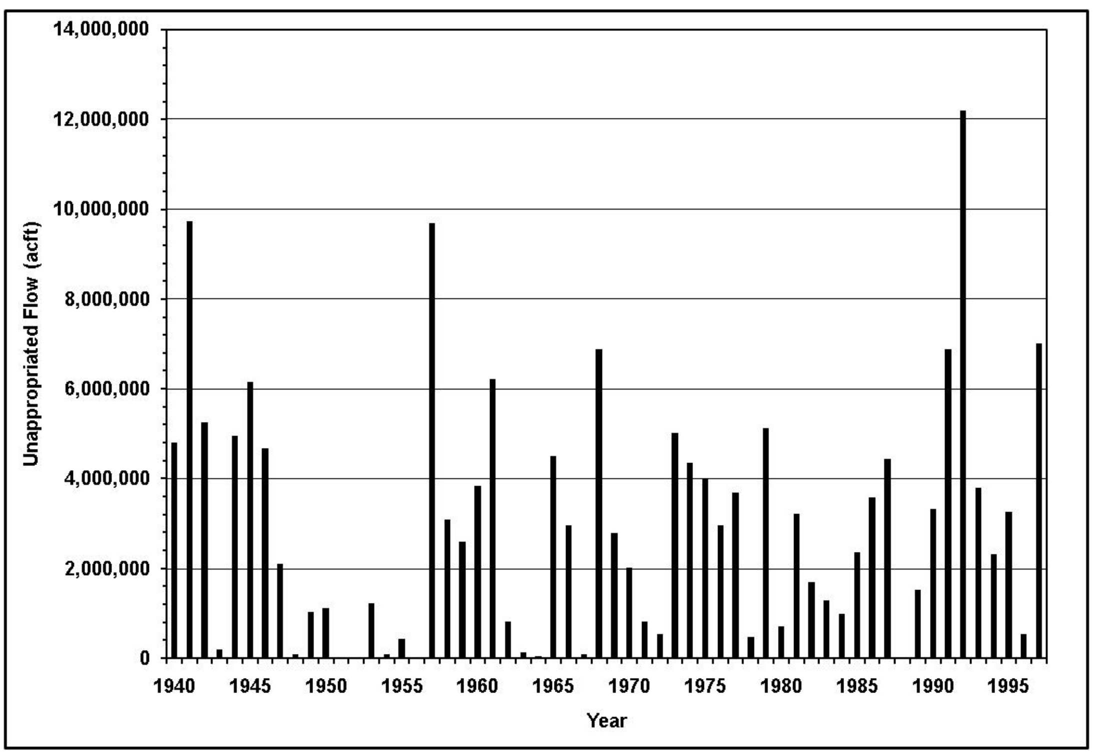

Figure 3.2-8. Estimated Annual Unappropriated Flow at Brazos River near Hempstead

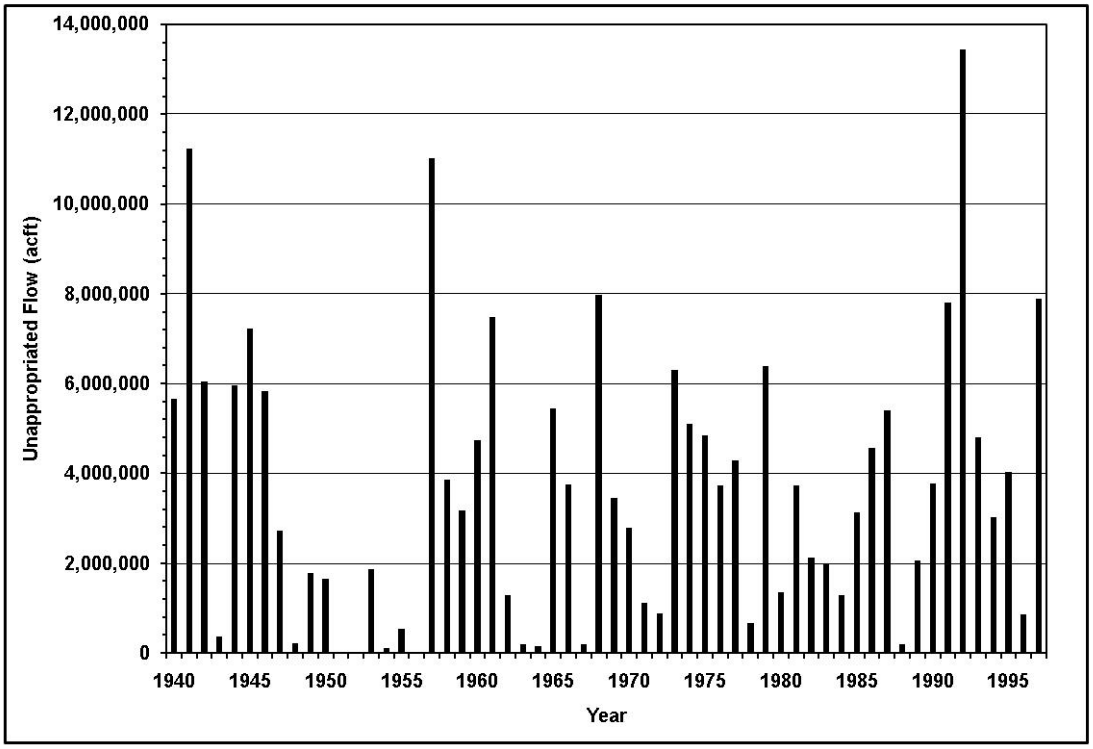

Figure 3.2-9. Estimated Annual Unappropriated Flow at Brazos River at Richmond

the reservoir and meet diversions in 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 nine years, with four 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.

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 very 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 non point source pollution. The TCEQ and USEPA (40 CFR 130.7) have the responsibility to identify water bodies that do not meet, or are not expected to meet, applicable water quality standards for designated uses.[2] These stream segments and lakes are identified in Section 303(d) list as impaired or threatened water bodies.[3] The summary of these segments is contained in Table 3.3-1.[4] The TCEQ has the responsibility to identify and prioritize water bodies that may require a Total Maximum Daily Load (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). Goose Branch in Erath County (and associated tributary) has been identified with a low priority for a TMDL study.

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 aggressively 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 issue in the Brazos River Basin is generally associated with total dissolved solids (TDS), chloride (Cl), and sulfate ($-SO^4$) 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

[2] Texas Commission on Environmental Quality, *TMDL Guidance Document Outline*. http://www.tnrcc.state.tx.us
[3] Texas Commission on Environmental Quality, Status Report: Implementing Total Maximum Daily Loads in Texas. October 2006
[4] Texas Commission on Environmental Quality, *2008 Texas 303(d) List (March 19, 2008)*.

Table 3.3-1.
DRAFT 2004 Texas 303(d) List (May 13, 2005)
Brazos G Regional Water Planning Area

Segment Number	Segment Name	County	Category	Parameter of Concern
1205	Lake Granbury	Hood	5c	Chloride
1206	Brazos River Below Possum Kingdom Lake	Palo Pinto	5b, 5c	Chloride, Impaired macrobenthic community
1208	Brazos River Above Possum Kingdom Lake	Young / Stonewall	5c	Bacteria
1209	Navasota River Below Lake Limestone	Robertson	5a	Bacteria
1209A	Country Club Lake	Brazos	5c	Chronic toxicity in sediment to aquatic organisms; metals in sediment
1209B	Fin Feather Lake	Brazos	5c	Chronic toxicity in sediment to aquatic organisms; arsenic, copper and lead in sediment
1209C	Carters Creek	Brazos	5c	Bacteria
1209D	Country Club Branch	Brazos	5c	Bacteria
1209E	Wickson Creek		5c	Bacterial
1209G	Cedar Creek	Robertson	5c	Bacteria
1209H	Duck Creek	Grimes	5c	Bacteria
1209I	Gibbons Creek	Grimes	5c	Depressed dissolved oxygen; bacteria
1209K	Steele Creek	Limestone	5c	Bacteria
1209L	Burton Creek	Brazos	5c	Bacteria
1210A	Navasota River above Lake Mexia		5c	Bacteria
1211A	Davidson Creek	Burleson	5c	Bacteria
1212	Lake Somerville		5c	Depressed dissolved oxygen; Low and high pH
1212B	East Yegua Creek	Lee / Milam	5c	Bacteria
1213	Little River	Milam / Bell	5c	Bacteria
1214	San Gabriel River	Milam / Williamson	5c, 5a	Chloride, sulfate and bacteria
1217	Lampasas River above Stillhouse Hollow Lake		5c	Bacteria
1218	Nolan Creek South Nolan Creek		5c	Bacteria
1220A	Cowhouse Creek	Bell / Coryell	5c	Bacteria
1221	Leon River below Proctor Lake		5a	Bacteria
1221A	Resley Creek	Comanche	5c	Bacteria
1221B	South Leon River	Comanche	5c	Bacteria
1221C	Pecan Creek		5c	Bacteria
1221F	Walnut Creek	Erath	5c	Bacteria
1222A	Duncan Creek	Comanche	5c	Bacteria

Table 3.3-1 (Concluded)

Segment Number	Segment Name	County	Category	Parameter of Concern
1222B	Rush Copperas Creek	Comanche	5c	Bacteria
1222C	Sabana River	Comanche / Eastland	5c	Bacteria
1222E	Sweetwater Creek	Comanche	5c	Bacteria
1223	Leon River Below Leon Reservoir	Comanche / Eastland	5c	Bacteria
1223A	Armstrong Creek	Erath	5c	Bacteria
1226B	Green Creek	Erath	5c	Bacteria
1226E	Indian Creek	Erath	5c	Bacteria
1226F	Sims Creek	Erath	5c	Bacteria
1226K	Little Duffau Creek	Erath	5c	Bacteria
1227	Nolan River	Hill / Johnson	5b	Chloride, Sulfate and TDS
1229	Paluxy River/North Paluxy River	Somervell / Erath	5c	Chloride, Sulfate and TDS
1232B	Deadman Creek	Jones	5c	Bacteria
1238	Salt Fork Brazos River	Stonewall	5b	Chloride
1241	Double Mountain Fork Brazos River	Stonewall / Kent	5b	Chloride
1241A	North Fork Double Mountain Fork Brazos River		5c	Bacteria
1242D	Thompson Creek		5c	Bacteria
1242I	Campbells Creek		5c	Bacteria
1242J	Deer Creek	Falls	5c	Bacteria
1242K	Mud Creek	Robertson	5a	Bacteria
1242L	Pin Oak Creek	Robertson	5a	Bacteria
1242M	Spring Creek	Robertson	5a	Bacteria
1242N	Tehuacana Creek	McLennan / Hill	5a	Bacteria
1242O	Walnut Creek	Robertson	5c	Bacteria
1242P	Big Creek	Falls	5c	Bacteria
1244	Brushy Creek	Milam / Williamson	5a	Bacteria
1246E	Wasp Creek	McLennan / Coryell	5c	Bacteria
1247A	Willis Creek	Williamson	5c	Bacteria
1248C	Mankins Branch	Williamson	5c	Bacteria
1255	Upper North Bosque River	Erath	5c	Bacteria
1255A	Goose Branch	Erath	5c	Bacteria
1255B	North Fork Upper North Bosque River	Erath	5c	Bacteria
1255C	Scarborough Creek	Erath	5c	Bacteria
1255E	Unnamed tributary of Goose Branch	Erath	5c	Bacteria
1255F	Unnamed tributary of Scarborough Creek	Erath	5c	Bacteria
1255G	Woodhollow Branch	Erath	5c	Bacteria

75 to 85 percent of dissolved salt.[5] 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 -SO^4 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 2060 firm yield of 303,299 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.[5] 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 Plan, the Brazos G RWPG completed a study[6] 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.

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 2009 Basin Highlights Report. A brief summary of these projects is described below.

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

[66] HDR Engineering, 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 3.3-2.
Water Bodies with Concerns for Meeting Public Water Quality Standards in the Brazos G 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	✓	✓	✓	✓	1,500	670	320
1205	Lake Granbury	✓	✓	✓	✓	2,500	1,000	600
1207	Possum Kingdom Lake	✓	✓	✓	✓	3,500	1,200	500
1235	Lake Stamford	✓	✓	✓		2,100	580	400
1237	Lake Sweetwater			✓		730	250	225
1242	Brazos River above Navasota River				✓	1,000	350	200

3.3.3.1 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 Section 4B.18 of this document (Volume II). In evaluating the project for the 2011 Plan, 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 Section 4B.18. 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.

3.3.3.2 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 is currently being developed based on the results of the sampling and source identification and will incorporate Best Management Practices to protect the water quality of the Lake.

3.3.3.3 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.

3.3.3.4 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.

3.3.3.5 Little Brazos River Tributaries Bacteria Assessment

Five tributaries to the Little Brazos River are listed on Texas 303(d) List for bacteria concentrations exceeding the standard for contact recreation. To identify sources of the contamination, eight monitoring sites have been established throughout the watershed to collect flow and stormwater data. The assessment is anticipated to be completed in August 2010.

3.3.3.6 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

Fifteen aquifers underlie parts of the Brazos G Area, including six of the major and ten of the minor aquifers in Texas.[7] The locations of the major and minor aquifers are shown in Section 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 managed available groundwater (MAG), which is based on desired future conditions (DFC), as established by representatives 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.

In the Brazos G Area, an official MAG has been determined by the TWDB in GMA8 for the Brazos River Alluvium, Woodbine, and Edwards (Balcones Fault Zone) Aquifer-Northern Segment. For the other aquifers, flexibility was applied in an attempt to compile the 'best available' estimates of groundwater availability for the 2011 Brazos G Water Plan. In many cases, the GMA representatives had made great progress in establishing a DFC and have made preliminary estimates of the MAG, with assistance from the TWDB. A summary of the selected methods and the affected aquifers is provided in Table 3.4-1. The groundwater management areas (GMA) are shown in Figure 3.4-1.

Table 3.4-2 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 3.4-3 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, and about 52 percent in the eastern area.

[7] Texas Water Development Board, *Water for Texas*, 1997.

Table 3.4-1.
Summary of Methods Used to Estimate Groundwater Availability for the 2011 Plan

Procedure	***Discussion***	***Aquifers***
MAG was officially determined by the TWDB from an adopted DFC by GMA representatives.	This is the procedure required in HB 1763. Only GMA8 has completed the process for some aquifers.	Edwards (Balcones Fault Zone)-Northern Segment, Woodbine, Brazos River Alluvium (GMA8 only)
Preliminary MAG estimates have been made by GMA from adopted DFC. However, the TWDB has not officially made a MAG determination.	GAM Method: Representatives of the GMAs selected several pumping levels by county and by aquifer, and requested the TWDB to make GAM run with these levels of pumping. The GMA representatives deliberated on the level of impacts from each run and agreed on a selected run. The DFCs are set equal to the drawdown for this GAM run.	Trinity
	Non-GAM method: A draft hydrologic method and calculations are pending review and approval by TWDB	Ellenburger-San Saba and Marble Falls
Preliminary MAG estimates have been made by GMA representatives using a TWDB GAM from likely DFCs. However, the GMA representatives have not formally adopted the DFC. Thus, the TWDB has not made an official MAG determination.	Estimates of existing, permitted and likely permitted pumping levels were made by GMA representatives. GMA consultants conducted GAM simulations for review by GMA representatives. From a potential consensus simulation, Brazos G consultants compiled pumping information from the model and conducted a simulation.	Sparta, Queen City and Carrizo-Wilcox
Preliminary MAG estimates were made from 2011 Brazos G GAM (Study 2) for western Nolan and eastern Mitchell Counties.	A GAM was developed for western Nolan and eastern Mitchell Counties and used to evaluate groundwater availability in the vicinity of Sweetwater's Champion Well Field.	Dockum (Nolan County)
2011 groundwater availability estimates were set equal to 2006 Plan estimates.	This is the default estimate if GMA representatives have not reached, or nearly reached, a decision on DFC and performed calculations for a MAG.	Gulf Coast Aquifer, Dockum (Kent and Fisher Counties), Seymour, Edwards-Trinity (Plateau) Other/Undifferentiated Aquifers and Brazos River Alluvium (GMA-12 and -14 only)
2011 groundwater availability calculated from net recharge rate and area of outcrop.	Assumes groundwater availability is equal to the amount of net recharge. Utilizes information from TWDB, GAM, and literature to calculate availability for new or redelineated aquifers not considered in 2006 Plan.	Blaine and Yegua-Jackson

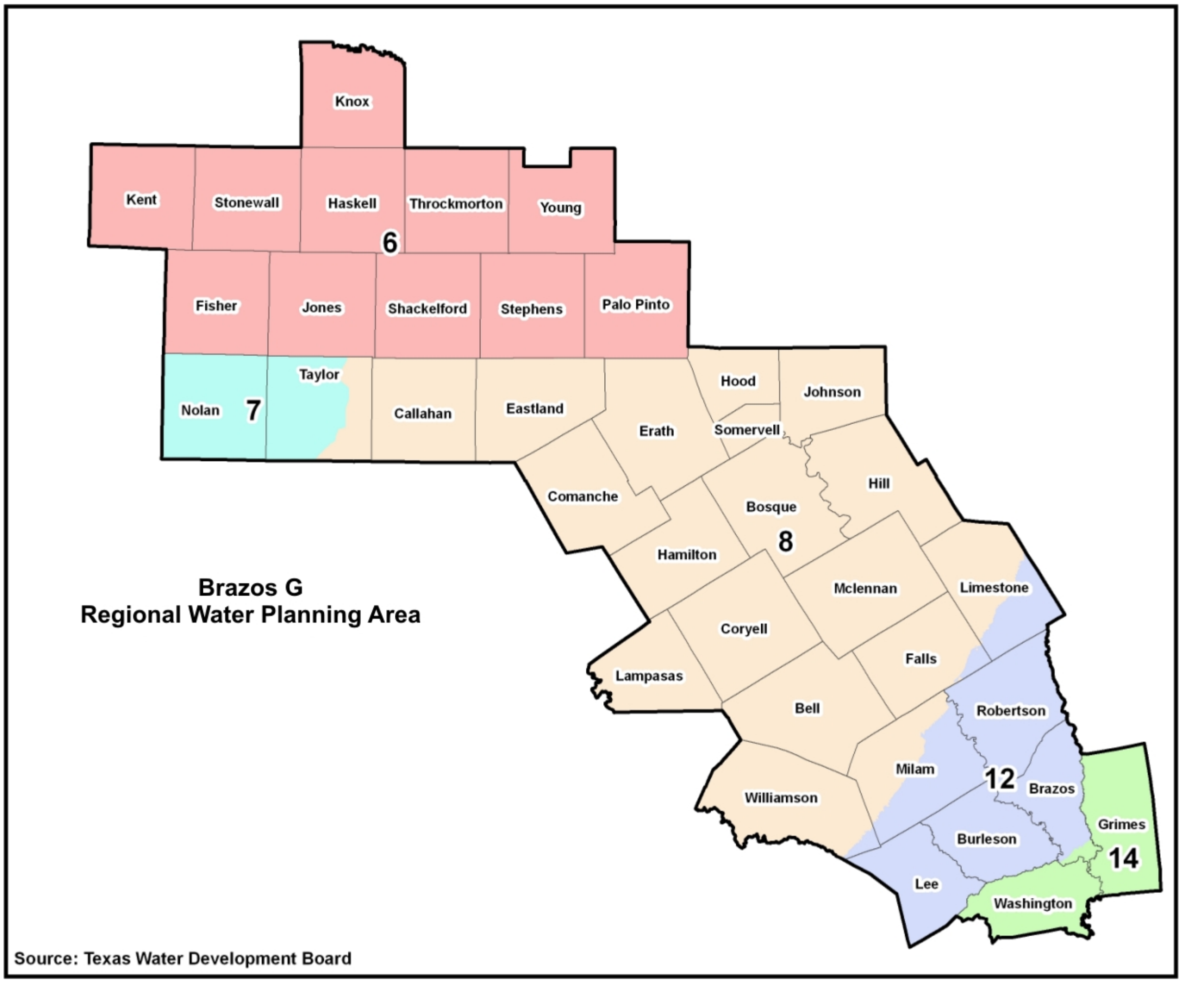

Figure 3.4-1. Groundwater Management Areas

Table 3.4-2.
Groundwater Availability Used in the 2011 Plan

County	Aquifer	Availability (acft/yr)	Source
Bell	Edwards-BFZ (Northern Segment)	6,469	GMA8 GAM Run 08-10mag
	Trinity	7,075	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	13,544	
Bosque	Brazos River Alluvium	830	GMA8 TWDB GTA Aquifer Assessment 07-05mag
	Trinity	5,823	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	6,653	
Brazos	Brazos River Alluvium	12,500	2006 Plan
	Carrizo-Wilcox	57,156	GMA12 Consensus GAM Run-3B
	Gulf Coast	1,177	2006 Plan
	Queen City	531	GMA12 Consensus GAM Run-3B
	Sparta	10,464	GMA12 Consensus GAM Run-3B
	Yegua-Jackson	6,100	Net recharge which is calculated from an estimate of net recharge rate and area of outcrop.
	Subtotal	87,928	
Burleson	Brazos River Alluvium	9,400	2006 Plan
	Carrizo-Wilcox	35,482	GMA12 Consensus GAM Run-3B
	Queen City	293	GMA12 Consensus GAM Run-3B
	Sparta	1,049	GMA12 Consensus GAM Run-3B
	Yegua-Jackson	5,900	Net recharge which is calculated from an estimate of net recharge rate and area of outcrop.
	Subtotal	52,124	
Callahan	Trinity	3,787	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	3,787	
Comanche	Trinity	23,294	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	23,294	
Coryell	Trinity	3,722	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	3,722	
Eastland	Trinity	4,713	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	4,713	
Erath	Trinity	29,536	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	29,536	
Falls	Brazos River Alluvium	16,684	GMA8 TWDB GTA Aquifer Assessment 07-05mag
	Carrizo-Wilcox	910	GMA12 Consensus GAM Run-3B
	Trinity	161	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	17,755	
Fisher	Blaine	3,600	Net recharge which is calculated from estimates of net recharge rate in TWDB Seymour GAM and area of outcrop.
	Dockum	100	2006 Plan
	Seymour	7,000	2006 Plan
	Subtotal:	10,700	

Table 3.4-2 (Continued)

County	Aquifer	Availability (acft/yr)	Source
Grimes	Brazos River Alluvium	1,700	2006 Plan
	Carrizo-Wilcox	5,000	2006 Plan
	Gulf Coast	14,083	2006 Plan
	Queen City	462	2006 Plan
	Sparta	2,044	2006 Plan
	Yegua-Jackson	5,800	Net recharge which is calculated from an estimate of net recharge rate and area of outcrop.
	Subtotal	29,089	
Hamilton	Trinity	2,146	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	2,146	
Haskell	Seymour	20,000	2006 Plan
	Subtotal:	20,000	
Hill	Brazos River Alluvium	632	GMA8 TWDB GTA Aquifer Assessment 07-05mag
	Trinity	3,148	GMA8 GAM Run 08-06 Preliminary determination.
	Woodbine	2,261	GMA8 GAM Run 08-14mag
	Subtotal:	6,041	
Hood	Trinity	11,064	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	11,064	
Johnson	Trinity	12,870	GMA8 GAM Run 08-06. Preliminary determination.
	Woodbine	4,732	GMA8 GAM Run 08-14mag
	Subtotal:	17,602	
Jones	Seymour	8,000	2006 Plan
	Subtotal:	8,000	
Kent	Dockum	100	2006 Plan
	Seymour	5,700	2006 Plan
	Subtotal:	5,800	
Knox	Blaine	700	Net recharge which is calculated from estimates of net recharge rate in TWDB Seymour GAM and area of outcrop.
	Seymour	24,000	2006 Plan
	Subtotal:	24,700	
Lampasas	Ellenburger-San Saba	2,341	Calculations based on GMA8 DFC
	Hickory	ND	Not Determined, Lack of Information
	Marble Falls	2,872	Calculations based on GMA8 DFC
	Trinity	3,146	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	8,359	
Lee	Carrizo-Wilcox	27,533	GMA12 Consensus GAM Run-3B
	Queen City	99	GMA12 Consensus GAM Run-3B
	Sparta	145	GMA12 Consensus GAM Run-3B
	Yegua-Jackson	3,700	Net recharge which is calculated from an estimate of net recharge rate and area of outcrop.
	Subtotal	31,477	

Table 3.4-2 (Continued)

County	Aquifer	Availability (acft/yr)	Source
Limestone	Carrizo-Wilcox	12,162	GMA12 Consensus GAM Run-3B
	Trinity	66	GMA8 GAM Run 08-06. Preliminary determination.
	Woodbine	34	GMA8 GAM Run 08-14mag
	Subtotal:	12,262	
McLennan	Brazos River Alluvium	15,023	GMA8 TWDB GTA Aquifer Assessment 07-05mag
	Trinity	20,689	GMA8 GAM Run 08-06. Preliminary determination.
	Woodbine	5	GMA8 GAM Run 08-14mag
	Subtotal:	35,717	
Milam	Brazos River Alluvium	475	GMA8 TWDB GTA Aquifer Assessment 07-05mag
	Carrizo-Wilcox	20,090	GMA12 Consensus GAM Run-3B
	Queen City	51	GMA12 Consensus GAM Run-3B
	Trinity	321	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	20,937	
Nolan	Blaine	100	Net recharge which is calculated from estimates of net recharge rate in TWDB Seymour GAM and area of outcrop.
	Dockum	5,750	Brazos G (2011) GAM-Study 2
	Edwards-Trinity (Plateau)	1,000	2006 Plan
	Subtotal:	6,850	
Palo Pinto	Trinity	12	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	12	
Robertson	Brazos River Alluvium	6,300	2006 Plan
	Carrizo-Wilcox	46,016	GMA12 Consensus GAM Run-3B
	Queen City	356	GMA12 Consensus GAM Run-3B
	Sparta	172	GMA12 Consensus GAM Run-3B
	Subtotal:	52,844	
Shackelford	Other (Local) Aquifer	809	2006 Plan
	Subtotal:	809	
Somervell	Trinity	2,485	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	2,485	
Stephens	Other (Local) Aquifer	705	2006 Plan
	Subtotal:	705	
Stonewall	Blaine	8,700	Net recharge which is calculated from estimates of net recharge rate in TWDB Seymour GAM and area of outcrop.
	Subtotal		
	Seymour	2,300	2006 Plan
	Subtotal:	11,000	
Taylor	Edwards-Trinity (Plateau)	500	2006 Plan
	Trinity	431	GMA8 GAM Run 08-06. Preliminary determination.
	Subtotal:	931	
Throckmorton	Other (Local) Aquifer	364	2006 Plan
	Subtotal:	364	

Table 3.4-2 (Concluded)

County	Aquifer	Availability (acft/yr)	Source
Washington	Brazos River Alluvium	3,100	2006 Plan
	Gulf Coast	13,036	2006 Plan
	Yegua-Jackson	1,400	Net recharge which is calculated from an estimate of net recharge rate and area of outcrop.
	Subtotal	17,536	
Williamson	Edwards-BFZ (Northern Segment)	3,452	GMA8 GAM Run 08-10mag
	Hickory	ND	Not Determined
	Trinity	1,811	GMA8 GAM Run 08-06. Preliminary determination.
	Other (Local) Aquifer	665	2006 Plan
	Subtotal:	5,928	
Young	Other (Local) Aquifer	1,181	2006 Plan
	Subtotal:	1,181	
Total:		587,595	

Table 3.4-3. Groundwater Availability from the Brazos G Area Aquifers

Aquifer	2011 Groundwater Availability (acft/yr)	Typical Range in Well Yields (gpm)
Western Area		
Blaine	13,100	less than 25
Dockum	5,950	100 to 400
Edwards-Trinity (Plateau)	1,500	5 to 300
Other (Local) Aquifers	2,250	5 to 300
Seymour	67,000	100 to 1,000
Subtotal:	**89,800**	
Central Area		
Brazos River Alluvium	33,169	250 to 500
Edwards-BFZ (Northern Segment)	9,921	200 to 2,000
Ellenburger-San Saba	2,341	Unknown
Hickory	ND	Unknown
Marble Falls	2,872	less than 100
Other (Local) Aquifers	1,474	5 to 300
Trinity	136,300	50 to 500
Woodbine	7,032	50 to 150
Subtotal:	**193,109**	
Southeastern Area		
Brazos River Alluvium	33,475	250 to 500
Carrizo-Wilcox	204,349	100 to 3,000
Gulf Coast	28,296	300 to 800
Queen City	1,792	200 to 500
Sparta	13,874	200 to 600
Yegua-Jackson	22,900	50 to 300
Subtotal:	**304,686**	
Total:	**587,595**	

BFZ – Balcones Fault Zone.
ND indicates not determined.

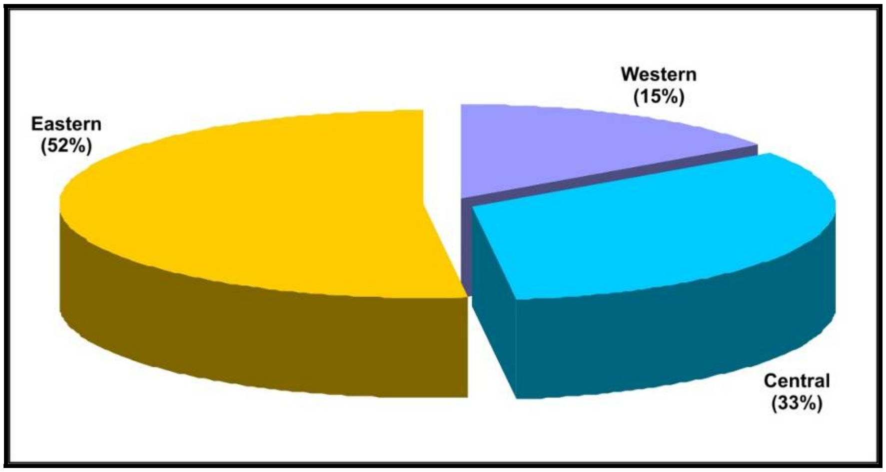

Figure 3.4-2. Distribution of Groundwater by Area

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 89,800 acft/yr. Of the four aquifers, the Seymour Aquifer has about 75 percent of the supplies and is scattered in six counties; however, about two-thirds of the supply is in Knox and Haskell Counties. The Dockum Aquifer exists only on the western fringe and can contribute about 7 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.

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 seven aquifers (Brazos River Alluvium, Edwards-BFZ (Northern Segment), Ellenburger-San Saba, Marble Falls, Trinity, Woodbine, and Other (Local) Aquifers) can provide up to 193,109 acft/yr. Of these aquifers, the Trinity Aquifer is most extensive and has about 72 percent of the supplies (Figure 3.4-6). Although the Trinity Aquifer as a whole can provide 136,300 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.

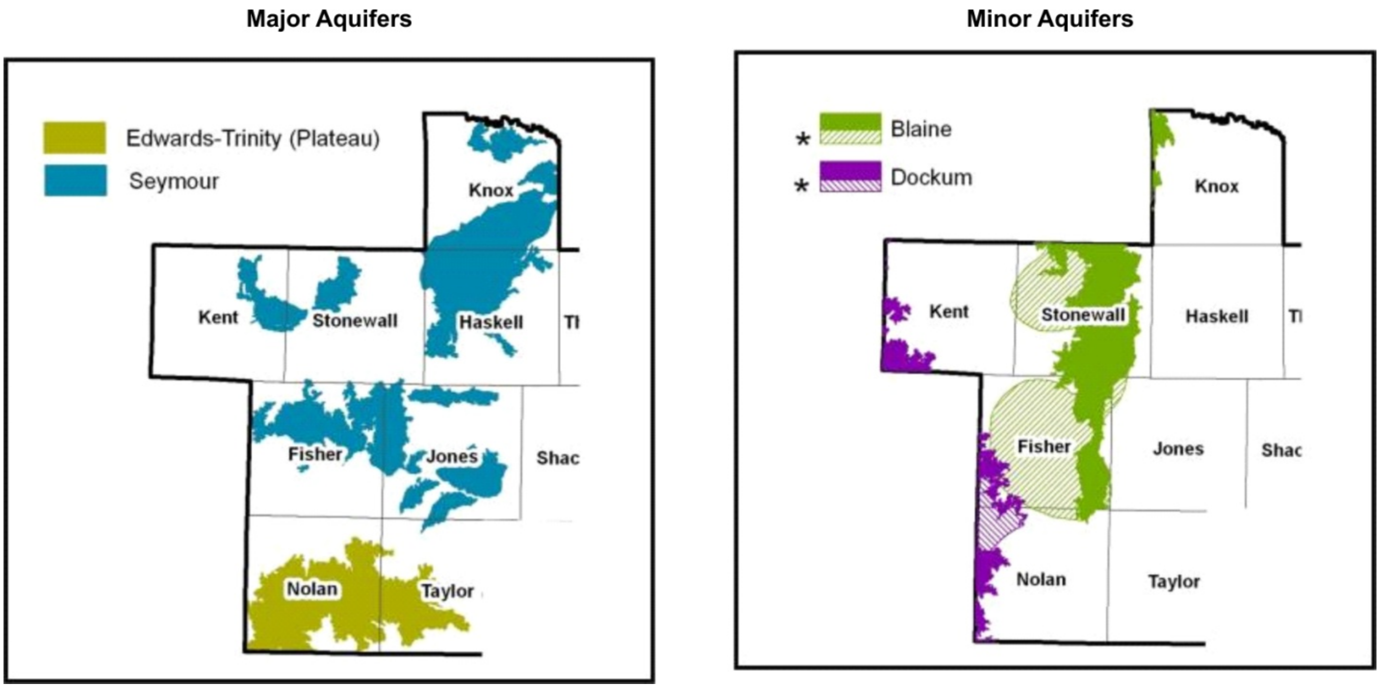

Figure 3.4-3. Major and Minor Aquifers in the Western Area

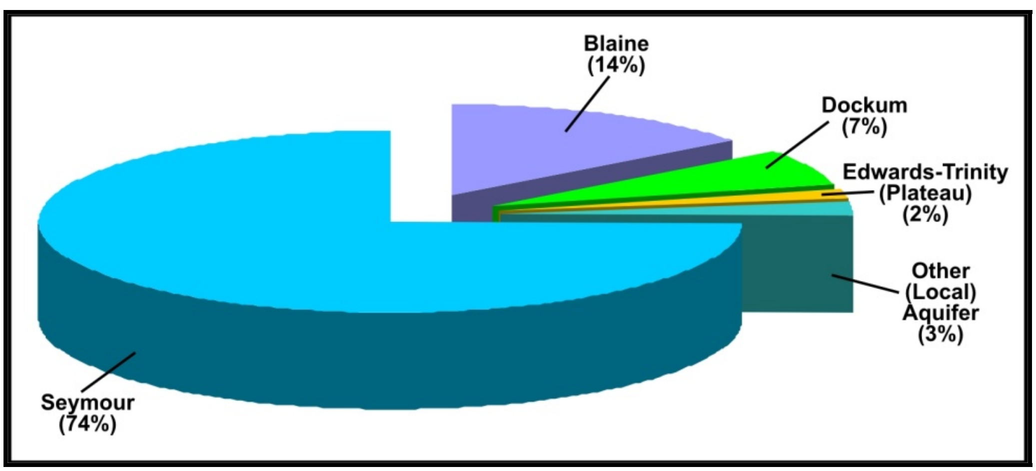

Figure 3.4-4. Groundwater Availability in the Western Area

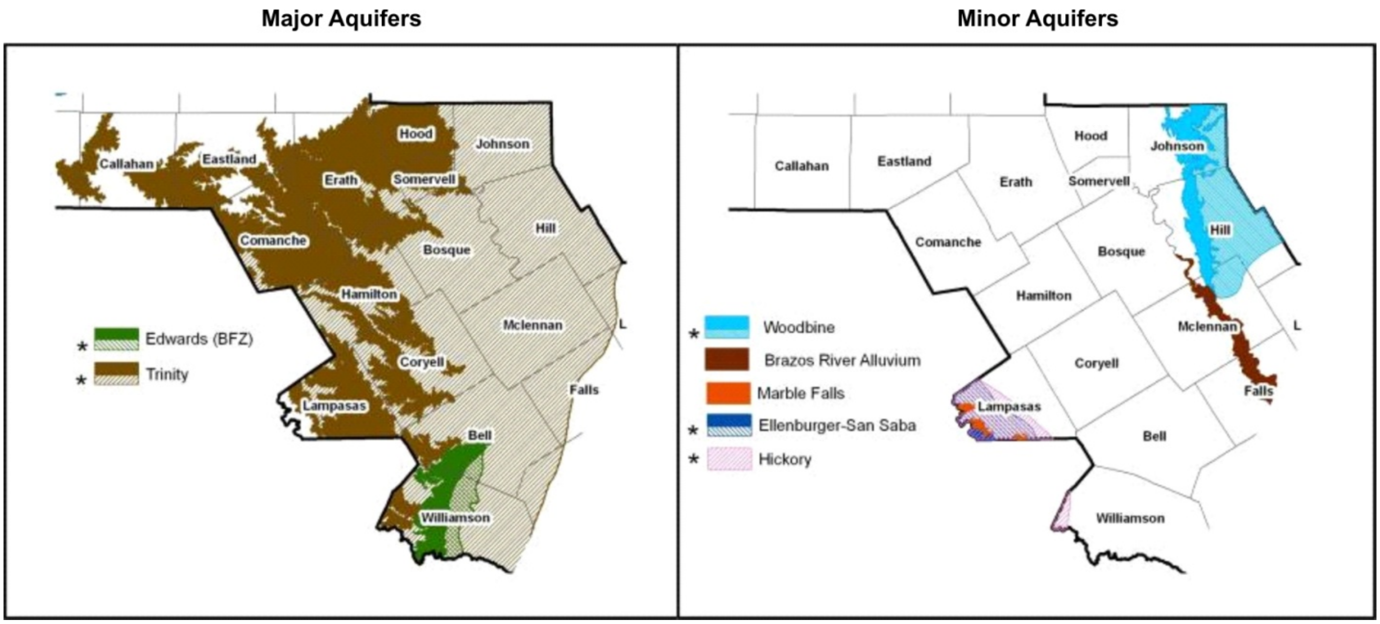

Figure 3.4-5. Major and Minor Aquifers in the Central Area

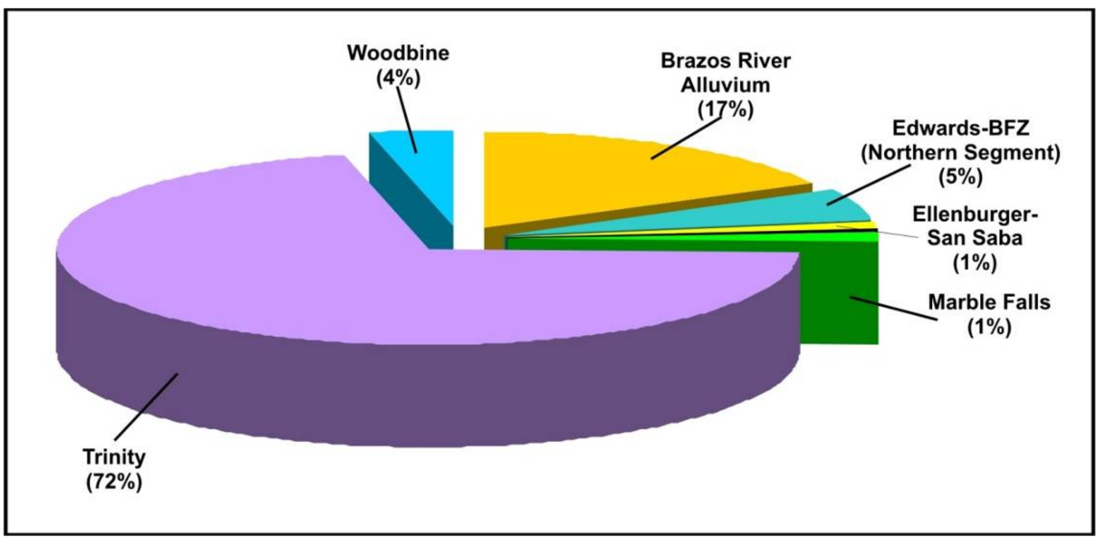

Figure 3.4-6. Groundwater Availability in the Central Area

3.4.4 Eastern Area

Major or minor aquifers exist throughout the eastern area except in the western fringe, as shown in Figures 3.4-7. Together, the six aquifers (Brazos River Alluvium, Carrizo-Wilcox, Gulf Coast, Queen City, Sparta and Yegua-Jackson) can provide up to 304,686 acft/yr. Of these aquifers, the Carrizo-Wilcox Aquifer is most extensive and has about 67 percent of the supplies (Figure 3.4-8). The Brazos River Alluvium has about 11 percent of the supplies.

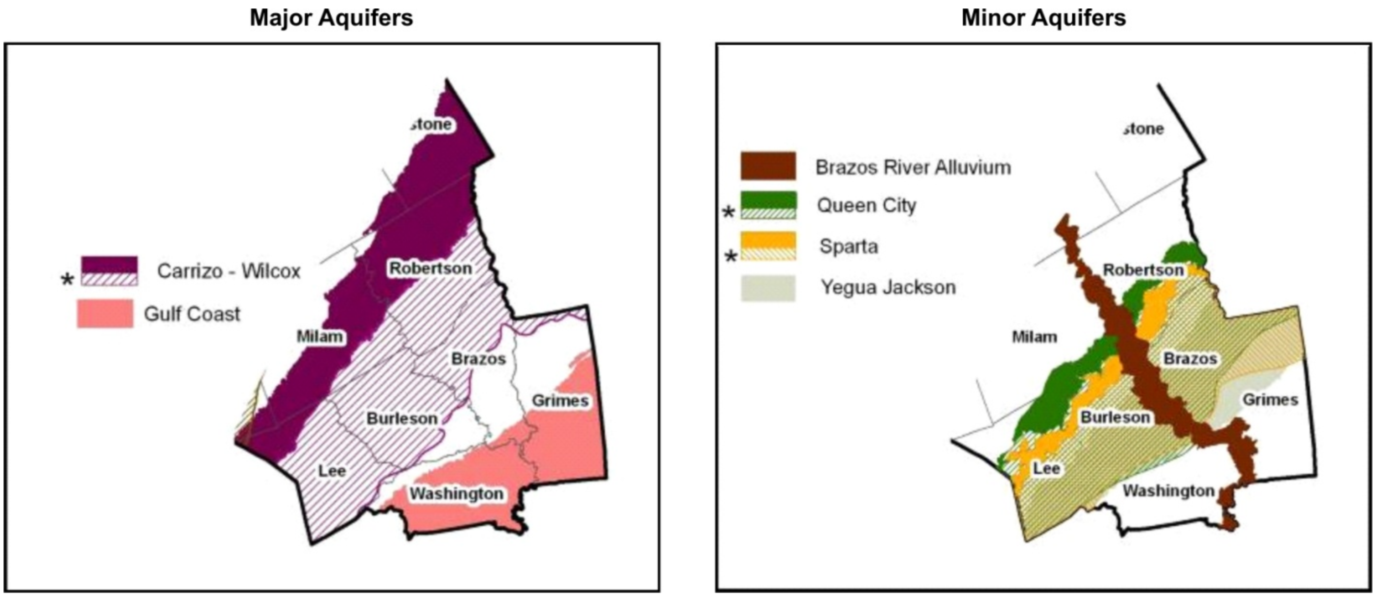

Figure 3.4-7. Major and Minor Aquifers in the Eastern Area

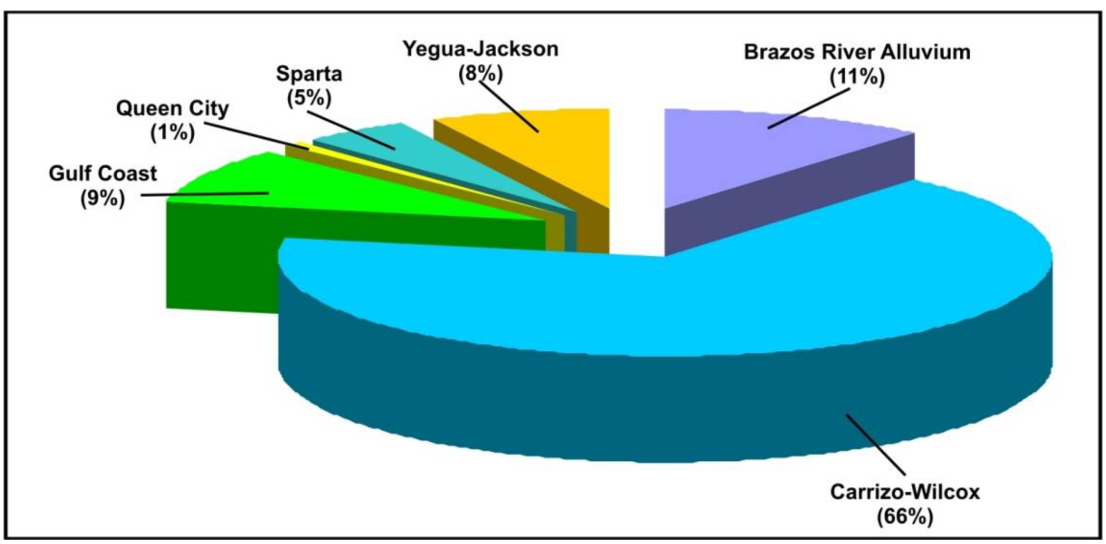

Figure 3.4-8. Groundwater Availability in the Eastern Area

3.5 Supplies from Other Regions

A limited number of entities within the Brazos G Area obtain water from sources 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), Richard 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
Mansfield	Lake Benbrook	C	Meets
Hill County – Other	Navarro Mills Reservoir	C	353
Abilene	Colorado River MWD System	F	6,720[1]
Hubbard	Navarro Mills Reservoir	C	Meets
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
Blockhouse MUD	Highland Lakes System	K	Included in Cedar Park
Wells Branch MUD	Highland Lakes System	K	Meets
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
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.

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Section 4A
Comparison of Water Demands with Water Supplies to Determine Needs

4A.1 Introduction

In this section, the demand projections from Section 2 and the supply projections from Section 3, are brought together to estimate projected water needs in the Brazos G Area through year 2060.

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

4A.1.1 Methods to Estimate Available Water Supplies in the Region

4A.1.1.1 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 reservoirs, and 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 from 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 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.

4A.1.1.2 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 3-14. 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 supplies from each aquifer were estimated as follows:
  a. For cities using groundwater sources, 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 availability, 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 2000 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 total availability, supply is prorated downward for every entity using that particular source.
- 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 2000 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 total availability, supply is prorated downwards for every entity using that particular source.
- Steam-electric supply from groundwater sources is associated with aquifers underlying the river basin portion of the county. The steam-electric supply is

generally calculated as 130 percent of the year 2000 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 total availability, supply is prorated downward for every entity using that particular source.

- 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 total availability, supply is prorated downward for every entity using that particular source.
- 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 total availability, 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. The demands and supplies for College Station as a WUG include Texas A&M University, by TWDB definition. However, Texas A&M utilizes its own supply source separate from the City. Recent improvements to the university's supply wells and effective water conservation efforts have increased supplies in excess of the university's demands. This surplus should not be considered as excess supply available to the City because the two utilities are interconnected only for emergency purposes. For College Station as a WUG, the supply from Texas A&M University wells was set equal to the university's projected demands (supplied by Texas A&M), in order to more accurately define needs for College Station.

4A.1.1.3 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 new 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 2011 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 Section 4A.3 and in the WUG supply-demand analyses presented in Appendix C.

4A.1.1.4 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 groundwater availability estimates adopted for use allow for 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 Managed Available Groundwater (MAG) 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 2060 to WUGs in five counties (Bosque, Hood, Johnson, McLennan and Williamson). Constraints on groundwater supplies are shown in the tables in Appendix C.

4A.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 for that water user group. 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.

4A.2.1 Projected Municipal Shortages

Water shortages are projected for 76 municipal WUGs, which are listed in Table 4A-1, along with the projected year 2030 and 2060 shortages, and the approximate decade that shortages are expected to begin. Multi-county WUGs are indicated with (P) in Table 4A-1; however total balances are described in Section 4C only in the primary county. Twenty-eight 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 2000. The County-Other category is projected to be water short in 6 counties: Eastland, Haskell, Jones, Knox, Throckmorton and Williamson.

Table 4A-1.
Municipal WUGs with Projected Water Shortages

County	Shortages Begin	Projected Shortages (acft/yr) Year 2030	Year 2060
Bell County			
Bartlett (P)	2010	(80)	(94)
Bell Milam Falls WSC (P)	2020	(47)	(84)
Jarrell-Schwertner WSC (P)	2010	(70)	(140)
Little River - Academy	2010	(18)	(27)
Morgans Point Resort	2010	(272)	(332)
Temple	2050	1,929	(3,577)
Bosque County			
Cross Country WSC (P)	2040	-	(52)
Valley Mills (P)	2030	(2)	(12)
Brazos County			
Bryan	2050	-	(809)
College Station	2030	(68)	(5,631)
Wickson Creek SUD (P)	2050	-	(251)
Burleson County			
Southwest Milam WSC (P)	2020	(10)	(22)
Callahan County			
Baird	2010	(241)	(232)
Potosi WSC (P)	2010	(1)	(0)
Comanche County			
None			
Coryell County			
Gatesville	2030	(72)	(1,450)
Kempner WSC (P)	2050	-	(812)
Eastland County			
Eastland County-Other	2010	(184)	(81)
Rising Star	2010	(9)	2
Erath County			
None			
Falls County			
Bell-Milam Falls WSC (P)	2010	(120)	(246)
Marlin	2010	(2,039)	(2,276)
West Brazos WSC (P)	2010	(140)	(241)
Fisher County			
None			
Grimes County			
Wickson Creek SUD (P)	2010	(760)	(1,112)

Table 4A-1 (Continued)

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	Year 2060
Hamilton County			
None			
Haskell County			
Haskell County-Other	2010	(2)	-
Haskell	2010	(506)	(472)
Hill County			
Files Valley WSC	2050	-	(150)
White Bluff Community WS	2010	(235)	(557)
Woodrow-Osceola WSC	2010	(81)	(116)
Hood County			
Granbury	2010	(3,109)	(5,577)
Lipan	2030	(94)	(683)
Oak Trail Shores Subdivision	2010	(345)	(333)
Tolar	2030	(18)	(147)
Johnson County			
Alvarado	2010	(300)	(504)
Bethany WSC	2030	(73)	(244)
Bethesda WSC	2030	(502)	(3,660)
Cleburne	2050	-	(1,954)
Godley	2010	(174)	(353)
Johnson County SUD (P)	2020	(4,841)	(16,704)
Keene	2060	-	(97)
Parker WSC (P)	2050	-	(124)
Jones County			
Abilene (P)	2020	(107)	(1)
Jones County-Other	2010	(46)	(29)
Stamford (P)	2010	(2,750)	(2,684)
Kent County			
Jayton	2010	(95)	(57)
Knox County			
Knox County-Other	2010	(9)	-
Knox City	2010	(220)	(216)
Munday	2010	(255)	(250)
Lampasas County			
None			

Table 4A-1 (Continued)

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	**Year 2060**
Lee County			
Aqua WSC	2020	(86)	(179)
Lee County WSC (P)	2010	(383)	(595)
Southwest Milam WSC (P)	2020	(11)	(23)
Limestone County			
Bistone MWSD	2010	(2,870)	(3,539)
Groesbeck	2050	-	(109)
Kosse	2010	(74)	(74)
McLennan County			
Chalk Bluff WSC	2040	-	(190)
Cross Country WSC (P)	2040	-	(245)
Hallsburg	2010	(21)	(45)
Lacy-Lakeview	2040	-	(357)
Mart	2010	(224)	(272)
North Bosque WSC	2040	-	(199)
Riesel	2040	(14)	(31)
Robinson	2060	-	(112)
West Brazos WSC (P)	2010	(82)	(131)
Western Hills WS	2040	-	(163)
Milam County			
Bell-Milam Falls WSC (P)	2010	(78)	(109)
Southwest Milam WSC (P)	2010	(407)	(508)
Nolan County			
Sweetwater	2010	(3,435)	(3,117)
Palo Pinto County			
Mineral Wells (P)	2020	(1,583)	(2,565)
Strawn	2020	(7)	(23)
Robertson County			
None			
Shackelford County			
None			
Somerville County			
Glen Rose	2030	(26)	(77)
Stephens County			
None			
Stonewall County			
None			
Taylor County			
ABILENE (P)	2010	(19,048)	(17,811)
MERKEL	2010	(116)	(83)

Table 4A-1 (Concluded)

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	Year 2060
Potosi WSC (P)	2010	(119)	(84)
Steamboat Mountain WSC	2010	(34)	(4)
Throckmorton County			
Throckmorton County-Other	2010	(14)	-
Throckmorton	2010	(9)	-
Washington County			
None			
Williamson County			
Aqua WSC (P)	2020	(27)	(85)
Bartlett (P)	2010	(56)	(85)
Bell-Milam Falls WSC (P)	2010	(35)	(94)
Blockhouse MUD	2030	(418)	(2,058)
Brushy Creek MUD	2020	(478)	(478)
Cedar Park	2010	(6,100)	(10,156)
Chisholm Trail SUD (P)	2050	-	(3,992)
Williamson County-Other	2040	-	(3,677)
Florence	2010	(161)	(344)
Georgetown	2030	(763)	(16,082)
Jarrell	2010	(169)	(164)
Jarrell-Schwertner WSC (P)	2020	(372)	(1,359)
Jonah Water SUD	2010	(1)	(1,575)
Leander	2030	(719)	(7,039)
Liberty Hill	2010	(863)	(1,797)
Round Rock	2010	(22,273)	(60,139)
Southwest Milam WSC (P)	2020	(105)	(357)
Thrall	2010	(185)	(293)
Weir	2010	(288)	(568)
Williamson-Travis County MUD #1	2020	(784)	(2,267)
Young County			
None			
(P) Indicates WUG is in multiple counties.			

4A.2.2 Projected Manufacturing Shortages

Table 4A-2 lists the counties projected to have shortages in the Manufacturing Use category, projected year 2030 and 2060 shortages, and the approximate decade shortages are projected to begin. Five of the 37 counties in the Brazos G Area are projected to have manufacturing shortages, including Johnson, Lampasas, Nolan, Limestone, and Williamson Counties.

Table 4A-2.
Counties with Projected Water Shortages
for Manufacturing Use

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	Year 2060
Johnson County	2010	(2,141)	(3,232)
Lampasas County	2010	(135)	(169)
Limestone County	2010	(39)	(69)
Nolan County	2060	-	(64)
Williamson County	2010	(1,785)	(2,521)

4A.2.3 Projected Steam-Electric Shortages

Table 4A-3 lists the nine counties projected to have shortages in the Steam-Electric Use category, projected year 2030 and 2060 shortages, and the approximate decade shortages are projected begin.

Table 4A-3.
Counties with Projected Water Shortages
for Steam-Electric Use

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	Year 2060
Bell County	2020	(4,296)	(7,102)
Bosque County	2030	(735)	(5,461)
Grimes County	2020	(16,699)	(23,199)
Johnson County	2010	(5,656)	(5,656)
Limestone County	2040	-	(17,576)
Milam County	2050	-	(2,000)
Nolan County	2010	(20,000)	(20,000)
Robertson County	2040	-	(16,485)
Somervell County	2010	(35,505)	(35,392)

4A.2.4 Projected Mining Shortages

Table 4A-4 lists the four counties projected to have shortages in the Mining Use category, projected year 2030 and 2060 shortages, and the approximate decade shortages are projected to begin. Shortages are projected for Milam, Nolan, Stephens and Williamson Counties. Mining water use in Williamson County is primarily associated with dewatering for quarry operations.

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

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	Year 2060
Milam County	2010	(70)	-
Nolan County	2010	(108)	(108)
Stephens County	2010	(8,473)	(9,253)
Williamson County	2010	(2,312)	(2,797)

4A.2.5 Projected Irrigation Shortages

Table 4A-5 lists the six counties projected to have shortages in the Irrigation Use category, projected year 2030 and 2060 shortages, and the approximate decade shortages are projected to begin.

Table 4A-5.
Counties with Projected Water Shortages for Irrigation Use

County	Shortages Begin	Projected Shortages (acft/yr)	
		Year 2030	Year 2060
Eastland County	2010	(9,385)	(9,418)
Haskell County	2010	(26,223)	(22,215)
Knox County	2010	(13,267)	(10,389)
Nolan County	2010	(1,465)	(1,091)
Shackelford County	2010	(93)	(78)
Throckmorton County	2010	(3,988)	(3,988)

4A.2.6 Projected Livestock Shortages

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

4A.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,
- Bluebonnet WSC,
- Central Texas WSC,
- Upper Leon Municipal Water District,
- Eastland County Water Supply District,
- Palo Pinto County Municipal Water District No. 1,
- West Central Texas Municipal Water District,
- North Central Texas Municipal Water Authority,
- City of Abilene,
- Bistone MWSD,
- City of Cedar Park,
- City of Round Rock,
- City of Stamford,
- City of Sweetwater,
- City of Temple,
- City of Waco, and
- City of Bryan.

In addition, to these WWPs, there are other WWPs that provide water to the Brazos G Area. These include the Lower Colorado River Authority (Region K), Colorado Municipal Water District (Region F), and the Trinity River Authority (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.

4A.3.1 Wholesale Water Provider Summary Tables

Summaries for each WWP, including a brief description, contracts for water sales, and supplies are provided in Tables 4A-6 through 4A-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.

4A.4 Water Supplied to Meet Demands Not in Region 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 4A-6 through Table 4A-24). Supplies have been coordinated with adjacent regions.

4A.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 I.

Table 4A-6.
Wholesale Water Provider Summary
Brazos River Authority

Name: **Brazos River Authority**

Description: 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 in the region: Lake Granbury, Possum Kingdom Lake, and Lake Limestone. BRA also contracts for conservation storage space in the nine U.S. Army Corps of Engineers reservoirs in the region: Lakes Waco, Proctor, Belton, Stillhouse Hollow, Georgetown, Granger, Somerville, Whitney, and Aquilla. The total permitted capacity of these twelve reservoirs in the BRA system is approximately 2.3 million acft. BRA holds rights for diversion in the region totaling more than 660,000 acft, and contracts to supply water to municipal, industrial and agricultural water customers in the BGRWPA and other regions. 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. 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 below 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.

Projected Demands:

Major Long-Term Water Contracts/ Demands from Recommended Strategies *(contracts as of August 2009)*	***Year (acft/yr)***					
	2010	***2020***	***2030***	***2040***	***2050***	***2060***
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)	250,140	249,747	249,381	249,110	248,788	248,446
Existing Contracts (Region K)	830	1,223	1,589	1,860	2,182	2,524
New Demands (Brazos G)	1,250	2,896	3,525	3,901	40,625	41,705
New Demands (Region K)	-	-	-	-	-	-
Total Demands Little River System	252,220	253,866	254,495	254,871	291,595	292,675
Main Stem/Lower Basin						
Existing Contracts (Brazos G)	259,472	259,472	259,472	259,472	259,472	259,472
Existing Contracts (Region C)	-	-	-	-	-	-
Existing Contracts (Region H)	153,693	153,693	153,693	153,693	153,693	153,693
New Demands (Brazos G)	77,020	77,020	77,020	79,520	79,520	79,677
New Demands (Region C)	-	-	-	-	-	-
New Demands (Region H)	-	-	30,000	30,000	211,000	211,000
Total Demands Main Stem/Lower Basin	490,185	520,185	520,185	703,685	703,685	703,842
Total Demand (Brazos G)	599,285	600,538	600,801	603,406	639,808	640,703
Total Demand (Region C)	-	-	-	-	-	-
Total Demand (Region K)	830	1,223	1,589	1,860	2,182	2,524
Total Demand (Region H)	153,693	183,693	183,693	364,693	364,693	364,693
Projected Total Demand	753,808	785,454	786,083	969,959	1,006,683	1,007,920

[1] BRA supplies from Lake Aquilla to Region C are included in Existing Contracts (Brazos G).

Table 4A-6 (Concluded)

Name: **Brazos River Authority**

Supplies (reservoir firm yield):

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Lake Aquilla System	13,746	12,895	12,044	11,192	10,341	9,490
Little River System	215,739	215,526	215,313	215,099	214,886	214,673
Main Stem/Lower Basin System	420,992	416,977	412,962	408,946	404,931	400,916
Total Supply	650,477	645,397	640,318	635,238	630,159	625,079

Projected Balances:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Lake Aquilla System	2,343	1,492	641	(211)	(1,062)	(1,913)
Little River System	(36,481)	(38,340)	(39,182)	(39,772)	(76,709)	(78,002)
Main Stem/Lower Basin System	(69,193)	(103,208)	(107,223)	(294,739)	(298,754)	(302,926)
Total Balance/(Shortage)	(103,331)	(140,056)	(145,764)	(334,722)	(376,525)	(382,841)

Table 4A-7.
Wholesale Water Provider Summary
Aquilla Water Supply District

Name: **Aquilla Water Supply District**

Description: 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 six wholesale customers. The City of Hillsboro is the district's largest customer, and utilized 3,889 acft in 2000. Total sales for Aquilla Water Supply District in 2000 were 4,844 acft.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Brandon-Irene WSC	280	280	280	280	280	280
Chatt WSC (Hill C-O)	84	84	84	84	84	84
Files Valley WSC	1,125	1,125	1,125	1,125	1,125	1,125
Hill County WSC (Hill C-O)	336	336	336	336	336	336
Hillsboro	4,200	4,200	4,200	4,200	4,200	4,200
Menlow WSC (Hill C-O)	45	45	45	45	45	45
Total Demand	6,070	6,070	6,070	6,070	6,070	6,070

Supply:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Lake Aquilla (BRA Contract)	5,953	5,953	5,953	5,695	5,325	4,954

Projected Balance:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Balance/(Shortage)	(117)	(117)	(117)	(375)	(745)	(1,116)

Table 4A-8.
Wholesale Water Provider Summary
Bell County WCID No. 1

Name: Bell County Water Control and Improvement District No.1

Description: 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. The District also treats wastewater at three regional WWTPs totaling 30 MGD capacity. The District is currently implementing plans to reuse effluent from these plants.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Fresh Water Demands						
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	740	740	740	740	740	740
Bell County-Other	1,000	1,000	1,000	1,000	1,000	1,000
Total Fresh Water Demands	62,509	62,509	62,509	62,509	62,509	62,509
Reuse Water Demands						
City of Harker Heights (Recommended Strategy)	185	185	185	185	185	185
City of Killeen (Recommended Strategy)	2,488	2,488	2,488	2,488	2,488	2,488
Total Reuse Water Demands	2,673	2,673	2,673	2,673	2,673	2,673

Supply:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Fresh Water Supplies						
Lake Belton (BRA Contract)	53,428	53,428	53,428	53,428	53,428	53,428
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)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Fresh Water Balance/(Shortage)	(9,081)	(9,081)	(9,081)	(9,081)	(9,081)	(9,081)
Reuse Water Balance/(Shortage) [1]	16,591	18,059	19,526	20,994	22,461	23,929

1 – The District has plans to develop a significant portion of this volume to meet future reuse demands (see Table 4.B.3-65). However, plans to meet those future demands have not yet been developed as recommended water management strategies beyond what is identified for the cities of Killeen and Harker Heights.

Table 4A-9. Wholesale Water Provider Summary Bluebonnet Water Supply Corporation

Name: **Bluebonnet Water Supply Corporation**

Description: 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 nine entities in the BGRWPA. The largest customer is the City of McGregor, which utilized 943 acft in 2000. Wholesale sales in year 2000 totaled 2,848 acft.

Projected Demands:

Major Water Contract Holders	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
City of Bruceville-Eddy	827	964	1,081	1,200	1,275	1,389
Elm Creek WSC	420	502	571	632	671	723
City of McGregor	933	923	913	902	894	899
Moffat WSC	402	430	457	468	477	488
City of Moody	202	203	203	204	206	212
Pendleton WSC	250	265	273	278	282	287
Spring Valley WSC (McLennan C-O)	250	298	331	336	331	331
City of Woodway	110	110	110	110	110	110
Total Demand	3,394	3,695	3,939	4,130	4,246	4,439

Supply:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Lake Belton (BRA Contract)	7,037	7,037	7,037	7,037	7,037	7,037

Projected Balance:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Balance/(Shortage)	3,643	3,342	3,098	2,907	2,791	2,598

Table 4A-10.
Wholesale Water Provider Summary
Central Texas Water Supply Corporation

Name: **Central Texas Water Supply Corporation**

Description: The Central Texas Water Supply Corporation (WSC) provides treated water to a number of water supply corporations and cities in Bell, Williamson, and Lampasas Counties. The Central Texas WSC obtains raw water under contracts with the Brazos River Authority (BRA) from Lake Stillhouse Hollow. The total contracted raw water supply is 13,795 acft/yr, of which a portion is provided through four separate three-party raw water contracts (BRA, Central Texas WSC, and "third party") with the third parties being Belton, Lampasas, Kempner WSC, and Rosebud. Lampasas and Kempner WSC have contracted for additional raw supply directly from BRA, which is not shown in this table.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Armstrong WSC (Bell C-O)	92	92	92	92	92	92
Bell County WCID No. 5 (Bell C-O)	37	37	37	37	37	37
Bell-Milam-Falls WSC	446	446	446	446	446	446
City of Belton	100	100	100	100	100	100
Dog Ridge WSC	671	671	671	671	671	671
East Bell County WSC	341	341	341	341	341	341
City of Holland	258	258	258	258	258	258
Kempner WSC	2,000	2,000	2,000	2,000	2,000	2,000
Little Elm Valley WSC (Milam C-O)	147	147	147	147	147	147
City of Lott	184	184	184	184	184	184
City of Lampasas	2,000	2,000	2,000	2,000	2,000	2,000
City of Rodgers	368	368	368	368	368	368
City of Rosebud	500	500	500	500	500	500
Town of Buckholts-Water Dept. (Milam C-O)	174	174	174	174	174	174
Town of Oenaville and Belfalls (Bell C-O)	57	57	57	57	57	57
West Bell County WSC	921	921	921	921	921	921
Westphalia WSC (Falls C-O)	45	45	45	45	45	45
Bell-Milam-Falls WSC (Recommended Strategy)	100	204	334	438	512	600
Kempner WSC (Recommended Strategy)						
Total Demand	8,441	8,545	8,675	8,779	8,853	8,941

Supply:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Lake Stillhouse Hollow (BRA Contract)	11,695	11,695	11,695	11,695	11,695	11,695

Projected Balance:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Balance/(Shortage)	3,254	3,150	3,020	2,916	2,842	2,754

Table 4A-11.
Wholesale Water Provider Summary
Upper Leon Municipal Water District

Name: **Upper Leon Municipal Water District**

Description: 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. Total 2000 sales were 2,445 acft.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
City of Comanche	634	632	622	605	587	568
City of De Leon	280	280	274	265	256	248
City of Dublin	485	516	544	576	682	753
City of Gorman	137	134	127	120	113	108
City of Hamilton	2,000	2,000	2,000	2,000	2,000	2,000
City of Stephenville	1,862	1,862	1,862	1,862	1,862	1,862
Total Demand	5,398	5,424	5,429	5,428	5,500	5,539

Supply:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Lake Proctor (BRA Contract)	6,029	6,029	6,029	6,029	6,029	6,029

Projected Balance:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Balance/(Shortage)	631	605	600	601	529	490

Table 4A-12. Wholesale Water Provider Summary Eastland County Water Supply District

Name: **Eastland County Water Supply District**

Description: 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. Total water sales in 2000 were 1,762 acft.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
City of Eastland	1,791	1,791	1,791	1,791	1,791	1,791
City of Ranger	710	710	710	710	710	710
Total Demand	2,501	2,501	2,501	2,501	2,501	2,501

Supplies:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Run-of-the-River Right	225	225	225	225	225	225
Lake Leon	5,938	5,925	5,913	5,900	5,875	5,875
Total Supply	6,163	6,150	6,138	6,125	6,100	6,100

Projected Balance:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Balance/(Shortage)	3,662	3,649	3,637	3,624	3,599	3,599

Table 4A-13.
Wholesale Water Provider Summary
Palo Pinto County Municipal Water District No. 1

Name: **Palo Pinto County Municipal Water District No. 1**

Description: 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. 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. Wholesale municipal sales totaled 4,616 acft in 2000 and steam electric power sales were 1,378 acft.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders*	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
City of Mineral Wells[1]	3,653	3,802	3,928	4,008	4,151	4,337
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)	228	228	228	228	228	228
North Rural WSC (Palo Pinto C-O)	368	368	368	368	368	368
Lake Palo Pinto Area WSC (Palo Pinto C-O)	250	250	250	250	250	250
Palo Pinto County Steam-Electric	1,000	4,000	4,000	4,000	4,000	4,000
Parker County SUD (Region C)	407	407	407	407	407	407
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
Parker County Mining (Region C)	2,000	2,000	2,000	2,000	2,000	2,000
Total Demand	9,196	12,345	12,471	12,551	12,694	12,880

1 Includes municipal supply to portion of Mineral Wells located in Region C.
* Volumes represent the greater of the 2008 actual use or the contract amounts

Supply:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Lake Palo Pinto	8,158	7,717	7,275	6,833	6,392	5,950

Projected Balance:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Balance/(Shortage)	(1,038)	(4,628)	(5,196)	(5,718)	(6,302)	(6,930)

Table 4A-14.
Wholesale Water Provider Summary
West Central Texas Municipal Water District

Name: **West Central Texas Municipal Water District**

Description: The West Central Texas Municipal Water District (MWD) holds water rights 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 2011 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 16.54 percent (~10,900 acft/yr)of the yield in O.H. Ivie Reservoir 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:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
City of Abilene	20,587	20,514	20,441	20,369	20,296	20,223
City of Albany	2,231	2,223	2,216	2,208	2,200	2,192
City of Anson	2,443	2,434	2,426	2,417	2,408	2,400
City of Breckenridge	2,948	2,937	2,927	2,917	2,906	2,896
Total Demand	28,209	28,108	28,010	27,911	27,810	27,711

Supply:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Hubbard Creek Reservoir	27,708	27,640	27,573	27,505	27,438	27,370

Projected Balance:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Balance/(Shortage)	(501)	(468)	(437)	(406)	(373)	(341)

Table 4A-15.
Wholesale Water Provider Summary
North Central Texas Municipal Water Authority

Name: **North Central Texas Municipal Water Authority**

Description: North Central Texas Municipal Water Authority supplies treated water to entities in Knox, Haskell and Stonewall Counties. The authority has water rights to divert 5,000 acft from Millers Creek Reservoir for municipal, industrial, and mining purposes. Wholesale water sales totaled 1,410 acft in 2000.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
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)	55	55	55	55	55	55
City of Haskell	558	558	558	558	558	558
City of Knox City	228	228	228	228	228	228
City of Munday	235	235	235	235	235	235
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
Rhineland WSC (Haskell C-O)	37	37	37	37	37	37
Paint Creek WSC (Haskell C-O)	74	74	74	74	74	74
Baylor WSC (Region B) (Recommended)	250	250	250	250	250	250
Total Demand	1,649	1,649	1,649	1,649	1,649	1,649

Supply:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Millers Creek Reservoir	50	40	30	20	10	0

Projected Balance:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Balance/(Shortage)	(1,599)	(1,609)	(1,619)	(1,629)	(1,639)	(1,649)

Table 4A-16.
Wholesale Water Provider Summary
City of Abilene

Name/Location: **City of Abilene**

Description: The City of Abilene relies on Fort Phantom Hill Reservoir, and contract water supplies from West Central Texas MWD (Hubbard Creek Reservoir). The City also has a contract with West Central Texas MWD for 16.54 percent (~10,900 acft/yr) of the safe yield of O.H Ivie Reservoir, owned by the Colorado River Municipal Water District. The City currently has facilities to utilize 6,720 acft/yr of the supply from O.H. Ivie.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
City of Abilene	22,891	23,485	23,507	23,181	22,588	21,879
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
Sun WSC (Taylor C-O)	230	230	230	230	230	230
View Caps WSC (Taylor C-O)	199	199	199	199	199	199
Eagle Construction and Environmental Services, L.P.	11,837	11,837	11,837	11,837	11,837	11,837
Taylor County Manufacturing	972	1,081	1,177	1,270	1,349	1,462
City of Baird (Recommended Strategy)	260	240	240	240	240	240
Nolan County Steam-Electric (Recommended)	1,000	11,500	20,000	20,000	20,000	20,000
City of Merkel (Recommended Strategy)	128	139	139	132	120	105
City of Potosi (Recommended Strategy)	136	142	141	129	116	104
Steamboat Mountain WSC (Recommended)	55	54	51	43	30	20
City of Tye (Recommended Strategy)	3	6	6	2	0	0
Total Treated Water Demand	27,239	27,941	28,055	27,791	27,237	26,604
Raw Water Only Demand[1]	12,837	23,337	31,837	31,837	31,837	31,837
Total Demand	40,076	51,278	59,892	59,628	59,074	58,441

[1]Raw water demands include Eagle Construction, Nolan County Steam-Electric.

Table 4A-16 (Concluded)

Name/Location: City of Abilene

Supplies:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
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]	6,720	6,720	6,720	6,720	6,720	6,720
Fort Phantom Hill	9,316	9,082	8,848	8,614	8,380	8,145
West Central Texas MWD (Hubbard)	20,086	20,046	20,004	19,963	19,923	19,882
Treated Supply (Hubbard and Ft. Phantom)[4]	27,552	13,440	13,440	13,440	13,440	13,440
Total Treated Water Supply	34,272	20,160	20,160	20,160	20,160	20,160
Total Raw Water Supply	36,122	35,848	35,572	35,297	35,023	34,747

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

[2] Lake Kirby is used primarily to store reuse water for the City's reuse customers. Reuse demands are not included in the water demand projections for the City.

[3] Current treatment capacity (desalination) is approximately 6 MGD (6,720 acft/yr).

[4] Supply has been constrained based on average annual capacity of the existing Northeast and Grimes treatment plant 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 acft/yr.

Projected Balances:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Treated Water Balance/(Shortage)	7,033	(7,781)	(7,895)	(7,631)	(7,077)	(6,444)
Total Raw Water Balance/(Shortage)	(3,954)	(15,430)	(24,320)	(24,331)	(24,051)	(23,694)

Table 4A-17.
Wholesale Water Provider Summary
Bistone MWSD

Name: **Bistone Municipal Water Supply District**

Description: 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 also utilizes groundwater from the Carrizo-Wilcox Aquifer. 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 cities of Tehuacana/Coolidge have 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:

	Year (acft/yr)					
Major Water Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Bistone MWSD	148	146	144	142	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
Limestone C-O	275	275	275	275	275	275
Total Demand	5,682	5,680	5,678	5,676	5,675	5,675

Supplies:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Lake Mexia	1,319	1,095	871	647	423	199
Carrizo – Wilcox Aquifer	1,937	1,937	1,937	1,937	1,937	1,937
Total Supply	3,256	3,032	2,808	2,584	2,360	2,136

Projected Balance:

	Year (acft/yr)					
Source	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Balance/(Shortage)	(2,426)	(2,648)	(2,870)	(3,092)	(3,315)	(3,539)

Table 4A-18.
Wholesale Water Provider Summary
City of Cedar Park

Name: **City of Cedar Park**

Description: 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. In 2000, the City purchased all of its raw water from the LCRA Highland Lakes System (Region K). The City sold 2,378 acft to its wholesale customers and provided 6,000 acft of water to retail customers.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
City of Cedar Park	11,961	16,571	17,910	21,779	21,779	21,780
Indian Springs Subdivision (Williamson C-O)	13	13	13	13	13	13
Leander	1,219	0	0	0	0	0
Williamson-Travis Co. MUD No.1	1,022	1,022	1,022	1,022	1,022	1,022
Blockhouse MUD	1,331	1,331	1,331	1,331	1,331	1,331
Increase Blockhouse MUD (Recommended)	0	0	500	1,000	1,500	2,100
Increase Williamson-Travis C. MUD No.1 (Recommended)	0	350	800	1,250	1,750	2,300
Total Demand	15,546	19,287	21,576	26,395	27,395	28,546

Supply:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Highland Lakes System (LCRA)	18,000	18,000	18,000	18,000	18,000	18,000
Constrained Supply[1]	14,372	14,270	14,176	14,117	14,054	13,990

[1] Supply has been constrained based on average annual capacity of the existing Cedar Park treatment plant. The average annual capacity is determined as 50% of the normal rated design capacity (26 MGD), or 14,560 acft/yr. This has been further reduced to account for supplies to the portion of Cedar Park located in Travis County (Region K).

Projected Balance:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Balance/(Shortage)	(1,174)	(5,017)	(7,400)	(12,278)	(13,341)	(14,556)

Table 4A-19.
Wholesale Water Provider Summary
City of Round Rock

Name: **City of Round Rock**

Description: The City of Round Rock obtains raw water from the Edwards-BFZ (Northern Segment) Aquifer and purchases additional water from BRA through Lake Georgetown. The City sells wholesale water to local providers in Williamson County. In addition to the 3,090 acft of wholesale water sales in 2000, the City provided approximately 14,000 acft of treated water to retail and manufacturing customers. The City of Round Rock has contracted to purchase 18,134 acft/yr from the BRA at Stillhouse Hollow Reservoir in Bell County. The pipeline that delivers this water to Lake Georgetown was completed in late 2004. Round Rock has plans to introduce a new supply (20,928 acft/yr) through the Brushy Creek RUA Water Supply Project.

Projected Demands:

Major Water Contract Holders	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
City of Round Rock	23,103	31,146	40,704	51,176	62,801	75,268
Fern Bluff MUD[1]	1,339	2,049	2,882	3,805	4,810	5,888
Williamson County MUD #9 (Williamson C-O)[1]	230	230	230	230	230	230
Williamson Co Manufacturing (Recommended)	1,472	1,572	1,772	2,072	2,272	2,472
Total Demand	26,144	34,997	45,588	57,283	70,113	83,858

1 – Projected demands for Fern Bluff MUD and Williamson County MUD #9 are likely overstated

Supplies:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Stillhouse Hollow Reservoir (BRA Contract)	15,374	15,374	15,374	15,374	15,374	15,374
Lake Georgetown (BRA Contract)	5,697	5,697	5,697	5,697	5,697	5,697
Edwards-BFZ (Northern Segment) Aquifer	821	821	821	821	821	821
Portion of Demand in Travis County (Region K)	(126)	(246)	(349)	(426)	(536)	(645)
LCRA – Lake Travis (Out of Region)	20,928	20,928	20,928	20,928	20,928	20,928
Constrained LCRA Supplies	0	0	0	0	0	0
Total Supply	21,765	21,645	21,542	21,465	21,355	21,246

Projected Balance:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Balance/(Shortage)	(4,379)	(13,352)	(24,046)	(35,818)	(48,758)	(62,612)

Table 4A-20. Wholesale Water Provider Summary City of Stamford

Name: **City of Stamford**

Description: The City of Stamford obtains supply from Lake Stamford and supplies water to several entities in Jones and Haskell Counties.

Projected Demands:

Major Water Contract Holders	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
City of Stamford	645	648	634	612	590	568
City of Hamlin	1,120	1,120	1,120	1,120	1,120	1,120
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)	92	92	92	92	92	92
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 Demand	4,219	4,222	4,208	4,186	4,164	4,142

Supplies:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Lake Stamford	5,667	5,593	5,520	5,447	5,373	5,300
Constrained Supply (WTP Capacity)	1,458	1,458	1,458	1,458	1,458	1,458
Total Supply	1,458	1,458	1,458	1,458	1,458	1,458

Projected Balance:

Source	Year (acft/yr)					
	2010	2020	2030	2040	2050	2060
Balance/(Shortage)	(2,761)	(2,764)	(2,750)	(2,728)	(2,706)	(2,684)

Table 4A-21.
Wholesale Water Provider Summary
City of Sweetwater

Name: **City of Sweetwater**

Description: 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. The City also operates a groundwater well field in the Dockum Aquifer. Although the City owns Lake Sweetwater and Lake Trammel, those water resources are unreliable and are not considered supplies. The City of Sweetwater provides wholesale water to entities in Nolan and Fisher Counties, and the City of Bronte in Region F. In 2000, Sweetwater sold approximately 750 acft of wholesale water to its municipal customers and 370 acft for steam-electric power.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
City of Sweetwater	3,013	3,072	3,081	3,029	2,900	2,763
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
Brian C and Garland Richards (Out of Region)	135	135	135	135	135	135
Nolan County Manufacturing	550	550	550	550	550	550
Total Demand	5,367	5,426	5,435	5,383	5,254	5,117

Supplies:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
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	2,000	2,000	2,000	2,000	2,000	2,000
Total Supply	2,000	2,000	2,000	2,000	2,000	2,000

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)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Balance/(Shortage)	(3,367)	(3,426)	(3,435)	(3,383)	(3,254)	(3,117)

Table 4A-22.
Wholesale Water Provider Summary
City of Temple

Name: **City of Temple:**

Description: The City of Temple has contracts 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 contracts can yield a reliable supply of 28,633 acft/yr and the City's water right can provide a reliable supply of almost its entire authorized diversion (supplies from the right increase over time due to sedimentation in the upstream Lake Belton and increased wastewater treatment plant discharges). Temple sells approximately 506 acft/yr of treated water to nearby water user groups. Although the City has sufficient raw water supply to meet its future needs, the City's water treatment plants have an annual average capacity of 16,800 acft. The water supply plans for Little River-Academy and Morgan's Point Resort include Temple supplying an additional 350 acft/yr of treated water to those entities by 2030, increasing to 413 acft/yr in 2060.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Fresh Water Demands						
City of Temple	21,033	23,018	25,170	26,892	28,804	30,613
City of Little River-Academy	68	68	68	68	68	68
City of Morgans Point Resort	291	291	291	291	291	291
City of Troy	124	124	124	124	124	124
Rolling Hills MHP (Bell C-O)	23	23	23	23	23	23
Morgan's Point Resort (Recommended)	206	255	300	330	346	363
Little River-Academy	50	50	50	50	50	50
Total Fresh Water Demand	21,795	23,829	26,026	27,778	29,706	31,532
Reuse Water Demands						
Bell County Steam-Electric (Panda Power)	0	8,407	8,407	8,407	8,407	8,407
Total Reuse Water Demand	0	8,407	8,407	8,407	8,407	8,407

Supplies:

	Year (acft/yr)					
Source	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Fresh Water Supplies						
Run-of-River Water Right	9,614	9,711	9,808	9,904	10,001	10,097
BRA Contract	28,633	28,633	28,633	28,633	28,633	28,633
Total Fresh Water Supplies	38,247	38,344	38,441	38,037	38,634	38,730
Constrained Supply (WTP Capacity)	27,955	27,955	27,955	27,955	27,955	27,955
Reuse Water Supplies						
BRA TBRSS	14,092	14,092	14,092	14,092	14,092	14,092

Projected Balances:

	Year (acft/yr)					
Source	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Fresh Water Balance/(Shortage)	6,160	4,126	1,929	177	(1,751)	(3,577)
Reuse Water Balance/(Shortage)	14,092	5,685	5,685	5,685	5,685	5,685

Table 4A-23.
Wholesale Water Provider Summary
City of Waco

Name: **City of Waco**

Description: The City has the right to divert 78,970 acft/yr for municipal and industrial purposes, and 900 acft/yr for irrigation uses from Lake Waco. In 2000, the City provided 1,278 acft of treated wholesale water to the City of Hewitt, City of Woodway, and Bosqueville Green Acres WSC. Total water used by Waco in 2000 was over 30,000 acft, including wholesale sales. Irrigation supply of 900 acft/yr from the City's rights is included in McLennan County Irrigation and is not shown here.

The City of Waco also operates the Waco Metropolitan Area Sewage System (WMARSS), which is projected to be a substantial source of reuse supply.

Projected Demands:

	Year (acft/yr)					
Current and Projected Contract Holders	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Fresh Water Demands						
City of Waco	24,876	26,453	27,781	29,159	30,033	31,304
City of Bellmead	2,622	2,751	2,873	2,984	3,065	3,202
City of Hewitt	2,029	2,237	2,395	2,571	2,684	2,877
City of Lacy-Lakeview	1,120	1,120	1,120	1,120	1,120	1,120
City of Woodway	2,944	2,925	2,903	2,882	2,867	2,874
City of Beverly Hills	414	416	416	414	416	424
City of West	1,120	1,120	1,120	1,120	1,120	1,120
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
McLennan County Manufacturing	2,503	2,888	3,249	3,618	3,948	4,403
Cross County WSC (Recommended Strategy)				251	282	333
City of Hallsburg (Recommended Strategy)	5	11	21	32	38	49
City of Mart (Recommended Strategy)	225	250	250	275	300	300
North Bosque WSC (Recommended Strategy)				70	120	194
City of Riesel (Recommended Strategy)	8	16	20	26	29	38
Total Fresh Water Demands	38,523	40,844	42,805	45,179	46,679	48,895
Reuse Water Demands						
Steam-Electric (LS Power)	16,000	16,000	16,000	16,000	16,000	16,000
City of Bellmead (Bellmead/Lacy-Lakeview)	1,121	1,121	1,121	1,121	1,121	1,121
City of Hewitt (Bullhide Creek)	1,223	1,223	1,223	1,223	1,223	1,223
City of Lacy-Lakeview (Bellmead/Lacy-Lakeview)	1,121	1,121	1,121	1,121	1,121	1,121
City of Lorena (Bullhide Creek)	448	448	448	448	448	448
McLennan County Manufacturing (Flat Creek)	5,319	6,918	7,847	7,847	7,847	7,847
Total Reuse Water Demands	25,242	26,752	26,752	26,752	26,752	26,752

Table 4A-23 (Concluded)

Name: City of Waco

Supplies:

Source	Year (acft/yr)					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Fresh Water Supplies						
Lake Waco (Municipal & Industrial)	78,198	77,418	76,639	75,859	75,080	74,300
Lake Brazos	5,600	5,600	5,600	5,600	5,600	5,600
Total Fresh Water Supplies	83,798	83,018	82,239	81,459	80,680	79,900
Constrained Fresh Water Supply[1]	50,400	50,400	50,400	50,400	50,400	50,400
Reuse Water Supplies (WMARSS)						
McLennan County Steam-Electric (LS Power)	16,000	16,000	16,000	16,000	16,000	16,000
Undeveloped WMARSS Reuse Supply	9,242	10,842	12,190	13,587	14,475	15,765
Total Reuse Supply from WMARSS[2]	25,242	26,842	28,190	29,587	30,475	31,765

[1] Fresh Water Supply has been constrained based on average annual capacity of the existing Waco treatment plant(s). 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:

Source	Year (acft/yr)					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Fresh Water Balance/(Shortage)	11,877	9,556	7,595	5,221	3,721	1,505
Reuse Water Balance/(Shortage)	0	90	1,438	2,836	3,723	5,013

Table 4A-24.
Wholesale Water Provider Summary
City of Bryan

Name: **City of Bryan**

Description: 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 has contracts to sell groundwater to Brushy WSC and Wellborn SUD for a total of 1,120 acft/yr. Wickson Creek SUD is also negotiating with Bryan to purchase up to 1,500 acft/yr.

Projected Demands:

	Year (acft/yr)					
Major Water Contract Holders	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
City of Bryan	11,957	13,179	14,221	15,022	16,096	16,493
Wellborn SUD	560	560	560	560	560	560
Brushy WSC (Brazos C-O)	560	560	560	560	560	560
Wickson Creek SUD (Recommended)	1,500	1,500	1,500	1,500	1,500	1,500
Total Demand	14,577	15,799	16,841	17,642	18,716	19,113

Supplies:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Carrizo – Wilcox Aquifer	18,304	18,304	18,304	18,304	18,304	18,304
Total Supply	18,304	18,304	18,304	18,304	18,304	18,304

Projected Balance:

	Year (acft/yr)					
Source	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Balance/(Shortage)	3,727	2,505	1,463	662	(412)	(809)

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Section 4C
Water Supply Plans

The following sections present water supply plans to meet needs (shortages) for WUGs and WWPs in the Brazos G Area. Detailed explanations of major water management strategies are presented in Volume II, Section 4B. In the following sections:

- Capital costs represent September 2008 prices.
- Unit and annual costs requiring new infrastructure (wells, reservoirs, etc.) are generally shown at full build-out and use of the facilities in the first year of implementation. This will often understate the unit costs ($/acft) in the early years of a project. However, detailed cost estimates for phasing of projects from decade to decade are beyond the scope of this regional planning study.
- Unit costs for projects utilizing existing infrastructure (purchase of additional water, etc.) are generally held constant, with annual costs adjusted according to level of projected use, and retirement of debt service.
- Unit costs for raw or treated water for interconnections between systems are assumed, with actual costs expected to be negotiated between entities.
- As explained in Volume II, Section 4B.2 Water Conservation, municipal conservation assumes a reduction in per capita water use of 21 gpcd beginning in year 2020 for municipal WUGs with needs and per capita water use exceeding a target of 140 gpcd. Municipalities are encouraged to utilize any BMPs to achieve the conservation goals, not just those used to develop costs. Non-municipal WUGs with needs are recommended by the Brazos G RWPG to reduce total water demand 3 percent by 2010, 5 percent by 2020, and 7 percent from 2030 to 2060 by using Best Management Practices (BMPs). Average costs for irrigation conservation BMPs were derived from the information in Volume II, Section 4B.2.2, but costs for other non-municipal conservation BMPs were not developed due to lack of available data and guidance. Some counties project large irrigation shortages which cannot be met through the recommended conservation targets. These irrigation shortages are typically too large to be met economically through new water supplies and remain as unmet needs in the plan.

- Each municipal water user group is identified with the county in which it is primarily located and the needs (shortages) are reported for all of the counties in which the WUG is located.

4C.1 Bell County Water Supply Plan

Table 4C.1-1 lists each water user group in Bell County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.1-1.
Bell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
439 WSC	196	73	Projected surplus
City of Bartlett			See Williamson County for plan
Bell-Milam-Falls WSC	(280)	(533)	Projected shortage – see plan below
City of Belton	0	0	Demand equals supply
Chisholm Trail SUD			See Williamson County for plan
Dog Ridge WSC	1,295	1,189	Projected surplus
East Bell County WSC	125	84	Projected surplus
Elm Creek WSC	159	159	Projected surplus
Fort Hood (CDP)	3,653	3,842	Projected surplus
City of Harker Heights	0	0	Demand equals supply
City of Holland	141	147	Projected surplus
Jarrell-Schwertner			See Williamson County for plan
Kempner WSC			See Coryell County for plan
City of Killeen	0	0	Demand equals supply
City of Little River-Academy	(18)	(27)	Projected shortage – see plan below
Moffat WSC	562	562	Projected surplus
City of Morgan's Point Resort	(272)	(332)	Projected shortage – see plan below
City of Nolanville	0	0	Demand equals supply
Pendleton WSC	0	0	Demand equals supply
City of Rogers	180	187	Projected surplus
Salado WSC	2,149	1,974	Projected surplus
City of Temple	1,929	(3,577)	Projected shortage – see Section 4C.38
City of Troy	38	46	Projected surplus
West Bell County WSC	298	322	Projected surplus
County-Other	927	942	Projected surplus
Manufacturing	283	0	Projected surplus/ Demand equals supply
Steam-Electric	(4,296)	(7,102)	Projected shortage – see plan below
Mining	36	44	Projected surplus
Irrigation	4,848	5,047	Projected surplus
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.

4C.1.1 439 WSC

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. No shortages are projected for 439 WSC and no changes in water supply are recommended.

4C.1.2 Bell-Milam-Falls WSC

4C.1.2.1 Description of Supply

This WUG is located in multiple counties (Bell, Falls, Milam, and Williamson). The shortages shown in Table 4C.1-2 represent the cumulative totals for Bell-Milam-Falls WSC.

- Source: Surface Water – Contract with Central Texas WSC from Lake Stillhouse Hollow. Groundwater – Trinity Aquifer
- Estimated Reliable Supply: 446 acft/yr of surface water and 331 acft/yr of groundwater
- System Description: Bell-Milam-Falls WSC purchases treated water from Central Texas WSC. Bell-Milam-Falls WSC also has wells that are used to supplement the purchased water.
- The year 2060 needs for Bell-Milam-Falls WSC are comprised of 84 acft/yr in Bell County, 246 acft/yr in Falls County, 109 acft/yr in Milam County, and 94 acft/yr in Williamson County.

4C.1.2.2 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 Bell-Milam-Falls WSC:

- Increase contract with Central Texas WSC by 100 acft/yr by 2010, increasing by 600 acft/yr by 2060.
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.1.2.3 Costs

Costs of the Recommended Plan for Bell-Milam-Falls WSC.

a. Increase contract with Central Texas WSC:
    - Cost Source: estimated wholesale treated water rate
    - Date to be Implemented: By year 2010

- Annual Cost: $410,400 in 2060
- The annual cost was calculated by multiplying the Bell-Milam-Falls WSC projected supply from this strategy by an estimated wholesale water rate of $684/acft.

Table 4C.1-2.
Recommended Plan Costs by Decade for Bell-Milam-Falls WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(20)	(156)	(280)	(379)	(450)	(533)
Increase Contract with CTWSC						
Supply From Plan Element (acft/yr)	100	204	334	438	512	600
Annual Cost ($/yr)	$68,400	$139,536	$228,456	$299,592	$350,208	$410,400
Unit Cost ($/acft)	$684	$684	$684	$684	$684	$684

4C.1.3 City of Belton

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. No shortages are projected for the City of Belton and no changes in water supply are recommended.

4C.1.4 Dog Ridge WSC

Dog Ridge WSC contracts with Central Texas WSC to divert, treat, and deliver water from Lake Stillhouse Hollow (BRA Contract) to the WSC. No shortages are projected for Dog Ridge WSC and no changes in water supply are recommended.

4C.1.5 East Bell County WSC

East Bell County WSC has a contract to purchase water from the Central Texas WSC from Lake Stillhouse Hollow. East Bell County WSC also has wells in the Trinity Aquifer. East Bell County WSC also has service area in Falls County. No shortages are projected for East Bell County WSC and no changes in water supply are recommended. The surplus shown in Table 4C.1-1 represents the cumulative totals for East Bell County WSC in Bell and Falls Counties.

4C.1.6 Elm Creek WSC

Elm Creek WSC service area includes portions of Bell, Coryell, Falls and McLennan County. Elm Creek WSC has a contract to purchase water from Bluebonnet WSC from Lake

Belton. No shortages are projected for Elm Creek WSC and no changes in water supply are recommended. The surplus shown in Table 4C.1-1 represents the cumulative totals for Elm Creek WSC in the counties it serves.

4C.1.7 Fort Hood

The U.S. Department of the Army (Fort Hood) has a water right to store and divert 12,000 acft in Lake Belton. The Fort Hood service area includes portions of Bell and Coryell Counties. No shortages are projected for Fort Hood and no changes in water supply are recommended. The surplus shown in Table 4C.1-1 represents the cumulative totals for Fort Hood in the counties it serves. Fort Hood is a Census-designated place (CDP) as designated by the United States Census Bureau for statistical purposes.

4C.1.8 City of Harker Heights

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. No shortages are projected for the City of Harker Heights. The contracted supplies of 8,800 acft/yr would result in a surplus of 3,000 acft/yr in 2030 and a surplus of 1,985 acft/yr in 2060.

Bell County WCID No.1 is pursuing a strategy to provide reuse supplies for a portion of Harker Heights non-potable demands. The strategy would supply 185 acft/yr for irrigation at a community park.

4C.1.8.1 Costs

Costs of the recommended plan for the City of Harker Heights are:

a. Reuse supply from Bell County WCID No. 1:
   - Cost Source: Volume II, Section 4B.3.1.7
   - Date to be Implemented: By year 2010
   - Total Project Cost: Capital costs will be borne by Bell Co WCID No.1
   - Annual Unit Cost: $762/acft or $2.34/1,000 gal.

Table 4C.1-3.
Recommended Plan Costs by Decade for City of Harker Heights

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	0	0	0	0	0	0
Reuse Supply (Bell County WCID No.1)						
Supply From Plan Element (acft/yr)	185	185	185	185	185	185
Annual Cost ($/yr)	$141,000	$141,000	$141,000	$141,000	$141,000	$141,000

4C.1.9 City of Holland

The City of Holland has 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.

4C.1.10 City of Killeen

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. No shortages are projected for the City of Killeen and no changes in water supply are recommended.

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.

4C.1.10.1 Costs

Costs of the recommended plan for the City of Killeen are:

a. Reuse supply from Bell County WCID No. 1:
   - Cost Source: Volume II, Section 4B.3.1.7
   - Date to be Implemented: By year 2010
   - Total Project Cost: Capital costs will be borne by Bell Co WCID No.1
   - Annual Unit Cost: $756/acft or $2.32/1,000 gal.

Table 4C.1-4.
Recommended Plan Costs by Decade for City of Killeen

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	0	0	0	0	0	0
Reuse Supply (Bell County WCID No.1)						
Supply From Plan Element (acft/yr)	2,488	2,488	2,488	2,488	2,488	2,488
Annual Cost ($/yr)	$1,881,000	$1,881,000	$1,881,000	$1,881,000	$1,881,000	$1,881,000

4C.1.11 City of Little River-Academy

4C.1.11.1 Description of Supply

- Source: Groundwater – Trinity Aquifer. Surface Water purchased from the City of Temple
- Estimated Reliable Supply: 274 acft/yr
- System Description: Surface water supply supplements groundwater supply. The City of Temple supplies treated surface water to Little River-Academy by transmission pipeline.

4C.1.11.2 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 the City of Little River-Academy:

- Voluntary Redistribution from City of Temple. Little River-Academy would meet the projected shortage by buying an additional 50 acft/yr from the City of Temple. The existing facilities have adequate capacity to deliver the additional water.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.1.11.3 Costs

Costs of the recommended plan for the City of Little River-Academy to meet the projected shortages are:

a. Voluntary Redistribution from City of Temple:
    - Cost Source: estimated wholesale treated water rate
    - Date to be Implemented: By year 2010
    - Annual Cost: $43,850 in 2060

- The annual cost was calculated by multiplying the City of Little River Academy projected supply from this strategy by an estimated wholesale water rate of $877/acft or $2.69/1,000 gal.

Table 4C.1-5.
Recommended Plan Costs by Decade for the City of Little River-Academy

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(1)	(11)	(18)	(20)	(23)	(27)
Voluntary Redistribution (City of Temple)						
Supply From Plan Element (acft/yr)	50	50	50	50	50	50
Annual Cost ($/yr)	$43,850	$43,850	$43,850	$43,850	$43,850	$43,850
Unit Cost ($/acft)	$877	$877	$877	$877	$877	$877

4C.1.12 Moffat WSC

Moffat WSC has a contract to purchase water from 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.

4C.1.13 City of Morgan's Point Resort

4C.1.13.1 Description of Supply

- Source: Surface Water from City of Temple
- Estimated Reliable Supply: 291 acft/yr
- System Description: The City of Morgan's Point Resort has a contract with the City of Temple to purchase treated surface water. The City of Temple serves Morgan's Point Resort through a transmission pipeline.

4C.1.13.2 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 the City of Morgan's Point Resort:

- Voluntary Redistribution from City of Temple. Morgan's Point Resort would meet its shortage through purchase of an additional 332 acft/yr from the City of Temple starting at 182 acft in 2010 increasing to 363 acft/yr by 2060.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.1.13.3 Costs

Costs of the recommended plan for the City of Morgan's Point Resort to meet the projected shortages are:

a. Voluntary Redistribution from City of Temple:
   - Cost Source: estimated wholesale treated water rate
   - Date to be Implemented: By year 2010
   - Annual Cost: $318,351 in 2060
   - The annual cost was calculated by multiplying the City of Morgan's Point Resort projected supply from this strategy by an estimated wholesale water rate of $877/acft or $2.69/1000 gal.

Table 4C.1-6.
Recommended Plan Costs by Decade for the City of Morgan's Point Resort

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Shortage (acft/yr)	(182)	(229)	(272)	(300)	(316)	(332)
Voluntary Redistribution (City of Temple)						
Supply From Plan Element (acft/yr)	206	255	300	330	346	363
Annual Cost ($/yr)	$180,662	$223,635	$263,100	$289,410	$303,442	$318,351
Unit Cost ($/acft)	$877	$877	$877	$877	$877	$877

4C.1.14 City of Nolanville

The City of Nolanville contracts with Bell County WCID No. 1 to divert, treat, and deliver water from Lake Belton to the City. No shortages are projected for Nolanville and no changes in water supply are recommended.

4C.1.15 Pendleton WSC

Pendleton WSC has 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.

4C.1.16 City of Rogers

The City of Rogers 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.

4C.1.17 Salado WSC

Salado WSC currently obtains water from the Edwards Aquifer and also has a contract with the BRA that has yet to be utilized. There are no projected shortages for Salado WSC.

4C.1.18 City of Temple

The recommended water supply plan for the City of Temple is included in Section 4C.38 with the wholesale water providers.

4C.1.19 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.

4C.1.20 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.

4C.1.21 County-Other

No shortages are projected for County-Other entities and no changes in water supply are recommended. The Oenaville & Belfalls WSC is included in the County-Other category and has informed the Brazos G RWPG that due to recent growth, it expects to be large enough to be included as a Water User Group in the next planning cycle. The WSC obtains supply through a contract with the Central Texas WSC (57 acft/yr) and has applied to the Clearwater Underground Water Conservation District for a Historical and Existing Use Permit for 16.2 acft/yr from the Trinity Aquifer.

4C.1.22 Manufacturing

No shortages are projected for Bell County Manufacturing and no changes in water supply are recommended.

4C.1.23 Steam-Electric

4C.1.23.1 Description of Supply

Steam-Electric is projected to have a shortage from year 2020 through 2060, with a shortage of 7,102 acft/year in 2060. The City of Temple has recently purchased a 2,500 acft/year supply from the Brazos River Authority for Steam-Electric uses. The City of Temple has also recently entered into an agreement with Panda Temple Power L.L.C. to supply up to 10 MGD to a proposed new generating facility.

4C.1.23.2 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 Bell County Steam Electric:

- Reuse Supply from the City of Temple
- Conservation was also considered, however conservation for Steam-Electric power generation depends greatly on cooling technologies employed and cannot be adequately quantified.

4C.1.23.3 Costs

Costs of the recommended plan for Bell County Steam-Electric to meet the projected shortages are:

a. Reuse Supply from the City of Temple
   - Cost Source: estimated reuse water purchase rate of $138/acft or $0.42/1000 gal; Volume II, Section 4B.17
   - Date to be Implemented: By year 2020
   - Total Project Cost: $17,404,000
   - Annual Cost: $3,375,000

Table 4C.1-7.
Recommended Plan Costs by Decade for Bell County Steam-Electric

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Shortage (acft/yr)	0	(3,674)	(4,296)	(5,053)	(5,977)	(7,102)
Reuse Supply from the City of Temple						
Supply From Plan Element (acft/yr)		8,407	8,407	8,407	8,407	8,407
Annual Cost ($/yr)		$3,375,000	$3,375,000	$1,858,000	$1,858,000	$1,858,000
Unit Cost ($/acft)		$401	$401	$221	$221	$221

4C.1.24 Mining

No shortages are projected for Bell County Mining and no changes in water supply are recommended.

4C.1.25 Irrigation

No shortages are projected for Bell County Irrigation and no changes in water supply are recommended.

4C.1.26 Livestock

No shortages are projected for Bell County Livestock and no changes in water supply are recommended.

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4C.2 Bosque County Water Supply Plan

Table 4C.2-1 lists each water user group in Bosque County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.2-1.
Bosque County Surplus/(Shortage)

	Surplus/(Shortage)[1]		
Water User Group	*2030 (acft/yr)*	*2060 (acft/yr)*	*Comment*
Childress Creek WSC	117	104	Projected surplus
City of Clifton	157	2	Projected surplus
Cross Country WSC			See McLennan County for Plan
Lake Whitney Water Co.			See Hill County for Plan
City of Meridian	238	237	Projected surplus
City of Morgan	148	91	Projected surplus
City of Valley Mills	0	(10)	Projected shortage – see plan below
City of Walnut Springs	10	11	Projected surplus
County-Other	23	10	Projected surplus
Manufacturing	379	0	Projected surplus/ Demand equals supply
Steam-Electric	(735)	(5,461)	Projected shortage – see plan below
Mining	156	173	Projected surplus
Irrigation	8,731	8,824	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.

4C.2.1 Childress Creek WSC

Childress Creek WSC obtains its water supply from groundwater from the Trinity Aquifer. No shortages are projected for Childress Creek and no changes in water supply are recommended. Note that the 2006 Plan included a strategy to receive supply from the City of Clifton via the Bosque County Regional Project to meet projected water needs. Those needs are not projected in the 2011 Plan.

4C.2.2 City of Clifton

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 405 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 small surplus in 2060. The ability to expand the project results in the City being a potential regional provider of water to other Bosque County entities.

4C.2.3 City of Meridian

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 and no changes in water supply are recommended. Note that the 2006 Plan included a strategy to receive supply from the City of Clifton via the Bosque County Regional Project to meet projected water needs. A phase of this project has been implemented recently with a water line from Clifton to Meridian.

4C.2.4 City of Morgan

The City of Morgan obtains its water supply from groundwater from the Trinity Aquifer. No shortages are projected for the City of Morgan and no changes in water supply are recommended.

4C.2.5 City of Valley Mills

4C.2.5.1 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 of 10 acft/yr in the year 2060. The surplus/shortages shown in Table 4C.2-2 represent the cumulative totals for the City of Valley Mills.

4C.2.5.2 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 the City of Valley Mills:

- Conservation; and
- Purchase water from the City of Clifton through the Bosque County Regional Project.

4C.2.5.3 Costs

Costs of the Recommended Plan for the City of Valley Mills to meet the projected shortages are:

a. Conservation:

- Cost Source: Volume II, Section 4B.2.1
- Date to be Implemented: 2010
- Annual Cost: maximum of $11,400 in 2020

b. Purchase water from the City of Clifton through the Bosque County Regional Project:

- Cost Source: Cost estimate from strategy evaluation (Section 4B.14.1)
- Date to be Implemented: before 2030
- Unit Cost: $2,937/acft or $9.01/1000 gal
- Annual Cost: $550,000

Table 4C.2-2.
Recommended Plan Costs by Decade for the City of Valley Mills

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Shortage (acft/yr)	48	18	0	(3)	(6)	(10)
Conservation						
Supply From Plan Element (acft/yr)	10	24	20	14	14	14
Annual Cost ($/yr)	$4,750	$11,400	$9,500	$6,650	$6,650	$6,650
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Purchase Water from the City of Clifton						
Supply From Plan Element (acft/yr)	-	-	190	190	190	190
Annual Cost ($/yr)	-	-	$550,000	$550,000	$101,000	$101,000
Unit Cost ($/acft)	-	-	$2,937	$2,937	$532	$532

4C.2.6 City of Walnut Springs

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 and no changes in water supply are recommended. Note that the 2006 Plan included a strategy to receive supply from the City of Clifton via the Bosque County Regional Project to meet projected water needs. Those needs are not present in the 2011 Plan.

4C.2.7 County-Other

County Other obtains its water supply from groundwater from the Trinity Aquifer. No shortages are projected for County Other and no changes in water supply are recommended.

4C.2.8 Manufacturing

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. No shortages are projected for manufacturing and no changes in water supply are recommended.

4C.2.9 Steam-Electric

4C.2.9.1 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 2060.

4C.2.9.2 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 Steam-Electric:

- Conservation.
- BRA System Operations Supply to Bosque County.

4C.2.9.3 Costs

Costs of the Recommended Plan for Steam-Electric to meet the projected shortages are:

a. Conservation
- Date to be Implemented: before 2010
- Annual Cost: Not determined

b. BRA System Operation
- Cost Source: BRA System Operations Supply (Volume II, Section 4B.17)
- Date to be Implemented: before 2030
- Unit Cost: $633/acft or $1.94/1000 gal
- Annual Cost: $3,307,000 at full implementation

Table 4C.2-3.
Recommended Plan Costs by Decade for Bosque County Steam-Electric

Plan Element	2010	2020	2030	2040	2050	2060
Projected Shortage (acft/yr)	2,177	312	(735)	(2,010)	(3,565)	(5,461)
Conservation						
Supply From Plan Element (acft/yr)	130	309	506	596	705	837
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
BRA System Operation						
Supply From Plan Element (acft/yr)	-	-	5,222	5,222	5,222	5,222
Annual Cost ($/yr)	-	-	$3,307,000	$3,307,000	$1,149,000	$1,149,000
Unit Cost ($/acft)	-	-	$633	$633	$220	$220

4C.2.10 Mining

Mining is not projected to need additional water supplies through the year 2060 and no changes in water supply are recommended.

4C.2.11 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.2.12 Livestock

No shortages are projected for Livestock and no changes in water supply are recommended.

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4C.3 Brazos County Water Supply Plan

Table 4C.3-1 lists each water user group in Brazos County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.3-1. Brazos County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Bryan	1,463	(809)	Projected shortage – see section 4C.38
City of College Station	(68)	(5,631)	Projected shortage – see plan below
Wellborn SUD	4,213	3,809	Projected surplus
Wickson Creek SUD	(353)	(1,309)	Projected shortage – see plan below
County-Other	950	1,148	Projected surplus
Manufacturing	16,782	16,646	Projected surplus
Steam-Electric	151	152	Projected surplus
Mining	3	1	Projected surplus
Irrigation	10,589	11,471	Projected surplus
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.

4C.3.1 City of Bryan

The recommended water supply plan for the City of Bryan is included in Section 4C.38 with the wholesale water providers.

4C.3.2 City of College Station

4C.3.2.1 Description of Supply

- Source: Groundwater from Carrizo-Wilcox Aquifer
- Estimated Reliable Supply: 21,930 acft/yr

4C.3.2.2 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 the City of College Station:

- Conservation;
- Additional Carrizo-Wilcox Aquifer Development;
- Wastewater Reuse; and
- BRA System Operation.
- In addition to these recommended plan elements, Millican Reservoir and the Little River Off-Channel Reservoir were considered as water management strategies to meet projected needs.

4C.3.2.3 Costs

Costs of the recommended plan for the City of College Station to meet the projected shortages are:

a. Conservation:
   - Cost Source: Strategy Evaluation (Volume II, Section 4B.2.1)
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $654,550 in 2020

b. Wastewater Reuse for the City of College Station:
   - Cost Source: Volume II, Section 4B.3.1
   - Date to be Implemented: By year 2040
   - Total Capital Cost: $4,583,000
   - Annual Cost: $464,000

c. Additional Carrizo-Wilcox Aquifer Development:
   - Cost Source: Strategy Evaluation (Volume II, Section 4B.15.2) Capital costs will vary based on location and capacity of wells.
   - Date to be Implemented: By year 2040
   - Total Project Cost: $28,101,000 for full Brazos County evaluation
   - Annual Cost: $1,182,000 (based on unit cost for Brazos County evaluation)

d. BRA System Operation (Volume II, Section 4B.17):
   - Cost Source: Purchase of water from the BRA at System Rate, plus necessary conveyance and treatment systems (Volume II, Section 4B.17).
   - Date to be Implemented: By year 2040
   - Total Project Cost: $23,954,000 (treatment and delivery system only)
   - Annual Cost: $3,226,000

Table 4C.3-2. Recommended Plan Costs by Decade for the City of College Station

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Shortage (acft/yr)	5,679	2,734	(68)	(2,133)	(4,721)	(5,631)
Conservation						
Supply From Plan Element (acft/yr)	545	1,378	1,320	1,177	1,149	1,184
Annual Cost ($/yr)	$258,875	$654,550	$627,000	$559,075	$545,775	$562,400
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Wastewater Reuse						
Supply From Plan Element (acft/yr)	—	—	—	312	312	312
Annual Cost ($/yr)	—	—	—	$464,000	$464,000	$65,000
Unit Cost ($/acft)	—	—	—	$1,485	$1,485	$207
Additional Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	3,000	3,000	3,000
Annual Cost ($/yr)	—	—	—	$1,182,000	$1,182,000	$525,000
Unit Cost ($/acft)	—	—	—	$394	$394	$175
BRA System Operation						
Supply From Plan Element (acft/yr)	—	—	—	2,500	2,500	2,500
Annual Cost ($/yr)	—	—	—	$3,226,000	$3,226,000	$1,138,000
Unit Cost ($/acft)	—	—	—	$1,290	$1,290	$455

4C.3.3 Wellborn SUD

Wellborn SUD currently obtains water from the Carrizo-Wilcox Aquifer and through contracts with BRA and the City of Bryan. Wellborn SUD does not have any projected shortages and no changes in water supply are recommended.

4C.3.4 Wickson Creek SUD

4C.3.4.1 Description of Supply

This WUG is located in multiple counties (Grimes, Robertson, and Brazos). The shortages shown in Table 4C.3-4 represent the cumulative totals for Wickson Creek SUD.

- Source: Sparta and Carrizo-Wilcox Aquifers, and
- Estimated Reliable Supply: 2,426 acft/yr.

4C.3.4.2 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 Wickson Creek SUD:

- Purchase Water from City of Bryan
- Conservation was also considered; however, the SUD's current per capita use rate is below the selected target rate of 140 gpcd.
- In addition to these recommended plan elements, Carrizo-Wilcox Aquifer Development, BRA System Operation, Millican Reservoir and the Little River Off-Channel Reservoir were considered as water management strategies to meet projected needs.

4C.3.4.3 Costs

Costs of the Recommended Plan for Wickson Creek SUD.

a. Purchase Water from City of Bryan
   - Cost Sources: Volume II, Section 4.B.17
   - Date to be Implemented: before 2020
   - Annual Cost:$394,000

Table 4C.3-3.
Recommended Plan Costs by Decade for Wickson Creek SUD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Shortage (acft/yr)	656	68	(353)	(711)	(1,104)	(1,309)
Purchase Water from the City of Bryan						
Supply From Plan Element (acft/yr)	1,500	1,500	1,500	1,500	1,500	1,500
Annual Cost ($/yr)	$394,000	$394,000	$288,000	$288,000	$288,000	$288,000
Unit Cost ($/acft)	$262	$262	$192	$192	$192	$192

4C.3.5 County-Other

No shortages are projected for Brazos County-Other entities and no changes in water supply are recommended.

4C.3.6 Manufacturing

Water supply for manufacturing in Brazos County is obtained from groundwater from Carrizo-Wilcox Aquifer. No shortages are projected for manufacturing and no changes in water supply are recommended.

4C.3.7 Steam-Electric

Steam-electric is not projected to need additional water supplies through the year 2060 and no changes in water supply are recommended.

4C.3.8 Mining

Mining is not projected to need additional water supplies through the year 2060 and no changes in water supply are recommended.

4C.3.9 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.3.10 Livestock

No shortages are projected for Livestock and no changes in water supply are recommended.

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4C.4 Burleson County Water Supply Plan

Table 4C.4-1 lists each water user group in Burleson County and their corresponding surplus or shortage in years 2030 and 2060.

Table 4C.4-1.
Burleson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
City of Caldwell	1,498	1,458	Projected surplus
Milano WSC			See Milam County for Plan
City of Snook	133	117	Projected surplus
City of Somerville	210	191	Projected surplus
Southwest Milam WSC			See Milam County for Plan
County-Other	159	4	Projected surplus
Manufacturing	116	16	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	5	5	Projected surplus
Irrigation	2,188	4,158	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.

4C.4.1 City of Caldwell

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 and no change in water supply is recommended.

4C.4.2 City of Snook

The City of Snook obtains its water supply from groundwater from the Sparta Aquifer. This supply is projected to be sufficient through the planning period and no change in water supply is recommended.

4C.4.3 City of Somerville

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 and no change in water supply is recommended.

4C.4.4 County-Other

The water supply entities for County-Other show a projected surplus and no changes in water supply are recommended.

4C.4.5 Manufacturing

Water supply for manufacturing in Burleson County is obtained from groundwater from Sparta Aquifer. No shortages are projected for manufacturing and no changes in water supply are recommended.

4C.4.6 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.4.7 Mining

Mining water use category shows a projected surplus and no changes in water supply are recommended.

4C.4.8 Irrigation

Water supply for irrigation in Burleson County is obtained from groundwater from the Brazos River Alluvial Aquifer, contracts with BRA, 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.

4C.4.9 Livestock

Livestock water use category shows no projected need and no changes in water supply are recommended.

4C.5 Callahan County Water Supply Plan

Table 4C.5-1 lists each water user group in Callahan County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.5-1.
Callahan County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
City of Baird	(241)	(232)	Projected shortage – see plan below
City of Clyde	308	348	Projected surplus
Coleman County WSC	0	0	Demand equals supply
City of Cross Plains	251	257	Projected surplus
Potosi WSC			See Taylor County for Plan
County-Other	237	290	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	5	0	Projected surplus/ Demand equals supply
Irrigation	444	482	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.

4C.5.1 City of Baird

4C.5.1.1 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 2000 through 2060, 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 60 acft/yr. Baird also receives reuse water from the City of Clyde in trade for potable water. Supplies will not be sufficient to meet demands through 2060.

4C.5.1.2 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 the City of Baird:

- Conservation, and
- Purchase additional water from City of Abilene.

4C.5.1.3 Costs

Costs of the recommended plan for the City of Baird to meet the projected shortages are:

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $12,350 in 2020

b. Purchase additional water from City of Abilene:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2010
   - Existing infrastructure is assumed to be capable of transporting additional treated water. Therefore, the total project cost consists of the purchase of treated water from the City of Abilene ($3.09 per 1,000 gallons).
   - Annual Cost: $261,560

Table 4C.5-2.
Recommended Plan Costs by Decade for the City of Baird

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Shortage (acft/yr)	(252)	(247)	(241)	(236)	(232)	(232)
Conservation						
Supply from Plan Element (acft/yr)	11	26	20	15	11	11
Annual Cost ($/yr)	$5,225	$12,350	$9,500	$7,125	$5,225	$5,225
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Purchase Additional Water from City of Abilene						
Supply from Plan Element (acft/yr)	260	240	240	240	240	240
Annual Cost ($/yr)	$261,560	$241,440	$241,440	$241,440	$241,440	$241,440
Unit Cost ($/acft)	$1,006	$1,006	$1,006	$1,006	$1,006	$1,006

4C.5.2 City of Clyde

The City of Clyde uses surface water from local sources which is projected to supply 500 acft/yr from 2000 through 2060. 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 2060. No change in water supply is recommended.

4C.5.3 Coleman County WSC

Coleman County WSC obtains its water supply from the City of Coleman via Lake Coleman and no future shortage is projected. No changes in water supply are recommended. This WUG is located in multiple counties (Callahan and Taylor). The values shown in Table 4C.5-1 represent the cumulative totals for Coleman County WSC in these two counties.

4C.5.4 City of Cross Plains

The City of Cross Plains uses locally available groundwater for all of its water supply and a surplus is projected. No changes in water supply are recommended.

4C.5.5 County-Other

The water supply entities for County-Other show a projected surplus and no changes in water supply are recommended. Currently there is a contractual purchase of 61 acft/yr through 2060 from the City of Abilene.

4C.5.6 Manufacturing

No Manufacturing demand exists or is projected for the county.

4C.5.7 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.5.8 Mining

No Mining shortage exists or is projected for the county.

4C.5.9 Irrigation

Irrigation water use shows a projected surplus and no changes in water supply are recommended.

4C.5.10 Livestock

No Livestock shortage exists or is projected for the county.

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4C.6 Comanche County Water Supply Plan

Table 4C.6-1 lists each water user group in Comanche County and their corresponding surplus or shortage in years 2030 and 2060. There are no water user groups with a projected shortage, and no water supply plans have been developed for this county. A brief summary of the county WUGs is presented in the following subsections.

Table 4C.6-1. Comanche County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Comanche	0	0	Demand equals supply
City of De Leon	0	0	Demand equals supply
County-Other	394	482	Projected surplus
Manufacturing	8	1	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	50	53	Projected surplus
Irrigation	5,922	6,900	Projected surplus
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.

4C.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.

4C.6.2 City of DeLeon

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.

4C.6.3 County-Other

No shortage is projected for Comanche County-Other entities and no changes in water supply are recommended.

4C.6.4 Manufacturing

No shortage is projected for Comanche County Manufacturing and no changes in water supply are recommended.

4C.6.5 Steam-Electric

No shortage is projected for Comanche County Steam-Electric and no changes in water supply are recommended.

4C.6.6 Mining

No shortage is projected for Comanche County Mining and no changes in water supply are recommended.

4C.6.7 Irrigation

No shortage is projected for Comanche County Irrigation and no changes in water supply are recommended.

4C.6.8 Livestock

No shortages are projected for Comanche County Livestock and no changes in water supply are recommended.

4C.7 Coryell County Water Supply Plan

Table 4C.7-1 lists each water user group in Coryell County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.7-1.
Coryell County Surplus/(Shortage)

Water User Group	***Surplus/(Shortage)[1]***		***Comment***
	2030 (acft/yr)	***2060 (acft/yr)***	
City of Copperas Cove	0	0	Demand equals supply
Elm Creek WSC	[redacted]		See Bell County for Plan
Fort Gates WSC	0	0	Demand equals supply
Fort Hood (CDP)	[redacted]		See Bell County for Plan
City of Gatesville	(72)	(1,450)	Projected shortage – see plan below
Kempner WSC	1,095	(812)	Projected shortage – see plan below
County-Other	897	228	Projected surplus
Manufacturing	3	0	Projected surplus/ Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	12	7	Projected surplus
Irrigation	1,651	1,651	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.

4C.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 needs. No shortages are projected for the City of Copperas Cove and no changes in water supply are recommended. This WUG is located in Coryell and Lampasas Counties. The quantity shown in Table 4C.7-1 represents the cumulative totals for the City of Copperas Cove.

4C.7.2 Fort Gates WSC

The Fort Gates WSC receives treated water from the City of Gatesville and has a BRA contract for supplies from Lake Belton. No shortages are projected for Fort Gates WSC and no changes in water supply are recommended.

4C.7.3 City of Gatesville

4C.7.3.1 Description of Supply

- Source: Surface Water – From Lake Belton via a contract with BRA for 5,898 acft/yr.
- Estimated Reliable Supply: 5,000 acft/yr (limited by treatment plant capacity)
- System Description: The City of Gatesville owns and operates a regional treatment plant. Raw water is transferred from a raw water intake site 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 a contract to meet Fort Gates WSC needs estimated at 257 acft/yr in 2060.

4C.7.3.2 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 the City of Gatesville:

- Conservation, and
- Coryell County Reservoir (BRA System).

4C.7.3.3 Costs

Costs of the recommended plan for the City of Gatesville to meet the projected shortages are:

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: By Year 2010
   - Annual Cost: maximum of $158,175 in 2060

b. Coryell County Reservoir (BRA System)
   - Cost Source: Volume II, Section 4B.13.7 for the Reservoir and Section 4B.17 for transmission and treatment.
   - Date to be Implemented: By Year 2030
   - Annual Cost: $4,338,000 in 2030 (based on $1,007/acft wholesale water cost plus costs for transmission and treatment)

Table 4C.7-2.
Recommended Plan Costs by Decade for the City of Gatesville

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	1,439	673	(72)	(601)	(1,054)	(1,450)
Conservation						
Supply From Plan Element (acft/yr)	131	326	323	324	313	333
Annual Cost ($/yr)	$62,225	$154,850	$153,425	$153,900	$148,675	$158,175
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Coryell County Reservoir (BRA System)						
Supply From Plan Element (acft/yr)	—	—	1,500	1,500	1,500	1,500
Annual Cost ($/yr)	—	—	$4,338,000	$4,338,000	$2,286,000	$2,286,000
Unit Cost ($/acft)	—	—	$2,892	$2,892	$1,524	$1,524

4C.7.4 Kempner WSC

4C.7.4.1 Description of Supply

Kempner WSC has service area in portions of Coryell, Bell and Lampasas counties. The WSC has contracts with Central Texas WSC and BRA. Kempner WSC also has an agreement with the City of Kempner to meet its needs. Shortages are projected for Kempner WSC in 2050. The supplies shown in Table 4C.7-1 represent the cumulative totals for Kempner WSC.

4C.7.4.2 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 Kempner WSC

- Conservation
- Purchase water from Lampasas

4C.7.4.3 Costs

Costs of the recommended plan for Kempner WSC to meet the projected shortages are:

a. Conservation

   - Cost Source: Volume II. Section 4B.2.1
   - Date to be Implemented: By Year 2050
   - Annual Cost: $134,425 in 2060 (based on $475/acft)

b. Purchase water from Lampasas

- Cost Source: Volume II. Section 4B.17
- Date to be Implemented: By Year 2050
- Annual Cost: $912,000 in 2060 (based on $912/acft Lampasas' wholesale treated water cost)

Table 4C.7-3.
Recommended Plan Costs by Decade for Kempner WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	3,330	2,160	1,095	329	(286)	(812)
Conservation						
Supply From Plan Element (acft/yr)	81	241	265	272	268	283
Annual Cost ($/yr)	$38,475	$114,475	$125,875	$129,200	$127,300	$134,425
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Purchase from Lampasas						
Supply From Plan Element (acft/yr)	—	—	—	—	300	1,000
Annual Cost ($/yr)	—	—	—	—	$274,000	$912,000
Unit Cost ($/acft)	—	—	—	—	$912	$912

4C.7.5 County-Other

No shortages are projected for Coryell County-Other. However, local officials believe that recent developments in the Fort Hood area will significantly increase population growth and water demands over what is currently projected in this plan. Accordingly, 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 for Coryell County-Other receive water from BRA contracts.

4C.7.5.1 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 future needs for water supply entities included in Coryell County-Other:

- Coryell County Reservoir (BRA System)

4C.7.5.2 Costs

Costs of the recommended plan for County-Other to meet the future demands are:

a. Coryell County Reservoir (BRA System)

- Cost Source: Volume II, Section 4B.13.7 for the Reservoir and Section 4B.17 for transmission and treatment
- Date to be Implemented: By Year 2030
- Annual Cost: $5,308,000 in 2030 (based on $1,007/acft wholesale water cost plus costs for transmission and treatment).

Table 4C.7-4.
Recommended Plan Costs by Decade for the Coryell County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	1,623	1,255	897	648	422	228
Coryell County Reservoir (BRA System)						
Supply From Plan Element (acft/yr)	—	—	1,865	1,865	1,865	1,865
Annual Cost ($/yr)	—	—	$5,308,000	$5,308,000	$2,837,000	$2,837,000
Unit Cost ($/acft)	—	—	$2,846	$2,846	$1,521	$1,521

4C.7.6 Manufacturing

No shortages are projected for Coryell County Manufacturing and no changes in water supply are recommended.

4C.7.7 Steam-Electric

Coryell County has no current or projected future demand for Steam-Electric; therefore, no recommendations have been made.

4C.7.8 Mining

No shortages are projected for Coryell County Mining and no changes in water supply are recommended.

4C.7.9 Irrigation

No shortages are projected for Coryell County Irrigation and no changes in water supply are recommended.

4C.7.10 Livestock

No shortages are projected for Coryell County Livestock and no changes in water supply are recommended.

4C.8 Eastland County Water Supply Plan

Table 4C.8-1 lists each water user group in Eastland County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.8-1. Eastland County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)[1]*		*Comment*
	2030 (acft/yr)	*2060 (acft/yr)*	
City of Cisco	248	338	Projected surplus
City of Eastland	793	902	Projected surplus
City of Gorman	0	0	Supply equals demand
City of Ranger	416	458	Projected surplus
City of Rising Star	(9)	2	Projected shortage – see plan below
Stephens County Rural			See Stephens County for Plan
County-Other	(184)	(81)	Projected shortage – see plan below
Manufacturing	33	24	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	669	659	Projected surplus
Irrigation	(9,385)	(9,418)	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.

4C.8.1 City of Cisco

The City of Cisco uses surface water from Lake Cisco which yields 1,294 acft/yr through 2060. The surface water supply is constrained by the water treatment plant capacity for the City. Cisco also has a contract sale to supply water to Westbound WSC of 147 acft/yr through 2060. No shortages are projected for the City of Cisco and no changes in water supply are recommended.

4C.8.2 City of Eastland

The City of Eastland receives its surface water from a contract with Eastland County WSD. This contract supplies 1,791 acft/yr through 2060. Eastland has contracts to supply water to Westbound WSC and City of Carbon for a total of 120 acft/yr through 2060. No shortages are projected for the City of Eastland and no changes in water supply are recommended.

4C.8.3 City of Gorman

The City of Gorman purchases treated water from Upper Leon River MWD and no current or future shortage is projected. Therefore, no changes in water supply are recommended.

4C.8.4 City of Ranger

The City of Ranger is supplied with surface water from a contract with Eastland Co. WSD. This contract is scheduled to supply 710 acft/yr through 2060. No shortages are projected for the City of Ranger and no changes in water supply are recommended.

4C.8.5 City of Rising Star

4C.8.5.1 Description of Supply

The City of Rising Star uses locally available groundwater for its water supply; however, shortages are projected for 2010 through 2050.

4C.8.5.2 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 shortage of the City of Rising Star:

- Connect to Westbound WSC
- Conservation was also considered; however, the City's current per capita use rate is below the selected target of 140 gpcd.

4C.8.5.3 Costs

Costs of the Recommended Plan for the City of Rising Star.

a. Water Supply from Westbound WSC

  - Cost Source: *West Central Brazos Basin Regional Water Treatment and Distribution Facility Plan*, Freese and Nichols, 2004. (Volume II, Section 4.B.17)
  - Date to be Implemented: before 2010
  - Total Project Cost: $262,000

- Annual Cost: $262,050
- Unit Cost: $1,747/acft

Table 4C.8-2.
Recommended Plan Costs by Decade for City of Rising Star

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(16)	(13)	(9)	(5)	(1)	2
Water Supply from Connection to Westbound WSC						
Supply From Plan Element (acft/yr)	150	150	150	150	150	150
Annual Cost ($/yr)	$262,050	$262,050	$239,250	$239,250	$239,250	$239,250
Unit Cost ($/acft)	$1,747	$1,747	$1,595	$1,595	$1,595	$1,595

4C.8.6 County-Other Category

4C.8.6.1 Description of Supply

The water supply entities for County-Other show a projected shortage from 2010 through 2060. Currently contract purchases through 2060 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).

4C.8.6.2 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 shortage of County-Other:

- Purchase additional water from Eastland County WSD
- Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target of 140 gpcd.

4C.8.6.3 Costs

Costs of the Recommended Plan for the County-Other.

a. Water Supply from Eastland County WSD through the City of Eastland:
   - Cost Source: assumed treated wholesale water rate of $1,375/acft ($4.22/kgal)
   - Date to be Implemented: before 2010
   - Annual Cost: $412,500

Table 4C.8-3.
Recommended Plan Costs by Decade for Eastland County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(234)	(217)	(184)	(146)	(110)	(81)
Water Supply from Eastland County WSD (Lake Leon)						
Supply From Plan Element (acft/yr)	300	300	300	300	300	300
Annual Cost ($/yr)	$412,500	$412,500	$412,500	$412,500	$412,500	$412,500
Unit Cost ($/acft)	$1,375	$1,375	$1,375	$1,375	$1,375	$1,375

4C.8.7 Manufacturing

Eastland County Manufacturing shows a projected surplus and no changes in water supply are recommended.

4C.8.8 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.8.9 Mining

Eastland County Mining shows a projected surplus and no changes in water supply are recommended.

4C.8.10 Irrigation

4C.8.10.1 Description of Supply

Surface water supplies for Eastland County Irrigation are obtained from Lake Leon, the Leon River, and its tributaries. Irrigation supplies are insufficient and shortages for Irrigation are projected through year 2060.

4C.8.10.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and the TWDB, the following water supply plan is recommended to partially mitigate projected shortages for Irrigation:

- Conservation; and
- Brush Control and Weather Modification – these supplies are unquantifiable, see Volume II, Sections 4B.9 and 4B.10 for more detailed information.

4C.8.10.3 Costs

Cost of the Recommended Plan for Eastland County Irrigation.

a. Water Supply from Conservation:

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: 2010
- Annual Cost: maximum of $254,630 in 2060

Table 4C.8-4.
Recommended Plan Costs by Decade for Eastland County Irrigation

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(9,335)	(9,360)	(9,385)	(9,403)	(9,410)	(9,418)
Conservation						
Supply From Plan Element (acft/yr)	489	816	1,145	1,146	1,146	1,147
Annual Cost ($/yr)	$108,560	$181,150	$254,190	$254,410	$254,410	$254,630
Unit Cost ($/acft)	$222	$222	$222	$222	$222	$222

4C.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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4C.9 Erath County Water Supply Plan

Table 4C.9-1 lists each water user group in Erath County and their corresponding surplus or shortage in years 2030 and 2060.

Table 4C.9-1.
Erath County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Dublin	0	0	Demand equals supply
City of Stephenville	3,253	2,478	Projected surplus
County-Other	1,009	0	Projected surplus/ Demand equals supply
Manufacturing	25	1	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	0	0	No projected demand
Irrigation	7,705	8,155	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.

4C.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 their needs through the year 2060.

4C.9.2 City of Stephenville

The City of Stephenville obtains its water supply from groundwater from the Trinity Aquifer. The City has also recently completed the construction of a pipeline to Lake Proctor to receive water supplied through a contract with the Upper Leon MWD. With the completion of this project, the City has adequate water supplies to meet their needs through the year 2060.

4C.9.3 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.9.4 Manufacturing

Manufacturing is projected to have a surplus of water and no changes in water supply are recommended.

4C.9.5 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.9.6 Mining

No Mining demand exists or is projected for the county.

4C.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.

4C.9.8 Livestock

No shortages are projected for Livestock use and no changes in water supply are recommended.

4C.10 Falls County Water Supply Plan

Table 4C.10-1 lists each water user group in Falls County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.10-1.
Falls County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
Bell-Milam Falls WSC	[redacted]	[redacted]	See Bell County for Plan
Bruceville-Eddy	[redacted]	[redacted]	See McLennan County for Plan
East Bell County WSC	[redacted]	[redacted]	See Bell County for Plan
Elm Creek WSC	[redacted]	[redacted]	See Bell County for Plan
City of Lott	92	96	Projected surplus
City of Marlin	(2,039)	(2,276)	Projected shortage – see plan below
City of Rosebud	532	541	Projected surplus
Tri-County SUD	139	50	Projected surplus – see plan below
West Brazos WSC	(222)	(372)	Projected shortage – see plan below
County-Other	206	372	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	75	83	Projected surplus
Irrigation	10,816	10,944	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.

4C.10.1 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 184 acft/yr of supply, which exceeds its 2060 water demand of 88 acft/yr. No change in water supply is recommended.

4C.10.2 City of Marlin

4C.10.2.1 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 that authorize diversion of 4,000 acft/yr from the Brazos River and have 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.

4C.10.2.2 Water Supply Plan

The supplies projected are not adequate to meet the City's water demand through 2060.

The following plan is recommended by the Brazos G RWPG for the City of Marlin:

- Conservation.
- Additional supply from Brushy Creek Reservoir

4C.10.2.3 Costs

a. Conservation

- Date to be Implemented: before 2010 – use rate exceeds 140 gpcd
- Annual Cost: maximum of $161,500 in 2060

b. Brushy Creek Reservoir (Volume II, Section 4B.12.10)

- Cost Source: Transmission and Treatment (Volume II, Section 4B.17)
- Date to be Implemented: 2010
- Total Project Cost: $18,553,000
- Annual Cost: $1,012,000

Table 4C.10-2.
Recommended Plan Costs by Decade for the City of Marlin

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(1,860)	(1,949)	(2,039)	(2,113)	(2,183)	(2,276)
Conservation						
Supply From Plan Element (acft/yr)	46	112	141	169	242	340
Annual Cost ($/yr)	$21,850	$53,200	$66,975	$80,275	$114,950	$161,500
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Brushy Creek Reservoir						
Supply From Plan Element (acft/yr)	2,090	2,090	2,090	2,090	2,090	2,090
Annual Cost ($/yr)	$1,012,000	$1,012,000	$449,000	$449,000	$140,000	$140,000
Unit Cost ($/acft)	$485	$485	$215	$215	$67	$67

4C.10.3 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 693 acft/yr of supply and from BRA for 100 act/yr, which exceeds its 2060 projected water demand of 152 acft/yr. No change in water supply is recommended.

4C.10.4 Tri-County SUD

Tri-County SUD obtains its water supply from the Trinity and Carrizo-Wilcox Aquifers. Tri-County SUD has adequate water supplies to meet its projected water demands. Therefore, no water supply plan is recommended. This WUG is located in multiple counties (Limestone, McLennan, Robertson, and Falls). The surplus shown in Table 4C.10-1 represents the cumulative totals for Tri-County SUD in all counties it serves.

4C.10.5 West Brazos WSC

4C.10.5.1 Description of Supply

This WUG is located in multiple counties (McLennan and Falls). The shortages shown in Table 4C.10-3 represent the cumulative totals for West Brazos WSC in both counties.

- Source: Groundwater – Trinity Aquifer, and
- Estimated Reliable Supply: 127 acft/yr.

4C.10.5.2 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:

- Purchase water from the City of Waco.
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.10.5.3 Costs

Costs of the Recommended Plan for West Brazos WSC.

a. Purchase water from City of Waco:
   - Cost Source: $3.09 per 1,000 gal for wholesale water costs and necessary transmission line and pump station. (Section 4B.17)
   - Date to be Implemented: By year 2010
   - Annual Cost: $1,466,000

Table 4C.10-3.
Recommended Plan Costs by Decade for West Brazos WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(111)	(171)	(222)	(278)	(315)	(372)
Purchase water from City of Waco						
Supply From Plan Element (acft/yr)	450	450	450	450	450	450
Annual Cost ($/yr)	$1,466,000	$1,466,000	$555,000	$555,000	$555,000	$555,000
Unit Cost ($/acft)	$3,258	$3,258	$1,233	$1,233	$1,233	$1,233

4C.10.6 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.10.7 Manufacturing

Manufacturing is projected to have no additional need for water through the year 2060 and no changes in water supply are recommended.

4C.10.8 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

4C.10.9 Mining

Mining is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.10.10 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.10.11 Livestock

Livestock is projected to have a no additional need for water through the year 2060 and no changes in water supply are recommended.

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4C.11 Fisher County Water Supply Plan

Table 4C.11-1 lists each water user group in Fisher County and their corresponding surplus or shortage in years 2030 and 2060. There are no water user groups with a projected shortage in Fisher County, and no water supply plans have been developed. A brief summary of each WUG is presented in the following subsections.

Table 4C.11-1.
Fisher County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)*[1]		*Comment*
	2030 (acft/yr)	*2060 (acft/yr)*	
Bitter Creek WSC			See Nolan County for Plan
City of Roby	256	255	Projected surplus
City of Rotan	0	0	Demand equals supply
County-Other	94	152	Projected surplus
Manufacturing	85	4	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	229	246	Projected surplus
Irrigation	2,437	2,633	Projected surplus
Livestock	0	0	Demand equals supply

[1] From Tables C-21 and C-22, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

4C.11.1 City of Roby

Surface water supplies are obtained from the City of Sweetwater through contract purchase from Oak Creek Reservoir. No shortages are projected for the City of Roby and no changes in water supply are recommended.

4C.11.2 City of Rotan

The City of Rotan is currently purchasing water under contract from the City of Snyder. Supply is allocated based on projected demands; therefore, no change in water supply is recommended.

4C.11.3 County-Other

The water supply entities for Fisher County-Other show a projected surplus and no changes in water supply are recommended.

4C.11.4 Manufacturing

No shortages are projected for Fisher County Manufacturing, surpluses are projected through 2060. No changes in water supply are recommended.

4C.11.5 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.11.6 Mining

No shortages are projected for Fisher County Mining, surpluses are projected through 2060. No changes in water supply are recommended.

4C.11.7 Irrigation

No shortages are projected for Fisher County Irrigation, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.11.8 Livestock

No shortages are projected for Fisher County Livestock and no changes in water supply are recommended.

4C.12 Grimes County Water Supply Plan

Table 4C.12-1 lists each water user group in Grimes County and their corresponding surplus or shortage in years 2030 and 2060.

Table 4C.12-1.
Grimes County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Navasota	1,067	1,006	Projected surplus
Wickson Creek SUD			See Brazos County for Plan
County-Other	229	195	Projected surplus
Manufacturing	221	112	Projected surplus
Steam-Electric	(16,699)	(23,199)	Projected shortage – see plan below
Mining	24	24	Projected surplus
Irrigation	1,752	1,752	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.

4C.12.1 City of Navasota

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 2060. No change in water supply is recommended.

4C.12.2 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.12.3 Manufacturing

Grimes County Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.12.4 Steam-Electric Power

4C.12.4.1 Description of Supply

- Source: Surface Water – Gibbons Creek Reservoir (Texas Municipal Power Agency (TMPA)), BRA contract for water from Lake Limestone, and a contract with the City of Huntsville (Trinity River Authority - Lake Livingston)
- Estimated Reliable Supply: 16,461 acft/yr

4C.12.4.2 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 Grimes County Steam-Electric:

- Conservation,
- Raise the level of Gibbons Creek Reservoir. The TMPA operates the Gibbons Creek Power Station, which uses Gibbons Creek Reservoir to provide cooling water supply. The TMPA is considering alternatives for increasing supply from Gibbons Creek Reservoir. Raising the conservation pool from 247 feet to 251 feet would provide up to 3,870 acre-feet of additional supply,
- Purchase reuse water from the Cities of College Station and Bryan; and
- Additional Gulf Coast Aquifer Development
- Alternative: Millican Reservoir Panther Creek Site

4C.12.4.3 Costs

Costs of the Recommended Plan for Grimes County Steam-Electric.

a. Conservation:
    - Date to be Implemented: 2010
    - Annual Cost: Not determined

b. Raise level of Gibbons Creek Reservoir:
    - Cost Source: Cost estimate provided by TMPA and updated to September 2008 prices (Volume II, Section 4B.12.9)
    - Date to be Implemented: 2010
    - Total Project Cost: $12,140,600
    - Annual Cost: $919,000

c. Purchase reuse water from the Cities of College Station and Bryan:
    - Cost Source: Section 4B.17.3.7.
    - Date to be Implemented: By the year 2020

- Annual Cost: $7,743,000
- Unit Cost: $704/acft (includes intake and conveyance, and purchase of water)

d. Additional Gulf Coast Aquifer Development:

- Cost Source: Volume II, Section 4B.17.3.7
- Date to be Implemented: By the year 2040
- Annual Cost: $3,574,000
- Unit Cost: $638/acft

Table 4C.12-2.
Recommended Plan Costs by Decade for Grimes County Steam-Electric

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	4,461	(15,299)	(16,699)	(18,199)	(20,199)	(23,199)
Conservation						
Supply From Plan Element (acft/yr)	360	1,588	2,321	2,426	2,566	2,776
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Raise Level of Gibbons Creek Reservoir						
Supply From Plan Element (acft/yr)	—	3,870	3,870	3,870	3,870	3,870
Annual Cost ($/yr)	—	$919,000	$919,000	$919,000	$919,000	$112,000
Unit Cost ($/acft)	—	$237	$237	$237	$237	$29
Purchase Reuse Water from College Station and Bryan						
Supply From Plan Element (acft/yr)	—	11,000	11,000	11,000	11,000	11,000
Annual Cost ($/yr)	—	$7,743,000	$7,743,000	$4,810,000	$4,810,000	$4,810,000
Unit Cost ($/acft)	—	$704	$704	$437	$437	$437
Additional Gulf Coast Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	5,600	5,600	5,600
Annual Cost ($/yr)	—	—	—	$3,574,000	$3,574,000	$816,000
Unit Cost ($/acft)	—	—	—	$638	$638	$146

4C.12.5 Mining

Mining is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.12.6 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.12.7 Livestock

Livestock is not projected to have any shortage of water through the year 2060 and no changes in water supply are recommended.

4C.13 Hamilton County Water Supply Plan

Table 4C.13-1 lists each water user group in Hamilton County and their corresponding surplus or shortage in years 2030 and 2060.

Table 4C.13-1.
Hamilton County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Hamilton	501	519	Projected surplus
City of Hico	91	98	Projected surplus
County-Other	240	269	Projected surplus
Manufacturing	4	1	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	0	0	No projected demand
Irrigation	4,367	4,408	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.

4C.13.1 City of Hamilton

The City of Hamilton obtains its water supply from Lake Proctor through the Upper Leon Municipal Water District with a contract for 2,000 acft/yr of supply. The City of Hamilton sells a portion of its supply to Multi-County WSC. The City's available supply exceeds the 2060 demands. No change in water supply is recommended.

4C.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 2060. No change in water supply is recommended.

4C.13.3 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.13.4 Manufacturing

Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.13.5 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.13.6 Mining

No Mining demand exists or is projected for the county.

4C.13.7 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.13.8 Livestock

Livestock water supply is projected to meet demands through the year 2060 and no changes in water supply are recommended.

4C.14 Haskell County Water Supply Plan

Table 4C.14-1 lists each water user group in Haskell County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.14-1.
Haskell County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)*[1]		*Comment*
	2030 (acft/yr)	*2060 (acft/yr)*	
City of Haskell	(506)	(472)	Projected shortage –see plan below
City of Rule	48	57	Projected surplus
City of Stamford			See Jones County for Plan
County-Other	(2)	32	Projected surplus- see plan below
Manufacturing	0	0	No projected demand
Steam-Electric	505	248	Projected surplus
Mining	18	21	Projected surplus
Irrigation	(26,223)	(22,215)	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.

4C.14.1 City of Haskell

4C.14.1.1 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 2060.

4C.14.1.2 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 shortage of the city of Haskell:

- Conservation.
- Millers Creek Reservoir Augmentation strategy by NCTMWA (Volume II, Section 4B.7)). This will provide supply at least up to the current amount contracted from NCTMWA.

4C.14.1.3 Costs

Cost of the recommended plan for the City of Haskell.

a. Conservation

- Date to be Implemented: before 2010
- Annual Cost: maximum of $22,325 in 2020

b. Millers Creek Reservoir Augmentation strategy by NCTMWA:

- Date to be Implemented: before 2010
- Total Project Cost: none (Current infrastructure assumed to be adequate)
- Annual Cost: none (supply already purchased from NCTMWA).

Table 4C.14-2.
Recommended Plan Costs by Decade for the City of Haskell

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(539)	(522)	(506)	(495)	(483)	(472)
Conservation						
Supply From Plan Element (acft/yr)	23	47	36	26	19	18
Annual Cost ($/yr)	$10,925	$22,325	$17,100	$12,350	$9,025	$8,550
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Millers Creek Reservoir Augmentation by NCTMWA						
Supply From Plan Element (acft/yr)	538	542	534	550	554	558
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.14.2 City of Rule

The City of Rule shows a projected surplus and no changes in water supply are recommended.

4C.14.3 County-Other

4C.14.3.1 Description of Supply

The water supplies for Haskell County-Other are from contract purchases from the City of Stamford and from NCTMWA. Haskell County-Other entities have contracts that total 165 acft/yr from City of Stamford. However the treated supply from Stamford is constrained based on the water treatment plant capacity; reducing the quantity of available supply to meet the City of Stamford contractual demands.

4C.14.3.2 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 Haskell County-Other

- City of Stamford expanding the water treatment plant capacity
- Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target rate of 140 gpcd.

4C.14.3.3 Costs

There are no costs for the recommended plan for Haskell County-Other since this supply is currently contracted. Costs associated with this project for Stamford are described in Section 4C.38.17

Table 4C.14-3.
Recommended Plan Costs by Decade for Haskell County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(31)	(18)	(2)	8	19	32
Stamford - Increase Treatment Plant Capacity						
Supply From Plan Element (acft/yr)	98	98	98	98	98	98
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.14.4 Manufacturing

No Manufacturing demand exists or is projected for the county.

4C.14.5 Steam-Electric

Haskell County Steam-Electric shows a projected surplus through 2060 and no changes in water supply are recommended.

4C.14.6 Mining

Haskell County Mining shows a projected surplus and no changes in water supply are recommended.

4C.14.7 Irrigation

4C.14.7.1 Description of Supply

Current surface water supplies for Irrigation are not sufficient to meet demands through 2060.

4C.14.7.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended to mitigate a portion of the shortages for Haskell County Irrigation:

- Conservation.
- Implement brush control and weather modification programs. These supplies are unquantifiable; see sections 4B.9 and 4B.10 of Volume II for more detailed information.
- Seymour Aquifer Storage Recovery Project

These options are not sufficient to meet all of the projected needs for Irrigation in Haskell County.

4C.14.7.3 Costs

a. Conservation:

- Cost Source: Strategy Evaluation (Section 4B.2.2)
- Date to be Implemented: before 2010
- Annual Cost: maximum of $659,750 in 2030

b. Seymour Aquifer Storage Recovery Project

- Cost Source: Volume II, Section 4B.8.1
- Date to be Implemented: 2010
- Unit Cost: $701/acft
- Annual Cost: $2,175,900/year

Table 4C.14-4.
Recommended Plan Costs by Decade for Haskell County Irrigation

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Surplus/(Shortage) (acft/yr)	(29,105)	(27,643)	(26,223)	(24,844)	(23,509)	(22,215)
Conservation						
Supply From Plan Element (acft/yr)	1,479	2,392	3,250	3,153	3,059	2,968
Annual Cost ($/yr)	$300,240	$485,580	$659,750	$640,060	$620,980	$547,690
Unit Cost ($/acft)	$203	$203	$203	$203	$203	$203
Seymour Aquifer Storage Recovery Project						
Supply From Plan Element (acft/yr)	3,104	3,104	3,104	3,104	3,104	3,104
Annual Cost ($/yr)	$2,175,900	$2,175,900	$492,000	$492,000	$492,000	$492,000
Unit Cost ($/acft)	$701	$701	$158	$158	$158	$158

4C.14.8 Livestock

No shortages are projected for Haskell County Livestock and no changes in water supply are recommended.

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4C.15 Hill County Water Supply Plan

Table 4C.15-1 lists each water user group in Hill County and their corresponding surplus or shortage in years 2030 and 2060. 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 4C.15-1.
Hill County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
Brandon-Irene WSC	108	34	Projected surplus
Files Valley WSC	99	(150)	Projected shortage – see plan below
City of Hillsboro	2,208	1,305	Projected surplus
City of Hubbard	400	400	Projected surplus
City of Itasca	19	30	Projected surplus
Johnson County SUD	[redacted]		See Johnson County for Plan
Lake Whitney Water Co.	407	416	Projected surplus
Parker WSC	[redacted]		See Johnson County for Plan
White Bluff Community WS	(235)	(557)	Projected shortage – see plan below
City of Whitney	104	74	Projected surplus
Woodrow-Osceola WSC	(81)	(116)	Projected shortage – see plan below
County-Other	833	661	Projected surplus
Manufacturing	284	252	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	1,054	1,059	Projected surplus
Irrigation	3,308	3,310	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.

4C.15.1 Brandon-Irene WSC

Brandon-Irene WSC obtains its water from the Trinity Aquifer and surface water through a contract with Aquilla WSD. Surpluses are projected through 2060 for Brandon Irene WSC, and no changes in water supply are recommended.

4C.15.2 Files Valley WSC

4C.15.2.1 Description of Supply

- Source: Treated surface water from Lake Aquilla through Aquilla Water Supply District
- Estimated Reliable Supply: 638 acft/yr in 2060. Files Valley WSC has contracted for sufficient supplies, but cannot obtain those supplies due to yield reductions in Lake Aquilla.
- Files Valley WSC also provides water to Parker WSC and Milford

4C.15.2.2 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 the Files Valley WSC:

- Storage Reallocation in Lake Aquilla from Flood Control to Conservation Storage. Files Valley WSC will not need to contract for, or purchase, additional supply through Aquilla WSD. This strategy will firm up existing contractual supplies from Lake Aquilla[1].
- Conservation

4C.15.2.3 Costs

Costs of the Recommended Plan for Files Valley WSC.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: By year 2010
   - Annual Cost: maximum of $16,625 in 2020

b. Storage Allocation in Lake Aquilla (Volume II, Section 4B.18):
   - Cost Source: This strategy will have zero cost for Files Valley, as the necessary supplies are already contracted and the existing infrastructure is in place to convey the supply.
   - Date to be Implemented: By year 2040
   - Annual Cost: $0

[1] Future increases in the BRA System Rate will account for costs of the BRA to augment its existing supplies.

Table 4C.15-2.
Recommended Plan Costs by Decade for the Files Valley WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	127	113	99	38	(52)	(150)
Conservation						
Supply From Plan Element (acft/yr)	15	35	29	21	20	21
Annual Cost ($/yr)	$7,125	$16,625	$13,775	$9,975	$9,500	$9,975
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Storage Reallocation in Lake Aquilla						
Supply From Plan Element (acft/yr)	-	-	-	44	106	169
Annual Cost ($/yr)	-	-	-	-	-	-
Unit Cost ($/acft)	-	-	-	-	-	-

4C.15.3 City of Hillsboro

The City of Hillsboro purchases its water supply from the Aquilla WSD and has surpluses projected through 2060. No change in water supply is recommended.

4C.15.4 City of Hubbard

The City of Hubbard obtains its water supply the Trinity Aquifer and from surface water 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 to meet the needs of the City of Hubbard through the year 2060. No change in water supply is recommended.

4C.15.5 City of Itasca

The City of Itasca obtains its water supply from groundwater from the Trinity Aquifer. The existing production capacity of the wells and groundwater availability are adequate to supply the needs of the City of Itasca through the year 2060. No change in water supply is recommended.

4C.15.6 Lake Whitney Water Co.

The Lake Whitney Water Co. service area includes portions of Hill and Bosque County. The company obtains its water supply from groundwater from the Trinity Aquifer and a BRA contract (150 acft/yr). The existing production capacity of the well and the contract are adequate to supply the needs of the entity through the year 2060. No change in water supply is recommended. The surplus shown in Table 4C.15-1 represents the cumulative totals for Lake Whitney Water Co. in Hill and Bosque Counties.

4C.15.7 White Bluff Community WS

4C.15.7.1 Description of Supply

- Source: Groundwater – Trinity Aquifer
- Estimated Reliable Supply: 318 acft/yr

4C.15.7.2 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 the White Bluff Community WS:

- Conservation, and
- BRA System Operation.

4C.15.7.3 Costs

Costs of the Recommended Plan for the White Bluff Community WS.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: By year 2010
   - Annual Cost: maximum of $21,375 in 2060

b. BRA System Operation:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: By year 2010
   - Annual Cost: $1,287,000

Table 4C.15-3.
Recommended Plan Costs by Decade for the White Bluff Community WS

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(51)	(138)	(235)	(332)	(439)	(557)
Conservation						
Supply From Plan Element (acft/yr)	11	29	31	33	40	45
Annual Cost ($/yr)	$5,225	$13,775	$14,725	$15,675	$19,000	$21,375
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
BRA System Operation						
Supply From Plan Element (acft/yr)	600	600	600	600	600	600
Annual Cost ($/yr)	$1,287,000	$1,287,000	$478,300	$478,300	$478,300	$478,300
Unit Cost ($/acft)	$2,147	$2,147	$797	$797	$797	$797

4C.15.8 City of Whitney

The City of Whitney obtains its water supply from groundwater from the Trinity Aquifer. The City of Whitney has also contracted with the Brazos River Authority for 750 acft of surface water supply from Lake Whitney; however, the City has not implemented 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 2060.

4C.15.9 Woodrow-Osceola WSC

4C.15.9.1 Description of Supply

- Source: Groundwater – Trinity Aquifer, and
- Estimated Reliable Supply: 203 acft/yr.

4C.15.9.2 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 Woodrow-Osceola WSC:

- BRA System Operation; and
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.15.9.3 Costs

Costs of the Recommended Plan for Woodrow-Osceola WSC.

a. BRA System Operation:
- Cost Source: Strategy Evaluation (Volume II, Section 4B.17)
- Date to be Implemented: By year 2010
- Annual Cost: $819,000

Table 4C.15-4.
Recommended Plan Costs by Decade for Woodrow-Osceola WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(83)	(82)	(81)	(84)	(95)	(116)
BRA System Operation						
Supply From Plan Element (acft/yr)	150	150	150	150	150	150
Annual Cost ($/yr)	$819,000	$819,000	$189,000	$189,000	$189,000	$189,000
Unit Cost ($/acft)	$5,460	$5,460	$1,258	$1,258	$1,258	$1,258

4C.15.10 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.15.11 Manufacturing

Hill County Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.15.12 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

4C.15.13 Mining

Mining is projected to have surpluses through the year 2060 and no changes in water supply are recommended.

4C.15.14 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.15.15 Livestock

Livestock water supply is projected to meet demands through the year 2060 and no changes in water supply are recommended.

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4C.16 Hood County Water Supply Plan

Table 4C.16-1 lists each water user group in Hood County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.16-1.
Hood County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
Acton MUD	1,915	31	Projected surplus
City of Cresson	98	38	Projected surplus
City of DeCordova	0	0	Demand equals supply
City of Granbury	(3,109)	(5,577)	Projected shortage – see plan below
City of Lipan	(94)	(683)	Projected shortage – see plan below
Oak Trail Shores Subdivision	(345)	(333)	Projected shortage – see plan below
City of Tolar	(18)	(147)	Projected shortage – see plan below
County-Other	1,844	349	Projected surplus
Manufacturing	10,010	10,003	Projected surplus
Steam-Electric	36,653	32,175	Projected surplus
Mining	349	352	Projected surplus
Irrigation	9,597	9,787	Projected surplus
Livestock	0	0	Demand equals supply

[1] From Tables C-31 and C-32, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

4C.16.1 Acton MUD

Acton MUD service area includes portions of Hood and Johnson County. 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 BRA SWATS plant capacity. The City of Granbury and Acton MUD are in the process of transferring Granbury's portion of the BRA SWATS plant capacity to Acton MUD. The transfer will be completed in stages over several years. No shortages are projected for Acton MUD and no changes in water supply are recommended. The surplus shown in Table 4C.16-1 represents the cumulative totals for Acton MUD in Hood and Johnson Counties.

4C.16.2 City of Cresson

This WUG is located in multiple counties (Johnson and Hood). The surplus/shortages shown in Table 4C.16-1 represent the cumulative totals for the City of Cresson in Hood and Johnson Counties. Supplies for the City of Cresson are from the Trinity and Paluxy aquifers and are sufficient to meet the City's projected needs. No change in water supply is recommended.

4C.16.3 City of DeCordova

The City of DeCordova is a gated residential community, served by Acton MUD. Current supplies from Acton MUD are sufficient to meet projected demands and no change in water supply is recommended.

4C.16.4 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 has adequate surface water rights to meet its 2060 demand; however the supply is constrained by its water treatment plant capacity. Groundwater supply is also constrained between 2030 and 2060.

4C.16.4.1 Description of Supply

- Source: Trinity Aquifer and Lake Granbury
- Supply: 989 acft/yr

4C.16.4.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortage of the City of Granbury:

- Conservation.
- Water treatment plant expansion (14 MGD)

4C.16.4.3 Costs

Costs of the Recommended Plan for the City of Granbury.

a. Conservation:
  - Cost Source: Volume II, Section 4B.2.1
  - Date to be Implemented: before 2010
  - Annual Cost: maximum of $91,675 in 2060

b. Water treatment plant phased expansion (14 MGD total)
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: Phase I before 2010 and Phase II before 2050
   - Annual Cost: maximum of $3,765,031 in 2060

Table 4C.16-2..
Recommended Plan Costs by Decade for the City of Granbury

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,806)	(2,467)	(3,109)	(3,800)	(4,616)	(5,577)
Conservation						
Supply From Plan Element (acft/yr)	55	158	148	156	165	193
Annual Cost ($/yr)	$26,125	$75,050	$70,300	$74,100	$78,375	$91,675
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Water Treatment Plant Expansion						
Supply From Plan Element (acft/yr)	3,920	3,920	3,920	3,920	7,840	7,840
Annual Cost ($/yr)	$2,618,560	$2,618,560	$1,034,880	$1,034,880	$3,765,031	$3,765,031
Unit Cost ($/acft)	$668	$668	$264	$264	$480	$480

4C.16.5 City of Lipan

4C.16.5.1 Description of Supply

- Source: Trinity Aquifer
- Supply: 239 acft/yr

4C.16.5.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortage of the City of Lipan:

- Conservation.
- Trinity Aquifer Development
- Alternative strategies considered to meet needs include purchase of BRA System Operations Supply and purchase of treated water from the City of Granbury.

4C.16.5.3 Costs

Costs of the Recommended Plan for the City of Lipan.

a. Conservation:
- Cost Source: Volume II, Section 4B.2.1
- Date to be Implemented: before 2010
- Annual Cost: maximum of $20,900 in 2060

b. Trinity Aquifer Development:
- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: By year 2030
- Annual Cost: maximum in 2060 of $670,000
- The project cost includes nine 100 gpm wells drilled to a depth of 300 feet in the Trinity Aquifer.

Table 4C.16-3.
Recommended Plan Costs by Decade for the City of Lipan

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	68	-	(94)	(227)	(416)	(683)
Conservation						
Supply From Plan Element (acft/yr)	5	16	19	23	31	44
Annual Cost ($/yr)	$2,375	$7,600	$9,025	$10,925	$14,725	$20,900
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	-	-	100	227	418	685
Annual Cost ($/yr)	-	-	$134,000	$304,000	$451,000	$670,000
Unit Cost ($/acft)	-	-	$1,337	$1,337	$1,078	$978

4C.16.6 Oak Trail Shores Subdivision

4C.16.6.1 Description of Supply

- Source: Groundwater – Trinity Aquifer
- Estimated Reliable Supply: 147 acft/yr

4C.16.6.2 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 Oak Trail Shores Subdivision:

- Purchase 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.
- Alternative strategies considered to meet this need included purchase of BRA System Operations Supply and Development of additional Trinity Aquifer supplies.

4C.16.6.3 Costs

Costs of the Recommended Plan for Oak Trail Shores Subdivision.

a. Purchase Water from the City of Granbury:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2010
   - Annual Cost: $638,000

Table 4C.16-4.
Recommended Plan Costs by Decade for Oak Trail Shores Subdivision

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(364)	(357)	(345)	(337)	(333)	(333)
Purchase water from City of Granbury						
Supply From Plan Element (acft/yr)	390	390	390	390	390	390
Annual Cost ($/yr)	$638,000	$638,000	$427,000	$427,000	$427,000	$427,000
Unit Cost ($/acft)	$1,636	$1,636	$1,094	$1,094	$1,094	$1,094

4C.16.7 City of Tolar

4C.16.7.1 Description of Supply

- Source: Groundwater – Trinity Aquifer
- Supply: 195 acft/yr

4C.16.7.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortage of the City of Tolar:

- Conservation.
- Trinity Aquifer Development
- Alternative strategies considered to meet this need include purchase of BRA System Operations Supply and purchase of treated water from the City of Granbury.

4C.16.7.3 Costs

Costs of the Recommended Plan for the City of Tolar.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $7,600 in 2030

b. Trinity Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: By year 2030
   - Annual Cost: maximum of $89,000 in 2030

Table 4C.16-5. Recommended Plan Costs by Decade for the City of Tolar

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	52	16	(18)	(51)	(94)	(147)
Conservation						
Supply From Plan Element (acft/yr)	6	15	16	14	13	15
Annual Cost ($/yr)	$2,850	$7,125	$7,600	$6,650	$6,175	$7,125
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	-	-	100	100	100	150
Annual Cost ($/yr)	-	-	$89,000	$89,000	$15,000	$60,000
Unit Cost ($/acft)	-	-	$893	$893	$150	$399

4C.16.8 County-Other

Hood County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.16.9 Manufacturing

Hood Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.16.10 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 2060. 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, 26,847 acft/yr of this excess supply is now transferred to Somervell County (see Section 4C.30.4 Somervell County Steam-Electric). No other changes in water supply are recommended.

4C.16.11 Mining

Hood Mining is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.16.12 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.16.13 Livestock

No shortages are projected for Livestock use and no changes in water supply are recommended.

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4C.17 Johnson County Water Supply Plan

Table 4C.17-1 lists each water user group in Johnson County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.17-1.
Johnson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
Acton MUD			See Hood County for Plan
City of Alvarado	(300)	(504)	Projected shortage – see plan below
Bethany WSC	(73)	(244)	Projected shortage – see plan below
Bethesda WSC	(502)	(3,660)	Projected shortage – see plan below
City of Burleson	0	0	Demand equals supply
City of Cleburne	2,350	(1,954)	Projected shortage – see plan below
City of Cresson			See Hood County for Plan
City of Godley	(174)	(353)	Projected shortage – see plan below
City of Grandview	27	38	Projected surplus
Johnson County SUD	(4,828)	(16,704)	Projected shortage – see plan below
City of Joshua	0	0	Demand equals supply
City of Keene	365	(97)	Projected shortage – see plan below
City of Mansfield	0	0	Demand equals supply
Mountain Peak WSC	1,880	1,413	Projected surplus
Parker WSC	160	(114)	Projected shortage – see plan below
City of Rio Vista	133	96	Projected surplus
City of Venus	720	989	Projected surplus
County-Other	2,009	1,815	Projected surplus
Manufacturing	(2,141)	(3,232)	Projected shortage – see plan below
Steam-Electric	(5,656)	(5,656)	Projected shortage – see plan below
Mining	55	27	Projected surplus
Irrigation	839	839	Projected surplus
Livestock	0	0	Demand equals supply

[1] From Tables C-33 and C-34, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

4C.17.1 City of Alvarado

4C.17.1.1 Description of Supply

- Source: Groundwater – Trinity Aquifer. Emergency supplies from Johnson County SUD.
- Estimated Reliable Supply: 354 acft/yr

4C.17.1.2 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 Alvarado:

- Overdraft the Trinity Aquifer (in 2010 only).
- Purchase water from Johnson County SUD. This will require Johnson County SUD to implement recommended water management strategies to connect to the Mansfield supplies.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.17.1.3 Costs

Costs of the Recommended Plan for the City of Alvarado.

a. Overdraft the Trinity Aquifer:
   - Cost Source: None
   - Date to be Implemented: before 2010
   - Total Project Cost: No project cost – assumes current infrastructure is sufficient
   - Annual Cost: No annual cost – assumes current operating costs are sufficient

b. Purchase Water from Johnson County SUD
   - Cost Source: Assumed unit cost of $928/acft treated water based on Mansfield to JCSUD project cost (4C.17.8)
   - Date to be Implemented: before 2020
   - Annual Cost: $2,078,720 (at full implementation)

Table 4C.17-2.
Recommended Plan Costs by Decade for the City of Alvarado

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(216)	(253)	(300)	(343)	(412)	(504)
Overdraft Trinity Aquifer						
Supply From Plan Element (acft/yr)	401	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Purchase water from Johnson County SUD (Mansfield)						
Supply From Plan Element (acft/yr)	—	2,240	2,240	2,240	2,240	2,240
Annual Cost ($/yr)	—	$2,078,720	$2,078,720	$2,078,720	$2,078,720	$2,078,720
Unit Cost ($/acft)	—	$928	$928	$928	$928	$928

4C.17.2 Bethany WSC

4C.17.2.1 Description of Supply

- Source: Groundwater – Trinity Aquifer
- Estimated Reliable Supply: 358 acft/yr in 2060

4C.17.2.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for Bethany WSC:

- Purchase water from Johnson County SUD. This will require Johnson County SUD to implement recommended water management strategies to connect to the Mansfield supplies.
- Bethany WSC has expressed interest in purchasing water supplies from the City of Keene (BRA SWATS).
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.17.2.3 Costs

Costs of the Recommended Plan for Bethany WSC.

a. Purchase water from Johnson County SUD:
   - Cost Source: Volume II. Section 4B.17
   - Date to be Implemented: 2010

- Annual Cost: $1,107,000
- Unit Cost: $988/acft

Table 4C.17-3.
Recommended Plan Costs by Decade for Bethany WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	55	21	(73)	(113)	(169)	(244)
Purchase water from Johnson County SUD (Mansfield)						
Supply From Plan Element (acft/yr)	1,120	1,120	1,120	1,120	1,120	1,120
Annual Cost ($/yr)	$1,107,000	$1,107,000	$1047,000	$1,047,000	$1,047,000	$1,047,000
Unit Cost ($/acft)	$988	$988	$935	$935	$935	$935

4C.17.3 Bethesda WSC

4C.17.3.1 Description of Supply

- Source: Groundwater – Trinity Aquifer; Surface Water from Tarrant Regional Water District (TRWD) through Fort Worth system.
- Estimated Reliable Supply: 3,436 acft/yr in 2060

4C.17.3.2 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 Bethesda WSC:

- Purchase additional water from the City of Fort Worth (TRWD)
- Purchase water from the City of Arlington (TRWD)
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.17.3.3 Costs

Costs of the Recommended Plan for Bethesda WSC.

a. Purchase additional water from the City of Fort Worth:
   - Cost Source: Assumed unit cost of $815/acft treated water ($2.50/1,000 gal)
   - Date to be Implemented: before 2030
   - Annual Cost: $2,034,108 in 2060
   - Assume existing infrastructure sufficient to convey additional supply.

b. Purchase Water from the City of Arlington (TRWD):
- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: by 2030
- Annual Cost: $2,357,000

Table 4C.17-4.
Recommended Plan Costs by Decade for Bethesda WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	862	198	(502)	(1,285)	(2,427)	(3,660)
Purchase additional water from City of Fort Worth (TRWD)						
Supply From Plan Element (acft/yr)			291	839	1,633	2,496
Annual Cost ($/yr)			$237,301	$684,002	$1,330,681	$2,034,108
Unit Cost ($/acft)			$815	$815	$815	$815
Purchase water from City of Arlington (TRWD)						
Supply From Plan Element (acft/yr)			1,248	1,248	1,248	1,248
Annual Cost ($/yr)			$2,357,000	$2,357,000	$932,000	$932,000
Unit Cost ($/acft)			$1,889	$1,889	$747	$694

4C.17.4 City of Burleson

The City of Burleson obtains its water supply from Tarrant Regional Water District (TRWD). The city purchases water through the City of Fort Worth supply system. Based on the amount of supply currently available from TRWD, the demand is projected to equal the supply through the year 2060. No changes in water supply are recommended.

4C.17.5 City of Cleburne

4C.17.5.1 Description of Supply

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 wastewater reuse supplies for steam-electric customers in Johnson County. The city's water treatment plant has an average annual capacity of 9,229 acft/yr which is sufficient for the current surface water supply. The City of Cleburne is projected to have surpluses through year 2040 and shortages in 2050 and 2060.

4C.17.5.2 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 the City of Cleburne:

- Conservation
- Reuse (The City has implemented a reuse program, which it has committed to expanding.) This strategy includes expanded use of existing system and new west loop reuse line.
- Lake Whitney Supply – The project will develop 9,700 acre-feet per year of undeveloped water supply from Lake Whitney contracted to the City through the Brazos River Authority. This project would develop part of Cleburne's remaining contractual commitment for water from the Brazos River Authority, beyond the 5,300 acre-feet per year currently available from Lake Aquilla. The project would require a deep water intake, diversion pump station to take water out of Lake Whitney, an advanced water treatment facility for the Lake Whitney water, blending tanks, a booster pump station, and a pipeline to connect the Lake Whitney supply to the existing Barkman Pipeline for delivery to Cleburne, and all associated appurtenances for a fully functional and operational water supply delivery and treatment system. This project would supply the City of Cleburne and Johnson County Mining, Manufacturing, Steam-Electric, and Irrigation needs.
- Optimization of the surface water supplies from Lake Pat Cleburne, Lake Aquilla, Lake Whitney and any other future water supply through planned expansions of the City's existing water treatment plant – The first phase project would expand the existing water treatment plant by 5 MGD to meet projected peak-day needs and to supply treated water to City customers. This project would supply the City of Cleburne and Johnson county mining, manufacturing, steam electric and irrigation water through Cleburne.
- Alternate: Additional BRA supplies through system operations to mitigate loss of yield from BRA Lake Aquilla supplies due to sedimentation

4C.17.5.3 Costs

Costs of the Recommended Plan for the City of Cleburne.

a. Conservation
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: $275,500 (maximum annual cost in 2020)

b. Additional Reuse (to be used in conjunction with potable supplies to meet Johnson County Manufacturing and Steam-Electric demands see Section 4C.17.17 - 18):
   - Cost Source: Strategy Evaluation (Section 4B.3)
   - Date to be Implemented: before 2010
   - Annual Cost: $1,345,000

c. Phase I Lake Whitney Water Supply Project
   - Cost Source: Volume II, Section 4B.21.1 in September 2008 prices
   - Date to be Implemented: before 2020
   - Total Project Cost: $41,453,000
   - Annual Cost: $6,068,000

d. Future Phase Lake Whitney Water Supply Project
   - Cost Source: Volume II, Section 4B.20.2
   - Date to be Implemented: before 2020
   - Total Project Cost: $110,843,000 (Lake Aquilla Augmentation and Pipeline from Lake Aquilla to Cleburne.
   - Annual Cost: $7,012,000 (based on a unit cost of $926/acft)

e. Optimization of Surface Water Supplies (Water Treatment Plant Expansion)
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2020
   - Total Project Cost: $13,951,000
   - Annual Cost: $1,814,000

f. Alternate: Additional BRA supplies through system operations to mitigate loss of yield for BRA Lake Aquila supplies due to sedimentation
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2020
   - Annual Cost: $1,443,000

Table 4C.17-5.
Recommended Plan Costs by Decade for the City of Cleburne

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	4,101	3,448	2,350	1,007	(532)	(1,954)
Conservation						
Supply From Plan Element (acft/yr)	240	580	519	482	488	532
Annual Cost ($/yr)	$114,000	$275,500	$246,525	$228,950	$231,800	$252,700
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Additional reuse (Expanded Use of Existing System and New West Loop Reuse Line)						
Supply From Plan Element (acft/yr)	2,031	2,031	2,031	2,031	2,731	4,533
Annual Cost ($/yr)	$1,345,000	$1,345,000	$260,000	$260,000	$350,000	$580,000
Unit Cost ($/acft)	$662	$662	$128	$128	$128	$128
Phase I Lake Whitney Water Supply Project						
Supply From Plan Element (acft/yr)	2,128	2,128	2,128	2,128	2,128	2,128
Annual Cost ($/yr)	$6,068,000	$6,068,000	$2,454,000	$2,454,000	$2,454,000	$2,454,000
Unit Cost ($/acft)	$2,850	$2,850	$1,153	$1,153	$1,153	$1,153
Future Phases of Lake Whitney Water Supply Project						
Supply From Plan Element (acft/yr)	—	7,572	7,572	7,572	7,572	7,572
Annual Cost ($/yr)	—	$7,012,000	$7,012,000	$7,012,000	$7,012,000	$7,012,000
Unit Cost ($/acft)	—	$926	$926	$926	$926	$926
Optimization of Surface Water Supplies (Water Treatment Plant Expansion)						
Supply From Plan Element (acft/yr)	—	2,800	2,800	2,800	2,800	2,800
Annual Cost ($/yr)	—	$1,814,000	$1,814,000	$597,690	$597,690	$597,690
Unit Cost ($/acft)	—	$648	$648	$213	$213	$213

4C.17.6 City of Godley

4C.17.6.1 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 through 2060.

4C.17.6.2 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 shortages of the City of Godley:

- Purchase water from the BRA SWATS plant expansion through Johnson County SUD.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.17.6.3 Costs

Costs of the Recommended Plan for the City of Godley.

a. Purchase from BRA SWATS:
   - Cost Source: Based on treatment costs of $3.74/1000 gal plus purchase and transmission costs. Volume II, Section 4B.17
   - Date to be Implemented: before 2010
   - Unit Cost: $2,933/acft $9.00/1,000 gal)
   - Annual Cost: $1,100,000

Table 4C.17-6.
Recommended Plan Costs by Decade for the City of Godley

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Surplus/(Shortage) (acft/yr)	(91)	(130)	(174)	(219)	(279)	(353)
Purchase from BRA SWATS						
Supply From Plan Element (acft/yr)	375	375	375	375	375	375
Annual Cost ($/yr)	$1,100,000	$1,100,000	$519,000	$519,000	$519,000	$519,000
Unit Cost ($/acft)	$2,933	$2,933	$1,385	$1,385	$1,385	$1,385

4C.17.7 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 2060 and no changes in water supply are recommended.

4C.17.8 Johnson County SUD

4C.17.8.1 Description of Supply

Johnson County SUD obtains its water supply from groundwater from the Trinity Aquifer, and has two contracts for surface water supplies: (1) with the Brazos River Authority for water from Lake Granbury through the SWATS system and (2) with the City of Mansfield for water from the Tarrant Regional Water District. Both of these supplies are limited by infrastructure constraints reducing the water available to the WUG. Johnson County SUD is projected to have shortages through the year 2060. This WUG is located in multiple counties (Johnson, Tarrant (Region C), Ellis (Region C), and Hill). The surplus/shortages shown in Table 4C.17-7 represent the cumulative totals for Johnson County SUD.

4C.17.8.2 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 Johnson County SUD:

- Conservation
- Complete infrastructure project to convey contracted Mansfield supplies (9 MGD). NOTE: Net water available for Johnson County SUD is 6 MGD after meeting contracts of 1 MGD for Bethany WSC and 2 MGD for the City of Alvarado.
- Purchase water from the City of Grand Prairie (6 MGD).
- Additional Supply from BRA SWATS.

4C.17.8.3 Costs

Costs of the Recommended Plan for Johnson County SUD.

a. Conservation:
  - Cost Source: Volume II, Section 4B.2.1
  - Date to be Implemented: before 2010
  - Annual Cost: maximum of $2,456,225 in 2060

b. Complete infrastructure project to convey contracted Mansfield supplies
  - Cost Source: Volume II, Section 4B.17
  - Date to be Implemented: 2010
  - Total Project Cost: $27,182,000
  - Annual Cost: $9,359,000

c. Purchase water from the City of Grand Prairie

- Cost Source: Volume II, Section 4B.17
- Date to be Implemented:
- Total Project Cost: $35,646,000
- Annual Cost: $8,016,000

d. BRA SWATS plant expansion to full design capacity of 20 MGD (based on Johnson County SUD interest in SWATS current treatment capacity)

- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: 2020
- Annual Cost: $3,861,000 with debt service.

Table 4C.17-7.
Recommended Plan Costs by Decade for Johnson County SUD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	322	(2,102)	(4,828)	(8,078)	(12,209)	(16,704)
Conservation						
Supply From Plan Element (acft/yr)	491	1,485	2,085	3,008	4,241	5,171
Annual Cost ($/yr)	$233,225	$705,375	$990,375	$1,428,800	$2,014,475	$2,456,225
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Infrastructure project for City of Mansfield (TRWD) water[1]						
Supply From Plan Element (acft/yr)	10,080	10,080	10,080	10,080	10,080	10,080
Annual Cost ($/yr)	$9,359,000	$9,359,000	$6,989,000	$6,989,000	$6,989,000	$6,989,000
Unit Cost ($/acft)	$928	$928	$693	$693	$693	$693
Purchase water from the City of Grand Prairie						
Supply From Plan Element (acft/yr)	—	6,726	6,726	6,726	6,726	6,726
Annual Cost ($/yr)	—	$8,017,000	$8,017,000	$4,910,000	$4,910,000	$4,910,000
Unit Cost ($/acft)	—	$1,192	$1,192	$730	$730	$730
BRA SWATS expansion						
Supply From Plan Element (acft/yr)	—	3,170	3,170	3,170	3,170	3,170
Annual Cost ($/yr)	—	$3,861,000	$3,861,000	$1,512,000	$1,512,000	$1,512,000
Unit Cost ($/acft)	—	$1,218	$1,218	$477	$477	$477
1 – Note that 1 MGD of Mansfield supply to JCSUD is committed to Bethany WSC and 2 MGD is committed to Alvarado						

4C.17.9 City of Joshua

The City of Joshua obtains its water supply from Johnson County SUD. Johnson County SUD obtains its water supply from groundwater from the Trinity Aquifer, and has two contracts for surface water supplies: (1) with the Brazos River Authority for water from Lake Granbury through the SWATS system and (2) with the City of Mansfield for water from the Tarrant

Regional Water District. The demand is projected to equal the supply and no changes in water supply are recommended.

4C.17.10 City of Keene

4C.17.10.1 Description of Supply

The City of Keene obtains its water supply from groundwater from the Trinity Aquifer and a contract with the Brazos River Authority for surface water supplies from Lake Granbury through the BRA SWATS plant. The City of Keene is projected to have a shortage of 97 acft/yr in the year 2060.

4C.17.10.2 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 the City of Keene:

- BRA System Operation
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.17.10.3 Costs

Costs of the Recommended Plan for City of Keene.

a. BRA System operations:
  - Cost Source: Volume II, Section 4B.17
  - Date to be Implemented: 2060
  - Annual Cost: $481,000

Table 4C.17-8.
Recommended Plan Costs by Decade for City of Keene

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	543	458	365	267	135	(97)
BRA System Operation						
Supply From Plan Element (acft/yr)	—	—	—	—	—	157
Annual Cost ($/yr)	—	—	—	—	—	$481,000
Unit Cost ($/acft)	—	—	—	—	—	$3,064

4C.17.11 City of Mansfield

The City of Mansfield obtains its water supply from surface water from the Tarrant Regional Water District (TRWD), principally located in Region C. The City has contracted for sufficient quantity of water supply to meet its projected needs through the year 2060.

4C.17.12 Mountain Peak SUD (Formerly Mountain Peak WSC)

Mountain Peak SUD (which remains Mountain Peak WSC in the TWDB database) obtains its water supply from groundwater from the Trinity Aquifer 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 2060. No changes in water supply are recommended.

4C.17.13 Parker WSC

4C.17.13.1 Description of Supply

Parker WSC obtains its water supply from groundwater from the Trinity Aquifer and surface water supplies from Files Valley WSC (Aquilla WSD). Based on the existing supply available from groundwater, a shortage of 152 acft/yr is projected in the year 2060. This WUG is located in multiple counties (Johnson and Hill). The surplus/shortages shown in Table 4C.17-10 represent the cumulative totals for Parker WSC.

4C.17.13.2 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 Parker WSC:

- Trinity Aquifer development (101 acft/yr per survey completed during Phase 1 Four-County Study)
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.17.13.3 Costs

Costs of the Recommended Plan for Parker WSC.

a. Trinity Aquifer Development:
   - Cost Source: Volume II. Section 4B.17
   - Date to be Implemented: 2040
   - Annual Cost: $214,000
   - Unit Cost: $1,338/ acft
   - Project costs include development of two 200 gpm wells in the Trinity Aquifer at a depth of 1,600 feet.

Table 4C.17-9.
Recommended Plan Costs by Decade for Parker WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	280	221	160	89	(1)	(114)
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	—	160	160
Annual Cost ($/yr)	—	—	—	—	$214,000	$214,000
Unit Cost ($/acft)	—	—	—	—	$1,338	$1,338

4C.17.14 City of Rio Vista

The City of Rio Vista obtains its water supply from groundwater from the Trinity Aquifer. No shortage is projected for the City of Rio Vista, surpluses are projected through 2060. No changes in water supply are recommended.

4C.17.15 City of Venus

The City of Venus obtains its water supply from groundwater from the Trinity and Woodbine Aquifers and surface water from the City of Midlothian (TRWD). The city has a sufficient quantity of water supply to meet its projected needs through the year 2060. No shortage is projected for the City of Venus and no changes in water supply are recommended.

4C.17.16 County-Other

Johnson County-Other obtains its water supply primarily from groundwater from the Trinity and Woodbine Aquifers. No shortage is projected for Johnson County-Other, surpluses are projected through 2060. No changes in water supply are recommended.

4C.17.17 Manufacturing

4C.17.17.1 Description of Supply

Johnson County Manufacturing obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, Johnson County Manufacturing is projected to have shortages through the year 2060.

4C.17.17.2 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 Johnson County Manufacturing:

- Conservation, and
- Purchase water from the City of Cleburne.

4C.17.17.3 Costs

Costs of the recommended plan for Johnson County Manufacturing to meet the projected shortages are:

a. Conservation:
    - Date to be Implemented: before 2010
    - Annual Cost: Not determined

b. Purchase water from the City of Cleburne:
    - Cost Source: Volume II, Section 4B.3
    - Date to be Implemented: before 2010
    - Annual Cost: $2,061,000

Table 4C.17-10.
Recommended Plan Costs by Decade for Johnson County Manufacturing

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,359)	(1,755)	(2,141)	(2,533)	(2,884)	(3,232)
Conservation						
Supply From Plan Element (acft/yr)	64	126	203	231	255	280
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Purchase water from the City of Cleburne (reuse and potable)						
Supply From Plan Element (acft/yr)	1,363	1,717	2,045	2,429	2,773	3,114
Annual Cost ($/yr)	$902,000	$1,137,000	$1,354,000	$1,608,000	$1,836,000	$2,061,000
Unit Cost ($/acft)	$662	$662	$662	$662	$662	$662

4C.17.18 Steam-Electric

4C.17.18.1 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 2060.

4C.17.18.2 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 Johnson County Steam-Electric:

- Conservation, and
- Purchase additional water from City of Cleburne

4C.17.18.3 Costs

Costs of the recommended plan for Johnson County Steam-Electric to meet the projected shortages are:

a. Conservation:
   - Date to be Implemented: before 2010
   - Annual Cost: Not determined

b. Purchase water from the City of Cleburne:
   - Cost Source: Strategy Evaluation (Volume II, Section 4B.3)
   - Date to be Implemented: before 2010
   - Annual Cost: $3,607,000

Table 4C.17-11.
Recommended Plan Costs by Decade for Johnson County Steam-Electric

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(2,156)	(5,656)	(5,656)	(5,656)	(5,656)	(5,656)
Conservation						
Supply From Plan Element (acft/yr)	105	350	490	490	490	490
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Purchase water from City of Cleburne						
Supply From Plan Element (acft/yr)	2,159	5,589	5,449	5,449	5,449	5,449
Annual Cost ($/yr)	$1,429,000	$3,700,000	$3,607,000	$3,607,000	$3,607,000	$3,607,000
Unit Cost ($/acft)	$662	$662	$662	$662	$662	$662

4C.17.19 Mining

Johnson County Mining obtains its water supply from groundwater from the Trinity Aquifer, the City of Cleburne, and various run-of-river rights. Johnson County Mining is projected to have surpluses through 2060 and no changes in water supply are recommended.

4C.17.20 Irrigation

Johnson County Irrigation obtains its water supply from groundwater from the Trinity Aquifer and local suppliers. No shortage is projected for Johnson County Irrigation and no changes in water supply are recommended.

4C.17.21 Livestock

Johnson County Livestock obtains its water supply from groundwater from the Trinity Aquifer and local suppliers. No shortage is projected for Johnson County Livestock and no changes in water supply are recommended.

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4C.18 Jones County Water Supply Plan

Table 4C.18-1 lists each water user group in Jones County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.18-1.
Jones County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Abilene			See Taylor County for Plan
City of Anson	274	391	Projected surplus
City of Hamlin	182	223	Projected surplus
City of Hawley	0	0	Demand equals supply
Hawley WSC	26	24	Projected surplus
City of Stamford	(2,750)	(2,684)	Projected shortage – see Section 4C.38
County-Other	(46)	(29)	Projected shortage – see plan below
Manufacturing	0	0	No projected demand
Steam-Electric	14,043	13,853	Projected surplus
Mining	59	56	Projected surplus
Irrigation	1,820	2,152	Projected surplus
Livestock	0	00	Demand equals supply

[1] From Tables C-35 and C-36, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

4C.18.1 City of Anson

The City of Anson obtains water from Hubbard Creek Reservoir through a contract with the WCTMWD. It has a projected surplus for the study period and no changes in water supply are recommended.

4C.18.2 City of Hamlin

The City of Hamlin obtains water from the a portion of the City of Anson's contract with the WCTMWD from Hubbard Creek Reservoir. This water is treated and delivered by the City of Abilene. The City has a projected surplus and no changes in water supply are recommended.

4C.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.

4C.18.4 Hawley WSC

This WUG is located in multiple counties (Shackelford, Taylor, and Jones). The surplus shown in Table 4C.18-1 represents the cumulative totals for Hawley WSC. Hawley WSC is supplied with water from the City of Abilene and no changes in water supply are recommended.

4C.18.5 City of Stamford

The recommended water supply plan for the City of Stamford is included in Section 4C.38 with the wholesale water providers.

4C.18.6 County-Other

4C.18.6.1 Description of Supply

Jones County-Other entities (City of Lueders and Ericksdahl WSC) have contracts for a total of 89 acft/yr from City of Stamford. However the treated supply from Stamford is constrained based on the water treatment plant capacity; reducing the firm supply available to meet the City of Stamford's contractual demands.

4C.18.6.2 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 Jones County-Other

- City of Stamford expanding the water treatment plant capacity
- Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target rate of 140 gpcd.

4C.18.6.3 Costs

There are no costs for the recommended plan for Jones County-Other since this supply is currently contracted. Costs associated with this project for Stamford are indicated in Section 4C.38.17.3.

Table 4C.18-2.
Recommended Plan Costs by Decade for Jones County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(52)	(50)	(46)	(40)	(34)	(29)
Stamford - Increase Treatment Plant Capacity						
Supply From Plan Element (acft/yr)	53	53	53	53	53	53
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.18.7 Manufacturing

Projected manufacturing demand for Jones County Manufacturing is zero through year 2060 and no changes in water supply are recommended.

4C.18.8 Steam-Electric

No shortages are projected for Steam-Electric. Surpluses are expected through year 2060 and no changes in water supply are recommended.

4C.18.9 Mining

No shortages are projected for Mining. Surpluses are expected through year 2060 and no changes in water supply are recommended.

4C.18.10 Irrigation

No shortages are projected for Irrigation. Surpluses are expected through year 2060 and no changes in water supply are recommended.

4C.18.11 Livestock

No shortages are projected for Livestock and no changes in water supply are recommended.

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4C.19 Kent County Water Supply Plan

Table 4C.19-1 lists each water user group in Kent County and their corresponding surplus or shortage in years 2030 and 2060. There are no water user groups with a projected shortage, and no water supply plans have been developed for these water user groups. A brief summary of each water user group supply is presented in the following subsections.

Table 4C.19-1.
Kent County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Jayton	(95)	(57)	Projected shortage – see plan below
County-Other	8	21	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	474	502	Projected surplus
Irrigation	1,239	1,271	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.

4C.19.1 City of Jayton

Water supply for the City of Jayton is groundwater from the Seymour and Dockum Aquifers. It is estimated that Jayton has sufficient supplies through 2060. 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 2060. The following water supply plan is recommended.

4C.19.1.1 Description of Supply

- Source: Groundwater – Seymour and Dockum Aquifers high in TDS and sulfates
- Estimated Reliable Supply: 0 acft/yr without salinity treatment

4C.19.1.2 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:

- Conservation
- New water treatment plant (0.4 MGD)

4C.19.1.3 Costs

Costs of the Recommended Plan for the City of Jayton.

a. Conservation
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: $3,800

b. New Water Treatment Plant (0.4 MGD)
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2010
   - Annual Cost: $488,000

Table 4C.19-2.
Recommended Plan Costs by Decade for the City of Jayton

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(112)	(108)	(95)	(75)	(66)	(57)
Conservation						
Supply From Plan Element (acft/yr)	3	8	6	3	3	2
Annual Cost ($/yr)	$1,425	$3,800	$2,850	$1,425	$1,425	$950
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
New Water Treatment Plant (0.4 MGD)						
Supply From Plan Element (acft/yr)	224	224	224	224	224	224
Annual Cost ($/yr)	$488,000	$488,000	$181,000	$181,000	$181,000	$181,000
Unit Cost ($/acft)	$2,179	$2,179	$809	$809	$809	$809

4C.19.2 County-Other

Water supply for County-Other is groundwater from local groundwater, and the Seymour and Dockum Aquifers. No shortages are projected, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.19.3 Manufacturing

No Manufacturing demand exists or is projected for the county.

4C.19.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.19.5 Mining

No shortages are projected for Mining, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.19.6 Irrigation

No shortages are projected for Irrigation, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.19.7 Livestock

No shortages are projected for Livestock, the demand equals the supply, and no changes in water supply are recommended.

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4C.20 Knox County Water Supply Plan

Table 4C.20-1 lists each water user group in Knox County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.20-1.
Knox County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
Knox City	(220)	(216)	Projected shortage – see plan below
City of Munday	(255)	(250)	Projected shortage – see plan below
County-Other	(9)	2	Projected shortage – see plan below
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	2	2	Projected surplus
Irrigation	(13,267)	(10,389)	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.

4C.20.1 Knox City

4C.20.1.1 Description of Supply

Knox City obtains surface water via a contract with North Central Texas Municipal Water Authority (NCTMWA) and current supplies are insufficient to meet projected demands in years 2010 through 2060.

4C.20.1.2 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 shortage of Knox City:

- Conservation
- Millers Creek Reservoir Augmentation strategy by NCTMWA (Section 4B.12.9)). This will provide supply up to the current amount contracted from NCTMWA.

4C.20.1.3 Costs

Costs of the Recommended Plan for Knox City

a. Conservation

- Cost Source: Volume II, Section 4B.2.1
- Date to be Implemented: 2010
- Annual Cost: maximum of $9,975 in 2060

b. Millers Creek Reservoir Augmentation strategy by NCTMWA (Volume II, Section 4B.7):

- Date to be Implemented: by 2010
- Total Project Cost: none (current infrastructure assumed sufficient)
- Annual Cost: none (supply already purchased from NCTMWA)

Table 4C.20-2.
Recommended Plan Costs by Decade for Knox City

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(217)	(222)	(220)	(219)	(217)	(216)
Conservation						
Supply From Plan Element (acft/yr)	9	21	17	13	11	11
Annual Cost ($/yr)	$4,275	$9,975	$8,075	$6,175	$5,225	$5,225
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Millers Creek Reservoir Augmentation by NCTMWA						
Supply From Plan Element (acft/yr)	220	221	225	225	226	228
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.20.2 City of Munday

4C.20.2.1 Description of Supply

The City of Munday obtains surface water via a contract with NCTMWA and current supplies are insufficient to meet projected demands in years 2010 through 2060.

4C.20.2.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended to meet the shortages projected for the City of Munday:

- Conservation

- Millers Creek Reservoir Augmentation strategy by NCTMWA (Volume II, Section 4B.7). This will provide supply up to the current amount contracted from NCTMWA.

4C.20.2.3 Costs

Costs of the Recommended Plan for the City of Munday:

a. Conservation

- Cost Source: Volume II, Section 4B.2.1
- Date to be Implemented: 2010
- Annual Cost: maximum of $11,400 in 2020

b. Millers Creek Reservoir Augmentation strategy by NCTMWA :

- Date to be Implemented: before 2010
- Total Project Cost: none (Current infrastructure assumed to be adequate)
- Annual Cost: none (supply already purchased from NCTMWA).

c. Additional water supply from NCTMWA:

- Date to be Implemented: 2010
- Total Project Cost: none (current infrastructure assumed to be adequate)
- Unit Cost: $401/acft ($1.23/1,000 gal based on FY2009 wholesale treated water cost)
- Annual Cost: $17,243

Table 4C.20-3.
Recommended Plan Costs by Decade for the City of Munday

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(259)	(258)	(255)	(252)	(249)	(250)
Conservation						
Supply From Plan Element (acft/yr)	10	24	19	14	10	10
Annual Cost ($/yr)	$4,750	$11,400	$9,025	$6,650	$4,750	$4,750
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Millers Creek Reservoir Augmentation by NCTMWA						
Supply From Plan Element (acft/yr)	227	228	232	232	233	235
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Additional Supply from NCTMWA						
Supply From Plan Element (acft/yr)	43	43	43	43	43	43
Annual Cost ($/yr)	$17,243	$17,243	$17,243	$17,243	$17,243	$17,243
Unit Cost ($/acft)	$401	$401	$401	$401	$401	$401

4C.20.3 County-Other Category

4C.20.3.1 Description of Supply

The Knox County-Other entities obtain surface water via contracts with NCTMWA and current supplies are insufficient to meet projected demands in years 2010 through 2050.

4C.20.3.2 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 of the County-Other entities.

- Millers Creek Reservoir Augmentation strategy by NCTMWA (Volume II, Section 4B.7). This will provide supply up to the current amounts contracted from NCTMWA.
- Conservation was also considered; however, the County-Other’s current per capita use rate is below the selected target of 140 gpcd.

4C.20.3.3 Costs

Costs of the Recommended Plan for County Other:

a. Millers Creek Reservoir Augmentation strategy by NCTMWA:

- Date to be Implemented: before 2010
- Total Project Cost: none (Current infrastructure assumed to be adequate)
- Annual Cost: none (supply already purchased from NCTMWA).

Table 4C.20-4.
Recommended Plan Costs by Decade for Knox County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(10)	(12)	(9)	(4)	(2)	2
Millers Creek Reservoir Augmentation by NCTMWA						
Supply From Plan Element (acft/yr)	25	25	25	20	20	20
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.20.4 Manufacturing

No Manufacturing demand exists or is projected for the county.

4C.20.5 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.20.6 Mining

No shortages are projected for Mining, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.20.7 Irrigation

4C.20.7.1 Description of Supply

Surface water supplies for Irrigation in Knox County are obtained from Wild Horse Creek, Lake Catherine, and Lake Davis. Irrigation shortages are projected through 2060.

4C.20.7.2 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 Irrigation shortages in the county; however, the recommended strategies cannot meet the entire projected shortages:

- Conservation

- Brush Control (unquantifiable costs and savings)
- Weather Modification (unquantifiable costs and savings)
- Seymour Aquifer Storage Recovery Project

4C.20.7.3 Costs

Costs of the Recommended Plan for Irrigation.

a. Additional water supply from Conservation

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: 2010
- Unit Cost: $280/acft of water saved
- Annual Cost: maximum of $784,560 in 2030

b. Seymour Aquifer Storage Recovery Project

- Cost Source: Volume II, Section 4B.8.1
- Date to be Implemented: 2010
- Unit Cost: $701/acft
- Annual Cost: $2,175,900/year

Table 4C.20-5.
Recommended Plan Costs by Decade for Knox County Irrigation

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(15,307)	(14,275)	(13,267)	(12,283)	(11,324)	(10,389)
Conservation						
Supply From Plan Element (acft/yr)	1,262	2,052	2,802	2,733	2,666	2,600
Annual Cost ($/yr)	$353,360	$574,560	$784,560	$765,240	$746,480	$728,000
Unit Cost ($/acft)	$280	$280	$280	$280	$280	$280
Seymour Aquifer Storage Recovery Project						
Supply From Plan Element (acft/yr)	3,104	3,104	3,104	3,104	3,104	3,104
Annual Cost ($/yr)	$2,175,900	$2,175,900	$492,000	$492,000	$492,000	$492,000
Unit Cost ($/acft)	$701	$701	$159	$159	$159	$159

4C.20.8 Livestock

No future shortages are projected for Livestock uses, the demand is projected to equal the supply, and no changes in water supply are recommended.

4C.21 Lampasas County Water Supply Plan

Table 4C.21-1 lists each water user group in Lampasas County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.21-1.
Lampasas County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
Copperas Cove			See Coryell County for Plan
City of Kempner	0	0	Demand equals supply
Kempner WSC			See Coryell County for Plan
City of Lampasas	3,516	3,541	Projected surplus
City of Lometa	0	0	Demand equals supply
County-Other	137	2	Projected surplus
Manufacturing	(135)	(169)	Projected shortage – see plan below
Steam-Electric	0	0	No projected demand
Mining	94	105	Projected surplus
Irrigation	1,104	1,095	Projected surplus
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.

4C.21.1 City of Kempner

The City of Kempner obtains its water supply from surface water from Kempner WSC. The city has a sufficient quantity of water supply to meet its projected needs through the year 2060. No shortage is projected for the City of Kempner and no changes in water supply are recommended.

4C.21.2 City of Lampasas

The City of Lampasas obtains its water supply from surface water from the Central Texas WSC via Kempner WSC (Lake Stillhouse Hollow). The City also has additional run of river rights. No shortage is projected for the City of Lampasas and no changes in water supply are recommended. A portion of Lampasas' surplus supplies may be made available to Kempner WSC to meet shortages in 2050 as indicated in Section 4C.7.4

4C.21.3 City of Lometa

City of Lometa water system is owned by the Lower Colorado River Authority, and is supplied water from the LCRA Highland Lakes System. The city has a sufficient quantity of water supply to meet its projected needs through the year 2060. No shortage is projected for the City of Lometa and no changes in water supply are recommended.

4C.21.4 County-Other

Lampasas County-Other obtains its water supply from groundwater from the Trinity Aquifer. Surpluses are projected through 2060 and no changes in water supply are recommended.

4C.21.5 Manufacturing

4C.21.5.1 Description of Supply

Lampasas County Manufacturing obtains its water supply from run-of-river rights. Based on the available surface water supply, Lampasas County Manufacturing is projected to have shortages through year 2060.

4C.21.5.2 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 Lampasas County Manufacturing:

- Conservation, and
- Purchase water from the City of Lampasas.

4C.21.5.3 Costs

Costs of the recommended plan for Lampasas County Manufacturing to meet the projected shortages are:

a. Conservation:
   - Date to be Implemented: before 2010
   - Annual Cost: Not determined

b. Purchase water from the City of Lampasas:
   - Cost Source: estimated wholesale treated water rate of $912/acft. (Volume II, Section 4B.17)
   - Date to be Implemented: By 2010
   - Annual Cost: $246,000

Table 4C.21-2.
Recommended Plan Costs by Decade for Lampasas County Manufacturing

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(111)	(124)	(135)	(146)	(156)	(169)
Conservation						
Supply From Plan Element (acft/yr)	4	7	11	11	12	13
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Purchase water from the City of Lampasas						
Supply From Plan Element (acft/yr)	165	165	165	165	165	165
Annual Cost ($/yr)	$246,000	$246,000	$161,000	$161,000	$161,000	$161,000
Unit Cost ($/acft)	$1,491	$1,491	$974	$974	$974	$974

4C.21.6 Steam-Electric

No Steam-Electric demand is projected for Lampasas County.

4C.21.7 Mining

Lampasas County Mining obtains its water supply from groundwater from the Trinity and Marble Falls Aquifers. Lampasas County Mining is projected to have surpluses through the year 2060 and no changes in water supply are recommended.

4C.21.8 Irrigation

No shortages are projected for Irrigation, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.21.9 Livestock

No shortages are projected for Livestock, the demand is projected to equal the supply, and no changes in water supply are recommended.

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4C.22 Lee County Water Supply Plan

Table 4C.22-1 lists each water user group in Lee County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.22-1.
Lee County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
Aqua WSC	(113)	(264)	Projected shortage – see plan below
City of Giddings	365	102	Projected surplus
Lee County WSC	(383)	(595)	Projected shortage – see plan below
City of Lexington	356	293	Projected surplus
Manville WSC	[redacted]		See Williamson County for Plan
Southwest Milam WSC	[redacted]		See Milam County for Plan
County-Other	26	46	Projected surplus
Manufacturing	3	0	Projected surplus/ Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	0	0	Demand equals supply
Irrigation	189	262	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.

4C.22.1 Aqua WSC

4C.22.1.1 Description of Supply

Aqua WSC obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. Based on the existing supply available from groundwater, a shortage is projected from year 2020 through year 2060. This WUG is located in multiple counties (Williamson and Lee). The surplus/shortages shown in Table 4C.22-2 represent the cumulative totals for Aqua WSC.

4C.22.1.2 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 Aqua WSC:

- Carrizo-Wilcox Aquifer Development.
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.22.1.3 Costs

Costs of the Recommended Plan for Aqua WSC.

a. Additional Carrizo-Wilcox Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: By year 2020
   - Total Project Cost: $1,364,000
   - Annual Cost: $177,000
   - The project cost includes one 500 gpm well drilled to a depth of 1,000 feet in the Carrizo-Wilcox Aquifer.

Table 4C.22-2. Recommended Plan Costs by Decade for Aqua WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	3	(60)	(113)	(166)	(214)	(264)
Additional Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)		403	403	403	403	403
Annual Cost ($/yr)		$177,000	$177,000	$58,000	$58,000	$58,000
Unit Cost ($/acft)		$439	$439	$143	$143	$143

4C.22.2 City of Giddings

The City of Giddings obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. There are surpluses projected through 2060 and no changes in water supply are recommended.

4C.22.3 Lee County WSC

4C.22.3.1 Description of Supply

Lee County WSC obtains its water supply from groundwater from the Queen City Aquifer. Shortages are projected through 2060.

4C.22.3.2 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 Lee County WSC:

- Carrizo-Wilcox Aquifer Development.
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.22.3.3 Costs

Costs of the Recommended Plan for Lee County WSC.

a. Carrizo-Wilcox Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2010
   - Total Project Cost: $2,166,000
   - Annual Cost: $335,000
   - The project cost includes two 500 gpm wells drilled to a depth of 500 feet in the Carrizo-Wilcox Aquifer.

Table 4C.22-3.
Recommended Plan Costs by Decade for Lee County WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(173)	(286)	(383)	(463)	(531)	(595)
Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	806	806	806	806	806	806
Annual Cost ($/yr)	$335,000	$335,000	$146,000	$146,000	$146,000	$146,000
Unit Cost ($/acft)	$416	$416	$181	$181	$181	$181

4C.22.4 City of Lexington

The City of Lexington obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Lexington, surpluses are projected through 2060, and no changes in water supply are recommended.

4C.22.5 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.22.6 Manufacturing

Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.22.7 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

4C.22.8 Mining

Mining demand is projected to equal supply through the year 2060 and no changes in water supply are recommended.

4C.22.9 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.22.10 Livestock

Livestock demand is projected to equal supply through the year 2060 and no changes in water supply are recommended.

4C.23 Limestone County Water Supply Plan

Table 4C.23-1 lists each water user group in Limestone County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.23-1.
Limestone County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
Bistone MWSD	(2,870)	(3,539)	Projected shortage – see Section 4C.38
City of Coolidge	43	4	Projected surplus – see plan below
City of Groesbeck	114	(109)	Projected shortage – see plan below
City of Kosse	(74)	(74)	Projected shortage – see plan below
City of Mexia	945	251	Projected surplus– see plan below
City of Thornton	222	224	Projected surplus
Tri-County SUD			See Falls County for Plan
County-Other	782	833	Projected surplus
Manufacturing	(39)	(69)	Projected shortage – see plan below
Steam-Electric	104	(17,576)	Projected shortage – see plan below
Mining	776	765	Projected surplus
Irrigation	19	19	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.

4C.23.1 Bistone MWSD

The recommended water supply plan for the Bistone Municipal Water Supply District is included in Section 4C.38 with the wholesale water providers.

4C.23.2 City of Coolidge

4C.23.2.1 Description of Supply

The City of Coolidge has a contract for 37 acft/yr 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.

4C.23.2.2 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 Coolidge.

- Bistone MWSD increasing its supplies through the development of Carrizo-Wilcox Aquifer.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.23.2.3 Costs

There are no costs for the recommended plan for the City of Coolidge since this supply is currently contracted. Costs associated with this project for Bistone MWSD are indicated in Section 4C.38.14.3

Table 4C.23-2.
Recommended Plan Costs by Decade for the City of Coolidge

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	74	57	43	32	19	4
Full Contract from Bistone MWSD						
Supply From Plan Element (acft/yr)	93	102	111	120	129	138
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.23.3 City of Groesbeck

4C.23.3.1 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. Based on the available surface water supply, the City of Groesbeck is projected to have shortages of 15 acft/yr in the year 2050 and 109 acft/yr in 2060.

4C.23.3.2 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 the City of Groesbeck:

- Groesbeck Off-Channel Reservoir

- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.23.3.3 Costs

Costs of the recommended plan for the City of Groesbeck to meet the projected shortages are:

a. Groesbeck Off-Channel Reservoir:
   - Source of Cost: Volume II, Section 4B.13.2
   - Date to be Implemented: Before 2050
   - Total Project Cost: $10,412,000
   - Annual Cost: $991,000

Table 4C.23-3. Recommended Plan Costs by Decade for the City of Groesbeck

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	360	197	114	49	(15)	(109)
Groesbeck Off-Channel Reservoir						
Supply From Plan Element (acft/yr)	—	—	—	—	1,755	1,755
Annual Cost ($/yr)	—	—	—	—	$991,000	$991,000
Unit Cost ($/acft)	—	—	—	—	$565	$565

4C.23.4 City of Kosse

4C.23.4.1 Description of Supply

The City of Kosse obtains its water supply from the Trinity Aquifer. However, this is not considered a reliable supply. The City is projected to have shortages, beginning in 2010.

4C.23.4.2 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 the City of Kosse:

- Development of Carrizo-Wilcox Aquifer.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.23.4. 3 Costs

Costs of the recommended plan for the City of Kosse to meet the projected shortages are:

a. Development of the Carrizo-Wilcox Aquifer:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: By 2010
   - Total Project Cost: $2,386,000
   - Annual Cost: $237,000
   - The project cost includes two 100 gpm wells drilled to a depth of 500 feet in the Carrizo-Wilcox Aquifer.

Table 4C.23-4.
Recommended Plan Costs by Decade for the City of Kosse

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(75)	(75)	(74)	(73)	(73)	(74)
Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	100	100	100	100	100	100
Annual Cost ($/yr)	$237,000	$237,000	$29,000	$29,000	$29,000	$29,000
Unit Cost ($/acft)	$2,370	$2,370	$290	$290	$290	$290

4C.23.5 City of Mexia

4C.23.5.1 Description of Supply

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. However, Bistone MWSD does not have sufficient supplies to meet the contracted demand.

4C.23.5.2 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 Mexia by providing supply of sufficient quantity to fully utilize the existing contract.

- Bistone MWSD increasing its supplies through the development of Carrizo-Wilcox Aquifer.

4C.23.5.3 Costs

There are no costs for the recommended plan for the City of Mexia since this supply is currently contracted. Costs associated with this project for Bistone MWSD are indicated in Section 4C.38.14.3

4C.23.6 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, surpluses are projected through 2060, and no changes in water supply are recommended.

Table 4C.23-5.
Recommended Plan Costs by Decade for the City of Mexia

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	1,386	1,166	945	734	503	251
Full Contract from Bistone MWSD						
Supply From Plan Element (acft/yr)	1,844	2,025	2,207	2,388	2,569	2,750
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.23.7 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.23.8 Manufacturing

4C.23.8.1 Description of Supply

Limestone County Manufacturing obtains its water supply from various run-of-river rights. Based on the available surface water supply, Limestone County Manufacturing is projected to have shortages through the year 2060.

4C.23.8.2 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 Limestone County Manufacturing:

- Conservation, and
- Development of the Carrizo-Wilcox Aquifer.

4C.23.8.3 Costs

Costs of the recommended plan for Limestone County Manufacturing to meet the projected shortages are:

a. Conservation:
   - Date to be Implemented: before 2010
   - Annual Cost: Not determined

b. Carrizo-Wilcox Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: By year 2010
   - Total Project Cost: $347,000
   - Annual Cost: $40,000
   - The project includes one 100 gpm well drilled to a depth of 250 feet in the Carrizo-Wilcox Aquifer.

Table 4C.23-6.
Recommended Plan Costs by Decade for Limestone County Manufacturing

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(18)	(28)	(39)	(49)	(59)	(69)
Conservation						
Supply From Plan Element (acft/yr)	1	3	4	4	5	5
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	75	75	75	75	75	75
Annual Cost ($/yr)	$40,000	$40,000	$10,000	$10,000	$10,000	$10,000
Unit Cost ($/acft)	$540	$540	$137	$137	$137	$137

4C.23.9 Steam-Electric

4C.23.9.1 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 2040 through the year 2060.

4C.23.9.2 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 Limestone County Steam-Electric:

- Conservation, and
- Reallocation of surplus Falls County Irrigation and McLennan County Steam-Electric supplies. Falls County Irrigation has greater than 8,000 acft/yr of projected surplus supplies and McLennan County Steam-Electric has greater than 13,000 acft/yr of surplus supplies. A portion of these surplus supplies could be reallocated to meet the projected needs for Steam-Electric demand in Limestone County, depending on the location where the projected demand actually develops.

4C.23.9.3 Costs

Costs of the recommended plan for Limestone County Steam-Electric to meet the projected shortages are:

a. Conservation:
   - Date to be Implemented: before 2010
   - Annual Cost: Not determined

b. Reallocation of surplus Falls County Irrigation and McLennan County Steam-Electric Supplies:
   - Cost Source: Unknown – the exact location of the projected Steam-Electric demands in Limestone County is unknown, but could logically be located near the supplies located in Falls and McLennan Counties, and development of a cost is not feasible.
   - Date to be Implemented: before 2040
   - Annual Cost: unknown

Table 4C.23-7.
Recommended Plan Costs by Decade for Limestone County Steam-Electric

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	4,471	4,066	104	(4,695)	(10,513)	(17,576)
Conservation						
Supply From Plan Element (acft/yr)	670	1,130	1,849	2,176	2,573	3,058
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Reallocation of Irrigation Supplies from Falls County						
Supply From Plan Element (acft/yr)	—	—	—	4,100	4,100	4,700
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Reallocation of Steam-Electric Supplies from McLennan County						
Supply From Plan Element (acft/yr)	—	—	—	—	5,700	12,000
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.23.10 Mining

Mining is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.23.11 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.23.12 Livestock

Livestock is projected to have the demand equal the supply through the year 2060 and no changes in water supply are recommended.

4C.24 McLennan County Water Supply Plan

Table 4C.24-1 lists each water user group in McLennan County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.24-1.
McLennan County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Bellmead	1,277	1,277	Projected surplus
City of Beverly Hills	0	0	Demand equals supply
City of Bruceville-Eddy	404	404	Projected surplus
Chalk Bluff WSC	9	(190)	Projected shortage – see plan below
City of Crawford	24	19	Projected surplus
Cross Country WSC	14	(297)	Projected shortage – see plan below
Elm Creek WSC			See Bell County for Plan
City of Gholson	604	557	Projected surplus
City of Hallsburg	(21)	(45)	Projected shortage – see plan below
City of Hewitt	1,467	1,467	Projected surplus
City of Lacy-Lakeview	4	(357)	Projected shortage – see plan below
City of Lorena	834	741	Projected surplus
City of Mart	(224)	(272)	Projected shortage – see plan below
City of McGregor	980	980	Projected surplus
City of Moody	179	179	Projected surplus
North Bosque WSC	1	(199)	Projected shortage – see plan below
City of Riesel	(14)	(31)	Projected shortage – see plan below
City of Robinson	307	(112)	Projected shortage – see plan below
Tri-County SUD			See Falls County for Plan
Valley Mills			See Bosque County for Plan
City of Waco	7,886	2,419	Projected surplus
City of West	876	845	Projected surplus
West Brazos WSC			See Falls County for Plan
Western Hills WS	11	(163)	Projected shortage – see plan below
City of Woodway	1,725	1,725	Projected surplus
County-Other	1,122	1,017	Projected surplus
Manufacturing	291	0	Projected surplus – see plan below
Steam-Electric	17,994	13,157	Projected surplus
Mining	92	115	Projected surplus
Irrigation	6,939	6,948	Projected surplus
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.

4C.24.1 City of Bellmead

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 currently negotiating a contract for water supply in order to reduce Bellmead's dependence on Trinity Aquifer groundwater. The purchase of supplemental reuse water from WMARSS is also recommended to reduce demands on Trinity Aquifer.

4C.24.1.1 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 Bellmead:

- 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

4C.24.1.2 Costs

Costs of the Recommended Plan for the City of Bellmead.

a. Reuse Water Supply from WMARSS (Bellmead/Lacy-Lakeview Reuse)
   - Cost Source: Volume II, Section 4B.3
   - Date to be Implemented: before 2010
   - Unit Cost: assumed unit cost of $350/acft ($1.07/1,000 gallons) for wholesale treated reuse water, including transmission costs
   - Annual Cost: $392,000

4C.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.

4C.24.3 City of Bruceville-Eddy

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 and no changes in water supplies are recommended. This WUG is located in multiple counties (McLennan and Falls). The surplus shown in Table 4C.24-1 represents the cumulative totals for the City of Bruceville-Eddy.

Table 4C.24-2.
Recommended Plan Costs by Decade for the City of Bellmead

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	1,277	1,277	1,277	1,277	1,277	1,277
Reuse Water Supply (WMARSS Bellmead/Lacy-Lakeview Reuse)						
Supply From Plan Element (acft/yr)	1,121	1,121	1,121	1,121	1,121	1,121
Annual Cost ($/yr)	$392,000	$392,000	$110,000	$110,000	$110,000	$110,000
Unit Cost ($/acft)	$350	$350	$98	$98	$98	$98

4C.24.4 Chalk Bluff WSC

4C.24.4.1 Description of Supply

Chalk Bluff WSC obtains its water supply from the Trinity Aquifer. They are projected to have a shortage from 2040 through the year 2060.

4C.24.4.2 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:

- Trinity Aquifer Development.
- An alternative is to develop alternative supplies through the FHLM Water Supply Corporation, which is an entity comprised of 15 water supply corporations and cities in Falls, Hill, Limestone, and McLennan Counties, including Chalk Bluff WSC. Other alternatives include purchasing supply from BRA System Operation and/or reuse water from WMARSS.
- Construct interconnect with Tri-County SUD
- Conservation was also considered; however, the WSC’s current per capita use rate is below the selected target rate of 140 gpcd.

4C.24.4.3 Costs

Costs of the Recommended Plan for Chalk Bluff WSC.

a. Trinity Aquifer Development:
    - Date to be Implemented: before 2040
    - Cost Source: Section 4B.17

- Unit Cost: $1,248/acft
- Annual Cost: $287,000
- The project cost includes the installation of two 200 gpm wells into the Trinity Aquifer at a depth of 2,125 feet.

Table 4C.24-3.
Recommended Plan Costs by Decade for Chalk Bluff WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	167	81	9	(68)	(114)	(190)
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	230	230	230
Annual Cost ($/yr)	—	—	—	$287,000	$287,000	$51,000
Unit Cost ($/acft)	—	—	—	$1,248	$1,248	$222

4C.24.5 City of Crawford

The City of Crawford obtains its water supply from the Trinity Aquifer and run-of-the-river diversion from Tonk Creek. A surplus is projected through the year 2060; and, there are no changes recommended to the water supply.

4C.24.6 Cross Country WSC

4C.24.6.1 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 2030 through the year 2060. This WUG is located in multiple counties (McLennan and Bosque). The surplus/shortages shown in Table 4C.24-4 represent the cumulative totals for Cross Country WSC.

4C.24.6.2 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 Cross Country WSC:

- Purchase water from the City of Waco
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd after 2020.

4C.24.6.3 Costs

Costs of the Recommended Plan for Cross Country WSC.

a. Water Supply from City of Waco:
   - Date to be Implemented: before 2040
   - Cost Source: Volume II, Section 4B.17
   - Unit Cost: assumed unit cost of $2,023/acft ($6.21/1,000 gallons) for wholesale treated water, including transmission costs
   - Annual Cost: $674,000 in 2050

Table 4C.24-4.
Recommended Plan Costs by Decade for Cross Country WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	123	63	14	(219)	(249)	(297)
Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	—	—	—	333	333	333
Annual Cost ($/yr)	—	—	—	$674,000	$674,000	$364,000
Unit Cost ($/acft)	—	—	—	$2,023	$2,023	$1,094

4C.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 2060; and, there are no changes recommended to the water supply.

4C.24.8 City of Hallsburg

4C.24.8.1 Description of Supply

The City of Hallsburg obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater supply, the City of Hallsburg is projected to have a shortage from 2010 through the year 2060.

4C.24.8.2 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 the City of Hallsburg:

- Conservation
- Purchase water from the City of Waco

4C.24.8.3 Costs

Costs of the Recommended Plan for the City of Hallsburg.

a. Conservation:
- Cost Source: Volume II, Section 4B.2.1
- Date to be Implemented: before 2010
- Annual Cost: maximum of $4,750 in 2020

b. Water Supply from City of Waco:
- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: before 2010
- Annual Cost: $138,000
- Unit Cost: assumed unit cost of $3,643/acft ($11.18/1,000 gallons) for wholesale treated water, including transmission costs

Table 4C.24-5.
Recommended Plan Costs by Decade for the City of Hallsburg

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(2)	(13)	(21)	(29)	(35)	(45)
Conservation						
Supply From Plan Element (acft/yr)	4	10	8	6	6	6
Annual Cost ($/yr)	$1,900	$4,750	$3,800	$2,850	$2,850	$2,850
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	49	49	49	49	49	49
Annual Cost ($/yr)	$138,000	$138,000	$63,000	$63,000	$63,000	$63,000
Unit Cost ($/acft)	$3,643	$3,643	$1,284	$1,284	$1,284	$1,284

4C.24.9 City of Hewitt

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. No shortages are projected for the City of Hewitt, however, 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.

4C.24.9.2 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 Hewitt:

- 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

4C.24.9.3 Costs

Costs of the Recommended Plan for the City of Hewitt

a. Reuse Water Supply from WMARSS (Bullhide Creek Reuse)
   - Date to be Implemented: before 2010
   - Cost Source: Volume II, Section 4B.3.1.12
   - Unit Cost: assumed unit cost of $1,223/acft ($3.75/1,000 gallons) for wholesale treated reuse water, including transmission costs
   - Annual Cost: $1,508,000

Table 4C.24-6.
Recommended Plan Costs by Decade for the City of Hewitt

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	1,467	1,467	1,467	1,467	1,467	1,467
Reuse Water Supply (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)	$1,508,000	$1,508,000	$150,000	$150,000	$150,000	$150,000
Unit Cost ($/acft)	$1,223	$1,223	$123	$123	$123	$123

4C.24.10 City of Lacy-Lakeview

4C.24.10.1 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 shortage from 2040 through the year 2060. Supplemental reuse water from WMARSS is recommended to reduce demands on water supplied by the City of Waco.

4C.24.10.2 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 the City of Lacy-Lakeview:

- Water Supply from City of Waco
- Reuse Water Supply from WMARSS (Bellmead/Lacy-Lakeview Reuse)
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.24.10.3 Costs

Costs of the Recommended Plan for the City of Lacy-Lakeview.

a. Water Supply from City of Waco:
   - Date to be Implemented: before 2040
   - Cost Source: Wholesale treated water rate from City of Waco
   - Unit Cost: assumed unit cost of $979/acft ($3.00/1,000 gallons) for wholesale treated water, including transmission costs
   - Annual Cost: $440,550 in 2060

b. Reuse Water Supply from WMARSS (Bellmead/Lacy-Lakeview Reuse)
   - Cost Source: Volume II, Section 4B.3.1.11
   - Date to be Implemented: before 2040
   - Unit Cost: assumed unit cost of $350/acft ($1.07/1,000 gallons) for wholesale treated reuse water, including transmission costs
   - Annual Cost: $392,000

Table 4C.24-7.
Recommended Plan Costs by Decade for the City of Lacy-Lakeview

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	285	131	4	(136)	(218)	(357)
Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	—	—	—	200	300	450
Annual Cost ($/yr)	—	—	—	$195,800	$293,700	$440,550
Unit Cost ($/acft)	—	—	—	$979	$979	$979
Reuse Water Supply (WMARSS Bellmead/Lacy-Lakeview Reuse)						
Supply From Plan Element (acft/yr)	1,121	1,121	1,121	1,121	1,121	1,121
Annual Cost ($/yr)	$392,000	$392,000	$110,000	$110,000	$110,000	$110,000
Unit Cost ($/acft)	$350	$350	$98	$98	$98	$98

4C.24.11 City of Lorena

The City of Lorena obtains its water supply from the Trinity Aquifer with supplemental supplies from the City of Robinson and Levi WSC, which are obtained either from the Trinity Aquifer and/or run-of-river rights in the Brazos River. No shortages are projected for the City of Lorena, however, purchase of supplemental reuse water from WMARSS is recommended to reduce demands on water supplied by the run-of-river rights and groundwater from the Trinity Aquifer.

4C.24.11.2 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 Lorena:

- 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

4C.24.11.3 Costs

Costs of the Recommended Plan for the City of Lorena

a. Reuse Water Supply from WMARSS (Bullhide Creek Reuse)
   - Date to be Implemented: before 2010
   - Cost Source: Volume II, Section 4B.3.1.12

- Unit Cost: assumed unit cost of $1,223/acft ($3.75/1,000 gallons) for wholesale treated reuse water, including transmission costs
- Annual Cost: $548,000

Table 4C.24-8.
Recommended Plan Costs by Decade for the City of Lorena

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	905	866	834	799	777	741
Reuse Water Supply (WMARSS Bullhide Creek Reuse)						
Supply From Plan Element (acft/yr)	448	448	448	448	448	448
Annual Cost ($/yr)	$548,000	$548,000	$150,000	$150,000	$150,000	$150,000
Unit Cost ($/acft)	$1,223	$1,223	$123	$123	$123	$123

4C.24.12 City of Mart

4C.24.12.1 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 2060.

4C.24.12.2 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 the City of Mart:

- Purchase water from the City of Waco
- Conservation was also considered; however, the City’s current per capita use rate is below the selected target rate of 140 gpcd.

4C.24.12.3 Costs

Costs of the Recommended Plan for the City of Mart.

a. Water Supply from City of Waco:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2010
   - Unit Cost: assumed unit cost of $3,643/ acft ($11.18/1,000 gallons) for wholesale treated water, including transmission costs
   - Annual Cost: $1,093,000

Table 4C.24-9.
Recommended Plan Costs by Decade for the City of Mart

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(192)	(211)	(224)	(240)	(251)	(272)
Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	300	300	300	300	300	300
Annual Cost ($/yr)	$1,093,000	$1,093,000	$385,000	$385,000	$385,000	$385,000
Unit Cost ($/acft)	$3,643	$3,643	$1,284	$1,284	$1,284	$1,284

4C.24.13 City of McGregor

The City of McGregor obtains its water supply from the Trinity Aquifer and from surface water from Lake Belton. No shortages are projected for the City of McGregor and no changes in water supply are recommended.

4C.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 Bluebonnet WSC. No shortages are projected for the City of Moody, and no changes in water supply are recommended.

4C.24.15 North Bosque WSC

4C.24.15.1 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 from 2040 through the year 2060.

4C.24.15.2 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 North Bosque WSC:

- Conservation
- Purchase water from the City of Waco

4C.24.15.3 Costs

Costs of the Recommended Plan for North Bosque WSC.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $19,950 in 2060

b. Water Supply from City of Waco:
   - Date to be Implemented: before 2040
   - Cost Source: Volume II, Section 4B.17
   - Unit Cost: assumed unit cost of $1,864/acft ($5.71/1,000 gallons) for wholesale treated water, including transmission costs
   - Annual Cost: $362,000

Table 4C.24-10.
Recommended Plan Costs by Decade for North Bosque WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	164	77	1	(77)	(124)	(199)
Conservation						
Supply From Plan Element (acft/yr)	10	33	36	38	37	42
Annual Cost ($/yr)	$4,750	$15,675	$17,100	$18,050	$17,575	$19,950
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	—	—	—	194	194	194
Annual Cost ($/yr)	—	—	—	$362,000	$362,000	$205,000
Unit Cost ($/acft)	—	—	—	$1,861	$1,861	$1,058

4C.24.16 City of Riesel

4C.24.16.1 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 2060.

4C.24.16.2 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 the City of Riesel:

- Purchase water from City of Waco
- Purchase emergency supply from Tri-County SUD (note: not a firm supply of water)
- An alternative strategy is to develop a water supply with the FHLM Water Supply Corporation, which is an entity comprised of 15 water supply corporations and cities in Falls, Hill, Limestone, and McLennan Counties, including Chalk Bluff WSC.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.24.16.3 Costs

Costs of the Recommended Plan for the City of Riesel.

a. Water Supply from City of Waco:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2010
   - Unit Cost: assumed unit cost of $3,643/acft ($11.18/1,000 gallons) for wholesale treated water, including transmission costs
   - Annual Cost: $138,000

Table 4C.24-11.
Recommended Plan Costs by Decade for the City of Riesel

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(3)	(10)	(14)	(20)	(23)	(31)
Water Supply from City of Waco						
Supply From Plan Element (acft/yr)	38	38	38	38	38	38
Annual Cost ($/yr)	$138,000	$138,000	$48,800	$48,800	$48,800	$48,800
Unit Cost ($/acft)	$3,643	$3,643	$1,284	$1,284	$1,284	$1,284

4C.24.17 City of Robinson

4C.24.17.1 Description of Supply

The City of Robinson obtains its water supply from the Trinity Aquifer and from the Brazos River. Based on the available groundwater supply, the City of Robinson is projected to have a shortage in the year 2060. 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.

4C.24.17.2 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 the City of Robinson:

- Expand water treatment plant by 2 MGD to utilize full surface water resources
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.24.17.3 Costs

Costs of the Recommended Plan for the City of Robinson.

a. Expand water treatment plant capacity (2 MGD)

- Cost Source: Volume II, Section 4B.17
- Date to be implemented: before 2050
- Unit Cost: $583/acft
- Annual Cost: $653,000

Table 4C.24-12.
Recommended Plan Costs by Decade for the City of Robinson

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	650	456	307	162	61	(112)
Expand Water Treatment Plant (2 MGD)						
Supply From Plan Element (acft/yr)	—	—	—	—	1,120	1,120
Annual Cost ($/yr)	—	—	—	—	$653,000	$653,000
Unit Cost ($/acft)	—	—	—	—	$583	$583

4C.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 and projected wholesale water sales are projected to cause a shortage before 2060. Refer to Section 4C.38.20 for the City's plan as a Wholesale Water Provider.

4C.24.19 City of West

The City of West obtains its water supply from the Trinity Aquifer and the City of Waco. Surpluses are projected through 2060 and there is no recommendation to change the water supply.

4C.24.20 Western Hills WS

4C.24.20.1 Description of Supply

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 shortage from 2040 through the year 2060.

4C.24.20.2 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 Western Hills WS:

- Trinity Aquifer Development.
- Conservation was also considered; however, the entity's current per capita use rate is below the selected target rate of 140 gpcd.

4C.24.20.3 Costs

Costs of the Recommended Plan for Western Hills WS.

a. Trinity Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2040
   - Unit Cost: $652/acft
   - Annual Cost: $129,000 in 2050
   - Project costs include installation of one 250 gpm well in the Trinity Aquifer at a depth of 1,150 feet.

Table 4C.24-13.
Recommended Plan Costs by Decade for Western Hills WS

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	147	73	11	(57)	(96)	(163)
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	198	198	198
Annual Cost ($/yr)	—	—	—	$129,000	$129,000	$35,000
Unit Cost ($/acft)	—	—	—	$652	$652	$177

4C.24.21 City of Woodway

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. No shortage is projected for the City of Woodway and no changes in water supply are recommended.

4C.24.22 County-Other

McLennan County-Other obtains its water supply from groundwater from the Trinity Aquifer and surface water from Lake Belton and Lake Waco. Surpluses are projected through the year 2060 and no changes in water supply are recommended.

4C.24.23 Manufacturing

4C.24.23.1 Description of Supply

McLennan County Manufacturing obtains its water supply from the Trinity Aquifer and surface water from run-of-river rights and Lake Waco. Based on the available groundwater and surface water supply, McLennan County Manufacturing is projected to have adequate supplies until the year 2060. 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.

4C.24.23.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to reduce McLennan County Manufacturing reliance on groundwater and surface water supplies:

- Reuse water from WMARSS.

4C.24.23.3 Costs

Costs of the Recommended Plan for McLennan County Manufacturing.

a. Reuse water supply from WMARSS (Flat Creek Reuse Project):
   - Cost Source: Volume II, Section 4B.3.1.13
   - Date to be Implemented: before 2010
   - Unit Cost: assumed unit cost of $223/acft ($0.68/1,000 gallons) for reuse water, including transmission costs
   - Annual Cost: $1,543,000

Table 4C.24-14.
Recommended Plan Costs by Decade for McLennan County Manufacturing

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	596	439	291	141	6	0
Reuse Supply from WMARSS (Flat Creek Reuse Project)						
Supply From Plan Element (acft/yr)	5,319	6,918	7,847	7,847	7,847	7,847
Annual Cost ($/yr)	$1,186,000	$1,543,000	$737,000	$737,000	$737,000	$737,000
Unit Cost ($/acft)	$223	$223	$94	$94	$94	$94

4C.24.24 Steam-Electric

4C.24.24.1 Description of Supply

McLennan County Steam-Electric obtains its water supply from Tradinghouse Reservoir and from WMARSS reuse. Recently, LS Power contracted for 16,000 acft/yr of reuse water from WMARSS to be delivered to a new power station near Lake Creek Reservoir. No shortage is projected for McLennan County Steam-Electric and no changes in water supply are recommended.

4C.24.25 Mining

No shortage is projected for McLennan County Mining and no changes in water supply are recommended.

4C.24.26 Irrigation

No shortage is projected for McLennan County Irrigation and no changes in water supply are recommended.

4C.24.27 Livestock

No shortage is projected for McLennan County Livestock and no changes in water supply are recommended.

4C.25 Milam County Water Supply Plan

Table 4C.25-1 lists each water user group in Milam County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.25-1.
Milam County Surplus/(Shortage)

Water User Group	***Surplus/(Shortage)[1]***		***Comment***
	2030 (acft/yr)	***2060 (acft/yr)***	
Bell-Milam Falls WSC			See Bell County for Plan
City of Cameron	789	741	Projected surplus
Milano WSC	56	30	Projected surplus
City of Rockdale	847	858	Projected surplus
Southwest Milam WSC	(533)	(910)	Projected shortage – see plan below
City of Thorndale	17	11	Projected surplus
County-Other	609	744	Projected surplus
Manufacturing	1,898	442	Projected surplus
Steam-Electric	1,500	(2,000)	Projected shortage – see plan below
Mining	(70)	0	Projected shortage – see plan below
Irrigation	6,961	7,041	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.

4C.25.1 City of Cameron

The City of Cameron obtains its water supply from run-of-the-river rights. No shortages are projected for the City of Cameron and no changes in water supply are recommended.

4C.25.2 Milano WSC

Milano WSC obtains its water supply from the Carrizo-Wilcox Aquifer. No shortages are projected for Milano WSC and no changes in water supply are recommended. This WUG is located in multiple counties (Milam and Burleson). The surplus shown in Table 4C.25-1 represents the cumulative total for Milano WSC.

4C.25.3 City of Rockdale

The City of Rockdale obtains its water supply from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Rockdale and no changes in water supply are recommended.

4C.25.4 Southwest Milam WSC

4C.25.4.1 Description of Supply

Southwest Milam WSC obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. Southwest Milam WSC is projected to have a shortage from 2020 through the year 2060. This WUG is located in multiple counties (Milam, Lee, Williamson, and Burleson). The surplus/shortages shown in Table 4C.25-2 represent the cumulative totals for Southwest Milam WSC.

4C.25.4.2 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 Southwest Milam WSC:

- Additional Carrizo-Wilcox Aquifer Development.
- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.25.4.3 Costs

Costs of the Recommended Plan for Southwest Milam WSC.

a. Additional Carrizo-Wilcox Aquifer Development:
    - Date to be Implemented: By year 2020
    - Cost Source: Volume II, Section 4B.17
    - Total Project Cost: $3,502,000
    - Annual Cost: $440,000 based on full implementation
    - The project cost includes two 1,000 gpm wells drilled to a depth of 1,000 feet in the Carrizo-Wilcox aquifer phased in as demand increases.

Table 4C.25-2.
Recommended Plan Costs by Decade for Southwest Milam WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(113)	(354)	(533)	(667)	(784)	(910)
Additional Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	400	400	700	700	966	966
Annual Cost ($/yr)	$182,000	$182,000	$319,000	$319,000	$135,000	$135,000
Unit Cost ($/acft)	$455	$455	$456	$456	$140	$140

4C.25.5 City of Thorndale

The City of Thorndale obtains its water supply from Southwest Milam WSC. No shortages are projected for the City of Thorndale and no changes in water supply are recommended.

4C.25.6 County-Other

The water supply entities for County-Other show a projected surplus and no changes in water supply are recommended.

4C.25.7 Manufacturing

The water supply entities for Milam County Manufacturing show a projected surplus and no changes in water supply are recommended.

4C.25.8 Steam-Electric

4C.25.8.1 Description of Supply

Milam County Steam-Electric obtains its water supply from Lake Alcoa. Based on the available surface water supply, Milam County Steam-Electric is projected to have a shortage beginning in year 2050.

4C.25.8.2 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 Milam County Steam-Electric:

- Conservation, and
- Carrizo-Wilcox Aquifer Development.

4C.25.8.3 Costs

Costs of the Recommended Plan for Milam County Steam-Electric.

a. Conservation:
   - Date to be Implemented: 2010
   - Annual Cost: Not determined

b. Carrizo-Wilcox Aquifer Development:
   - Date to be Implemented: By year 2050
   - Cost Source: Volume II, Section 4B.17
   - Total Project Cost: $3,160,000
   - Annual Cost: $365,000
   - The project cost includes two 1,000 gpm wells drilled to a depth of 1,000 feet in the Carrizo-Wilcox Aquifer.

Table 4C.25-3.
Recommended Plan Costs by Decade for Milam County Steam-Electric

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	1,500	1,500	1,500	1,500	(2,000)	(2,000)
Conservation						
Supply From Plan Element (acft/yr)	375	625	875	875	1,120	1,120
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	—	1,613	1,613
Annual Cost ($/yr)	—	—	—	—	$365,000	$365,000
Unit Cost ($/acft)	—	—	—	—	$226	$226

4C.25.9 Mining

4C.25.9.1 Description of Supply

Milam County Mining obtains its water supply from the Carrizo-Wilcox Aquifer. Based on the available groundwater supply, Milam County Mining is projected to have a shortage between 2010 and 2030.

4C.25.9.2 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 Milam County Mining:

- Carrizo-Wilcox Aquifer Development.
- Groundwater use for Mining in Milam County is largely associated with dewatering/depressurization. Consequently, conservation was not selected as a water management strategy.

4C.25.9.3 Costs

Costs of the Recommended Plan for Milam County Mining.

a. Carrizo-Wilcox Aquifer Development:
   - Date to be Implemented: 2010
   - Cost Source: Volume II, Section 4B.17
   - Total Project Cost: $715,000
   - Annual Cost: $72,000
   - The project cost includes one 150 gpm wells drilled to a depth of 1,000 feet in the Carrizo-Wilcox Aquifer.

Table 4C.25-4.
Recommended Plan Costs by Decade for Milam County Mining

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(70)	(70)	(70)	0	0	0
Additional Carrizo-Wilcox Aquifer Development						
Supply From Plan Element (acft/yr)	100	100	100	—	—	—
Annual Cost ($/yr)	$72,000	$72,000	$9,500	—	—	—
Unit Cost ($/acft)	$719	$719	$95	—	—	—

4C.25.10 Irrigation

No shortage is projected for the Milam County's Irrigation and no changes in water supply are recommended.

4C.25.11 Livestock

No shortage is projected for the Milam County's Livestock and no changes in water supply are recommended.

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4C.26 Nolan County Water Supply Plan

Table 4C.26-1 lists each water user group in Nolan County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.26-1.
Nolan County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)*[1] 2030 (acft/yr)	2060 (acft/yr)	*Comment*
Bitter Creek WSC	274	290	Projected surplus
City of Roscoe	64	87	Projected surplus
City of Sweetwater	(3,435)	(3,117)	Projected shortage – see Section 4C.38
County-Other	64	89	Projected surplus
Manufacturing	270	(64)	Projected shortage – see plan below
Steam-Electric	(20,000)	(20,000)	Projected shortage – see plan below
Mining	(108)	(108)	Projected shortage – see plan below
Irrigation	(1,465)	(1,091)	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.

4C.26.1 Bitter Creek WSC

The Bitter Creek WSC obtains its water from groundwater and treated water from the City of Sweetwater. No current or future shortages are projected and no changes in water supply uses are projected or recommended. This WUG is located in multiple counties (Nolan and Fisher). The surplus shown in Table 4C.26-1 represents the cumulative totals for Bitter Creek WSC in both counties.

4C.26.2 City of Roscoe

The City of Roscoe obtains surface water from local sources and groundwater from the Dockum Aquifers. No current or future shortages are projected and no changes in water supply are projected or recommended.

4C.26.3 City of Sweetwater

The recommended water supply plan for the City of Sweetwater is included in Section 4C.38 with the wholesale water providers.

4C.26.4 County-Other

The Nolan County-Other entities obtain their water from the City of Sweetwater. Surpluses are projected through 2060.

4C.26.5 Manufacturing

4C.26.5.1 Description of Supply

The current water supply is supplied from the Dockum and Edwards-Trinity (Plateau) Aquifers and the City of Sweetwater. The projected demands will exceed the current supplies by 2060.

4C.26.5.2 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 shortage for Nolan County Manufacturing:

- Conservation
- City of Sweetwater increasing water supplies to firm contracted supply

4C.26.5.3 Costs

Cost of the Recommended Plan for the Manufacturing.

a. Conservation (Volume II, Section 4B.2)

- Date to be Implemented: 2010
- Annual Cost: not determined

b. Water Supply from Sweetwater:

- Cost Source: Cost applied to City of Sweetwater (Section 4C.38.18.3)

Table 4C.26-2.
Recommended Plan Costs by Decade for Nolan County Manufacturing

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	529	393	270	149	42	(64)
Conservation						
Supply From Plan Element (acft/yr)	23	46	73	81	89	96
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Additional water supply from Sweetwater to meet contract						
Supply From Plan Element (acft/yr)	83	83	83	83	83	83
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.26.6 Steam-Electric

4C.26.6.1 Description of Supply

The current supply comes from the Dockum and Edwards-Trinity (Plateau) Aquifers and the City of Sweetwater. Projected demands exceed current supplies.

4C.26.6.2 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 Steam-Electric:

- 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 from City of Abilene

4C.26.6.3 Costs

Cost of the recommended plan for Steam-Electric:

a. Water Supply from City of Abilene:

- Cost Source: Volume II, Section 4B.17. Wholesale raw water cost from Abilene estimated at $100/acft.
- Date to be Implemented: before 2020 (demands in 2010 have not yet developed)
- Total Project Cost: $91,940,000

- Annual Cost: $14,574,000 in 2020
- Note this strategy could be developed in conjunction with the alternative strategy for the City of Sweetwater presented in Section 4C.38.18.3. This could allow for potential cost savings between the project participants.

Table 4C.26-3.
Recommended Plan Costs by Decade for Nolan County Steam-Electric

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(807)	(11,311)	(20,000)	(20,000)	(20,000)	(20,000)
Water Supply from City of Abilene						
Supply From Plan Element (acft/yr)	—	11,500	20,000	20,000	20,000	20,000
Annual Cost ($/yr)	—	$14,574,000	$14,574,000	$6,560,000	$6,560,000	$6,560,000
Unit Cost ($/acft)	—	$1,267	$729	$328	$328	$328

4C.26.7 Mining

4C.26.7.1 Description of Supply

Mining uses are supplied from the Dockum and Edwards-Trinity (Plateau) Aquifers. Projected demands exceed available supply.

4C.26.7.2 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 shortage for Nolan County Mining:

- Conservation
- Local Groundwater

4C.26.7.3 Costs

Cost of the Recommended Plan for Nolan County Mining.

a. Conservation (Volume II, Section 4B.2)

- Date to be Implemented: 2010
- Annual Cost: not determined

b. Water Supply from Edwards-Trinity (Plateau) Aquifer:

- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: 2010

- Total Project Cost: $679,000
- Annual Cost: $67,000

Table 4C.26-4.
Recommended Plan Costs by Decade for the Nolan County Mining

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(108)	(108)	(108)	(108)	(108)	(108)
Conservation						
Supply From Plan Element (acft/yr)	8	14	19	19	19	19
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Water Supply from Edwards-Trinity (Plateau) Aquifer						
Supply From Plan Element (acft/yr)	114	114	114	114	114	114
Annual Cost ($/yr)	$67,000	$67,000	$8,000	$8,000	$8,000	$8,000
Unit Cost ($/acft)	$588	$588	$68	$68	$68	$68

4C.26.8 Irrigation

4C.26.8.1 Description of Supply

The current supply includes the Dockum aquifer and run-of-river diversions from the Brazos River. The water supply for Nolan County Irrigation shows a projected shortage.

4C.26.8.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended to mitigate some of the projected shortage Nolan County Irrigation:

- Conservation
- Brush Control and Weather Modification – these supplies are unquantifiable, see sections 4B.9 and 4B.10 for more detailed information.

4C.26.8.3 Costs

Cost of the Recommended Plan for Nolan County Irrigation.

a. Conservation

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: 2010
- Annual Cost: $74,340 in 2030

Table 4C.26-5.
Recommended Plan Costs by Decade for the Nolan County Irrigation

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,732)	(1,597)	(1,465)	(1,335)	(1,212)	(1,091)
Conservation						
Supply From Plan Element (acft/yr)	154	250	341	332	323	315
Annual Cost ($/yr)	$33,570	$54,500	$74,340	$72,380	$70,410	$68,670
Unit Cost ($/acft)	$218	$218	$218	$218	$218	$218

4C.26.9 Livestock

No shortages are projected for Livestock uses and no changes in water supply are recommended.

4C.27 Palo Pinto County Water Supply Plan

Table 4C.27-1 lists each water user group in Palo Pinto County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.27-1.
Palo Pinto County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)[1]*		*Comment*
	2030 (acft/yr)	*2060 (acft/yr)*	
Fort Belknap WSC			See Young County for Plan
City of Graford	76	73	Projected surplus
City of Mineral Wells	(1,583)	(2,565)	Projected shortage–see plan below
Stephens County Rural WSC			See Stephens County for Plan
City of Strawn	(7)	(23)	Projected shortage–see plan below
County-Other	1,320	886	Projected surplus
Manufacturing	1,164	1,154	Projected surplus
Steam-Electric	9,337	7,935	Projected surplus
Mining	833	833	Projected surplus
Irrigation	2,237	2,267	Projected surplus
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.

4C.27.1 City of Graford

The City of Graford obtains surface water from Keechi Creek and purchases water from Palo Pinto County MWD No. 1. Projections indicate a surplus for the City of Graford and no changes in water supply are recommended.

4C.27.2 City of Mineral Wells

4C.27.2.1 Description of Supply

The City of Mineral Wells obtains surface water from Lake Palo Pinto through a contract with the Palo Pinto County Municipal Water District No. 1. Supplies will not be sufficient to meet demands through 2060.

4C.27.2.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortage of the City of Mineral Wells:

- Conservation.
- Increase contract with Palo Pinto County Municipal Water District No. 1 when the Turkey Peak Reservoir project is completed. Prior to completion of the Turkey Peak Reservoir project, if a severe drought were to occur, the City could construct a pipeline and utilize water from Lake Mineral Wells.

The Palo Pinto County Municipal Water District No. 1 is pursuing the Turkey Peak project to recover lost storage in Lake Palo Pinto. The District would be able to supply the recovered yield to its customers, including the City of Mineral Wells. The District will develop a new 15 MGD water treatment plant to provide treated supplies to its customers (Section 4C.38).

4C.27.2.3 Costs

Costs of the Recommended Plan for the City of Mineral Wells.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $121,125 in 2020

b. Increase Contract with PPCMWD No. 1
   - Cost Source: Volume II, Section 4B.12.5
   - Date to be Implemented: 2020
   - Total Project Cost: $50,227,000
   - Annual Cost: $7,019,000
   - Unit Cost: $924 per acft ($2.83/1000 gal.)

Table 4C.27-2.
Recommended Plan Costs by Decade for the City of Mineral Wells

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	-	(1,281)	(1,583)	(1,861)	(2,191)	(2,565)
Conservation						
Supply From Plan Element (acft/yr)	101	255	231	181	170	178
Annual Cost ($/yr)	$47,975	$121,125	$109,725	$85,975	$80,750	$84,550
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Water Supply from Palo Pinto County Municipal Water District No. 1 (Turkey Peak Reservoir)						
Supply From Plan Element (acft/yr)	—	7,600	7,600	7,600	7,600	7,600
Annual Cost ($/yr)	—	$7,019,000	$7,019,000	$5,619,000	$5,619,000	$3,349,000
Unit Cost ($/acft)	—	$924	$924	$624	$624	$440

4C.27.3 City of Strawn

4C.27.3.1 Description of Supply

Surface water supplies are obtained from Lake Tucker. Supplies will not be sufficient to meet demands through 2060.

4C.27.3.2 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 shortage of the City of Strawn:

- Conservation
- Water supply from Eastland County WSD.

Water supply from Eastland County WSD is a new supply and would require new infrastructure and transmission facilities to deliver the water to the City. It is assumed that this WMS would be brought online in sufficient quantities to replace the existing supply from Lake Tucker. The Eastland County WSD has not agreed to this recommended water management strategy.

4C.27.3.3 Costs

Cost of the Recommended Plan for the City of Strawn.

a. Conservation

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: 2010

- Annual Cost: maximum of $6,650 in 2020

b. Water Supply from Eastland County WSD:

- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: by 2040
- Total Project Cost: $5,158,000
- Annual Cost: $775,000

Table 4C.27-3.
Recommended Plan Costs by Decade for the City of Strawn

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	-	(4)	(7)	(10)	(16)	(23)
Conservation						
Supply From Plan Element (acft/yr)	7	14	11	9	9	9
Annual Cost ($/yr)	$3,325	$6,650	$5,225	$4,275	$4,275	$4,275
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Water Supply from Eastland County WSD						
Supply From Plan Element (acft/yr)	—	—	—	200	200	200
Annual Cost ($/yr)	—	—	—	775,000	775,000	325,400
Unit Cost ($/acft)	—	—	—	$3,875	$3,875	$1,627

4C.27.4 County-Other

The current supply includes water purchased from Lake Palo Pinto through the Palo Pinto County MWD No. 1, from Possum Kingdom Reservoir through BRA, and run-of-the-river diversions. Projections indicate a surplus for this use category and no changes in water supply are recommended.

4C.27.5 Manufacturing

Manufacturing supplies are obtained from local surface water sources and groundwater from the Trinity Aquifer. Palo Pinto County Manufacturing shows a projected surplus and no changes in water supply are recommended.

4C.27.6 Steam-Electric

Surface water supplies are obtained from a contract with Palo Pinto County MWD No. 1. Palo Pinto County Steam-Electric shows a projected surplus and no changes in water supply are recommended.

4C.27.7 Mining

Palo Pinto County Mining shows a projected surplus and no changes in water supply are recommended.

4C.27.8 Irrigation

Palo Pinto County Irrigation shows a projected surplus and no changes in water supply are recommended.

4C.27.9 Livestock

No future shortages are projected and no changes in water supply are recommended.

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4C.28 Robertson County Water Supply Plan

Table 4C.28-1 lists each water user group in Robertson County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.28-1.
Robertson County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
City of Bremond	240	245	Projected surplus
City of Calvert	195	203	Projected surplus
City of Franklin	239	233	Projected surplus
City of Hearne	1,838	1,865	Projected surplus
Robertson County WSC	69	52	Projected surplus
Tri-County SUD			See Falls County for Plan
Wickson Creek SUD			See Brazos County for Plan
County-Other	76	74	Projected surplus
Manufacturing	48	2	Projected surplus
Steam-Electric	2,746	(16,485)	Projected shortage – see plan below
Mining	9	9	Projected surplus
Irrigation	5,948	7,249	Projected surplus
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.

4C.28.1 City of Bremond

The City of Bremond obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Bremond and no changes in water supply are recommended.

4C.28.2 City of Calvert

The City of Calvert obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Calvert and no changes in water supply are recommended.

4C.28.3 City of Franklin

The City of Franklin obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Franklin and no changes in water supply are recommended.

4C.28.4 City of Hearne

The City of Hearne obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for the City of Hearne and no changes in water supply are recommended.

4C.28.5 Robertson County WSC

Robertson County WSC obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. No shortages are projected for Robertson County WSC and no changes in water supply are recommended.

4C.28.6 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.28.7 Manufacturing

Robertson County Manufacturing obtains its water supply from groundwater from the Carrizo-Wilcox Aquifer. Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.28.8 Steam-Electric

4C.28.8.1 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 2060.

4C.28.8.2 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 Robertson County Steam-Electric:

- Conservation, and
- Purchase depressurization water from Walnut Creek Mine.

4C.28.8.3 Costs

Costs of the Recommended Plan for Robertson County Steam-Electric.

a. Conservation:
   - Date to be Implemented: 2010
   - Annual Cost: Not determined

b. Purchase depressurization water from Walnut Creek Mine:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: before 2040
   - Total Project Cost: $23,126,000
   - Annual Cost: $7,117,000
   - Unit Cost: $460/acft

Table 4C.28-2.
Recommended Plan Costs by Decade for Robertson County Steam-Electric

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	18,087	15,985	2,746	(2,518)	(14,276)	(16,485)
Conservation						
Supply From Plan Element (acft/yr)	474	894	2,178	2,546	3,368	3,522
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Purchase reuse water from Walnut Creek Mine						
Supply From Plan Element (acft/yr)	—	—	—	1,791	13,314	15,479
Annual Cost ($/yr)	—	—	—	$7,117,000	$7,117,000	$5,108,000
Unit Cost ($/acft)	—	—	—	$3,973	$535	$330

4C.28.9 Mining

Mining is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.28.10 Irrigation

Irrigation is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.28.11 Livestock

No shortage is projected for Livestock and no changes in water supply are recommended.

4C.29 Shackelford County Water Supply Plan

Table 4C.29-1 lists each water user group in Shackelford County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.29-1.
Shackelford County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Albany	(15)	287	Projected shortage –see plan below
Hawley WSC	[redacted]	[redacted]	See Jones County for Plan
Stephens County Rural SUD	[redacted]	[redacted]	See Stephens County for Plan
County-Other	423	423	Projected surplus – see plan below
Manufacturing	50	50	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	1	1	Projected surplus
Irrigation	(93)	(78)	Projected shortage –see plan below
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.

4C.29.1 City of Albany

4C.29.1.1 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. Shortages are projected from 2010 through 2030.

4C.29.1.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortage of the City of Albany:

- Conservation; and
- Increase the water treatment plant capacity by approximately 0.1MGD.

4C.29.1.3 Costs

Costs of the Recommended Plan for the City of Albany.

a. Conservation:
- Cost Source: Volume II, Section 4B.2.1
- Date to be Implemented: before 2010
- Annual Cost: maximum of $16,150 in 2020

b. Increase water treatment plant capacity:
- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: 2010
- Annual Cost: $32,663
- Unit Cost: $583/acft or $1.79/kgal

Table 4C.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)	(3)	(37)	(15)	45	160	287
Conservation						
Supply From Plan Element (acft/yr)	16	34	26	20	14	12
Annual Cost ($/yr)	$7,600	$16,150	$12,350	$9,500	$6,650	$5,700
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Increase Treatment Plant Capacity						
Supply From Plan Element (acft/yr)	56	56	56	56	56	56
Annual Cost ($/yr)	$32,663	$32,663	$12,768	$12,768	$12,768	$12,768
Unit Cost ($/acft)	$583	$583	$228	$228	$228	$228

4C.29.2 County-Other

4C.29.2.1 Description of Supply

Projections indicate a surplus of water for County-Other supply, 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.

4C.29.2.2 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 Stephens Regional SUD:

- Additional supply through the Midway Group and the West Central Brazos Water Distribution System (WCBWDS).

4C.29.2.3 Costs

Cost of the recommended Plan for Shackelford County-Other.

a. Water Supply from Midway Group and WCBWDS:

- Cost Source: Volume II, Section 4B.14.2
- Date to be Implemented: 2010
- Annual Cost: $511,500 at full implementation.
- Unit Cost: $2,046/acft or $6.28/kgal.

Table 4C.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
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	250	250	250	250	250	250
Annual Cost ($/yr)	$511,500	$511,500	$162,000	$162,000	$162,000	$162,000
Unit Cost ($/acft)	$2,046	$2,046	$648	$648	$648	$648

4C.29.3 Manufacturing

Projections indicate a surplus of water for Manufacturing supply and no changes in water supply are recommended.

4C.29.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.29.5 Mining

Projections indicate a surplus of water for Mining supply and no changes in water supply are recommended.

4C.29.6 Irrigation

4C.29.6.1 Description of Supply

Surface water for Irrigation in Shackelford County is obtained from the Clear Fork of the Brazos River. Shortages are projected through 2060. There are no significant groundwater supplies available in the county.

4C.29.6.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended to mitigate the unmet Irrigation needs:

- Conservation, and
- Brush Control and Weather Modification – these supplies are unquantifiable, see sections 4B.9 and 4B.10 for more detailed information.

4C.29.6.3 Costs

Cost of the Recommended Plan for Irrigation in Shackelford County.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2
   - Date to be Implemented: 2010
   - Unit: $392/acft of water saved
   - Annual Cost: maximum of $4,700 in 2030

Table 4C.29-4.
Recommended Plan Costs by Decade for Shackelford County Irrigation

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Surplus/(Shortage) (acft/yr)	(104)	(98)	(93)	(88)	(83)	(78)
Conservation						
Supply From Plan Element (acft/yr)	6	9	12	12	12	11
Annual Cost ($/yr)	$2,350	$3,530	$4,700	$4,700	$4,700	$4,310
Unit Cost ($/acft)	$392	$392	$392	$392	$392	$392

4C.29.7 Livestock

No future shortages are projected in the Livestock category and no changes in water supply are recommended.

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4C.30 Somervell County Water Supply Plan

Table 4C.30-1 lists each water user group in Somervell County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.30-1.
Somervell County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
City of Glen Rose	(26)	(77)	Projected shortage – see plan below
County-Other	2,057	2,038	Projected surplus – see plan below
Manufacturing	303	300	Projected surplus
Steam-Electric	(35,505)	(35,392)	Projected shortage – see plan below
Mining	616	637	Projected surplus
Irrigation	616	644	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.

4C.30.1 City of Glen Rose

4C.30.1.1 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 2030 through year 2060.

4C.30.1.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortage of the City of Glen Rose:

- Conservation.
- 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.

4C.30.1.3 Costs

Costs of the Recommended Plan for the City of Glen Rose.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $22,325 in 2020

b. Somervell County Water Supply Project:
   - Cost Source: 2006 Plan Amendment provided by Somervell County Water District, updated to September 2008 dollars (Volume II, Section 4B.21)
   - Date to be Implemented: approximately 2010 for Phases 1 – 4
   - Annual Cost: $965,940 (based on unit cost for entire project, Phases 1 – 4)
     $298,220 (based on unit cost for entire project Phases 5 – 13)
   - Note : The cost estimate for the Somervell County Water Supply Project includes debt service on capital cost for a period of 30 years, not 20. The 30 year period assumption was included in the amendment to the 2006 plan and was included in the 2011 plan to be consistent with the request for TWDB funding.

Table 4C.30-2. Recommended Plan Costs by Decade for the City of Glen Rose

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	100	31	(26)	(58)	(71)	(77)
Conservation						
Supply From Plan Element (acft/yr)	22	47	41	32	28	29
Annual Cost ($/yr)	$10,450	$22,325	$19,475	$15,200	$13,300	$13,775
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Somervell County Water Supply Project Phases 1 – 4						
Supply From Plan Element (acft/yr)	340	340	340	340	340	340
Annual Cost ($/yr)	$965,940	$965,940	$965,940	$172,720	$172,720	$172,720
Unit Cost ($/acft)	$2,841	$2,841	$2,841	$508	$508	$508
Somervell County Water Supply Project Phases 5 – 13						
Supply From Plan Element (acft/yr)	—	—	260	260	260	260
Annual Cost ($/yr)	—	—	$298,220	$298,220	$298,220	$45,240
Unit Cost ($/acft)	—	—	$1,147	$1,147	$1,147	$174

4C.30.2 County-Other

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.

4C.30.2.1 Water Supply Plan

The following water supply plan is recommended to for Somervell County-Other:

- Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target rate of 140gpcd.
- 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.

4C.30.2.2 Costs

Costs of the Recommended Plan for Somervell County-Other.

a. Somervell County Water Supply Project:

- Cost Source: 2006 Plan Amendment provided by Somervell County Water District, updated to September 2008 dollars (Volume II, Section 4B.21)
- Date to be Implemented: approximately 2010 for Phases 1 – 4
- Annual Cost: $568,200 (based on unit cost for entire project, Phases 1 – 4)
  $591,852 (based on unit cost for entire project Phases 5 – 13)
- Note : The cost estimate for the Somervell County Water Supply Project includes debt service on capital cost for a period of 30 years, not 20. The 30 year period assumption was included in the amendment to the 2006 plan and was included in the 2011 plan to be consistent with the request for TWDB funding.

Table 4C.30-2.
Recommended Plan Costs by Decade for Somervell County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	2,123	2,085	2,057	2,045	2,042	2,038
Somervell County Water Supply Project Phases 1 – 4						
Supply From Plan Element (acft/yr)	200	200	200	200	200	200
Annual Cost ($/yr)	$568,200	$568,200	$568,200	$101,600	$101,600	$101,600
Unit Cost ($/acft)	$2,841	$2,841	$2,841	$508	$508	$508
Somervell County Water Supply Project Phases 5 – 13						
Supply From Plan Element (acft/yr)	—	—	516	516	516	516
Annual Cost ($/yr)	—	—	$591,852	$591,852	$591,852	$89,784
Unit Cost ($/acft)	—	—	$1,147	$1,147	$1,147	$174

4C.30.3 Manufacturing

Somervell County Manufacturing obtains its water supply from groundwater from the Trinity Aquifer. There are surpluses projected through 2060 and no changes recommended to the water supply.

4C.30.4 Steam-Electric

4C.30.4.1 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 2010 and continuing through year 2060. 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.

4C.30.4.2 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 Somervell County Steam-Electric:

- 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.
- BRA System Operation; and
- 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. 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. When the Somervell County Water Supply Project is developed, some potable water and process water for the plant will be obtained from the project.

4C.30.4.3 Costs

Costs of the Recommended Plan 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 (shortage projected for 2010 is unlikely to develop prior to 2020)
   - Annual Cost: $ zero

b. BRA System Operation:
   - Cost Source: 2006 Plan Amendment updated to September 2008 dollars (Volume II, Section 4B.21) Costs include Luminant Infrastructure necessary to transport the water.
   - Date to be Implemented: 2020 (shortage projected for 2010 is unlikely to develop prior to 2020)
   - Annual Cost: $23.23 million at full implementation

c. Somervell County Water Supply Project:
   - Cost Source: 2006 Plan Amendment provided by Somervell County Water District, updated to September 2008 dollars (Volume II, Section 4B.21)
   - Date to be Implemented: approximately 2010 for Phases 1 – 4
   - Annual Cost: $852,300 (based on unit cost for entire project, Phases 1 – 4)
     $211,048 (based on unit cost for entire project Phases 5 – 13)
   - Note : The cost estimate for the Somervell County Water Supply Project includes debt service on capital cost for a period of 30 years, not 20. The 30 year period assumption was included in the amendment to the 2006 plan and was included in the 2011 plan to be consistent with the request for TWDB funding.

Table 4C.30-4.
Recommended Plan Costs by Decade for Steam-Electric

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(35,580)	(35,542)	(35,505)	(35,467)	(35,430)	(35,392)
Transfer Steam-Electric Supplies from Hood County to Somervell County						
Supply From Plan Element (acft/yr)	—	26,847	26,847	26,847	26,847	26,847
Annual Cost (million $/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
BRA System Operation						
Supply From Plan Element (acft/yr)	—	76,270	76,270	76,270	76,270	76,270
Annual Cost (million $/yr)	—	$23.23	$23.23	$23.23	$23.23	$23.23
Unit Cost ($/acft)	—	$291	$291	$291	$291	$291
Somervell County Water Supply Project Phases 1 – 4						
Supply From Plan Element (acft/yr)	300	300	300	300	300	300
Annual Cost ($/yr)	$852,300	$852,300	$852,300	$152,400	$152,400	$152,400
Unit Cost ($/acft)	$2,841	$2,841	$2,841	$508	$508	$508
Somervell County Water Supply Project Phases 5 – 13						
Supply From Plan Element (acft/yr)	—	—	184	184	184	184
Annual Cost ($/yr)	—	—	$211,048	$211,048	$211,048	$32,016
Unit Cost ($/acft)	—	—	$1,147	$1,147	$1,147	$174

4C.30.5 Mining

Somervell County Mining obtains its water supply from groundwater from the Trinity Aquifer. There are surpluses projected through 2060 and no changes recommended to the water supply.

4C.30.6 Irrigation

Somervell County Irrigation is projected to have a surplus of water through 2060 and no changes in water supply are recommended.

4C.30.7 Livestock

No shortages are projected for Somervell County Livestock and no changes in water supply are recommended.

4C.31 Stephens County Water Supply Plan

Table 4C.31-1 lists each water user group in Stephens County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.31-1.
Stephens County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
City of Breckenridge	234	347	Projected surplus
Fort Belknap WSC			See Young County for Plan
Stephens Regional SUD	917	960	Projected surplus – see plan below
County-Other	63	88	Projected surplus
Manufacturing	52	49	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	(8,473)	(9,253)	Projected shortage –see plan below
Irrigation	2,789	2,805	Projected surplus
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.

4C.31.1 City of Breckenridge

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.

4C.31.2 Stephens Regional SUD (formerly Stephens County Rural WSC)

4C.31.2.1 Description of Supply

The current supply comes from the Lake Daniel and Hubbard Creek Reservoir through the City of Breckenridge, and through a contract with the Brazos River Authority for supply from Possum Kingdom Reservoir (800 acft), for which facilities are currently being constructed. Projections indicate a surplus of water for Stephens Regional SUD, however a change is recommended in water supply. This WUG is located in multiple counties (Eastland, Shackelford, Palo Pinto, Throckmorton and Stephens). The surplus shown in Table 4C.31-1 represents the cumulative totals for Stephens Regional SUD in all the counties it serves. 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.

4C.31.2.2 Water Supply Plan

Participate in the Midway Group project with Shackelford County WSC, 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 Stephens Regional SUD:

- Additional supply through the Midway Group and the West Central Brazos Water Distribution System (WCBWDS).
- Conservation was also considered; however, the SUD's current per capita use rate is below the selected target rate of 140 gpcd.

4C.31.2.3 Costs

Cost of the recommended Plan for the Stephens Regional SUD.

a. Water Supply from Midway Group and WCBWDS:

  - Cost Source: Volume II, Section 4B.14.2
  - Date to be Implemented: 2010
  - Annual Cost: $818,400 at full implementation.
  - Unit Cost: $2,046/acft or $6.28/kgal.

Table 4C.31-2.
Recommended Plan Costs by Decade for Stephens Regional SUD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	906	911	917	934	952	960
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	400	400	400	400	400	400
Annual Cost ($/yr)	$818,400	$818,400	$259,200	$259,200	$259,200	$259,200
Unit Cost ($/acft)	$2,046	$2,046	$648	$648	$648	$648

4C.31.3 County-Other

The current supply comes from groundwater. Projections indicate a surplus of water and no changes are recommended for the water supply.

4C.31.4 Manufacturing

Projections indicate a surplus of water for Manufacturing and no changes in water supply are recommended.

4C.31.5 Steam-Electric

No Steam-Electric demand or supply exists for the county.

4C.31.6 Mining

4C.31.6.1 Description of Supply

The current supply comes from groundwater and Possum Kingdom Reservoir; the supplies will not be sufficient through 2060.

4C.31.6.2 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 shortage for Stephens County Mining:

- Conservation
- Purchase interruptible contract water from BRA from Possum Kingdom Reservoir. This would be a series of short-term contracts to temporarily overdraft supplies until the demands of long-term contract holders increase to full contracted supplies.

4C.31.6.3 Costs

Cost of the Recommended Plan for Stephens County Mining.

a. Conservation (Volume II, Section 4B.2)
   - Date to be Implemented: 2010
   - Annual Cost: Not determined

b. Water Supply from BRA (Possum Kingdom Reservoir):
   - Cost Source: BRA System Rate ($54.50/acft). Assumes existing infrastructure is sufficient to convey supplies

- Date to be Implemented: 2010
- Annual Cost: maximum of $493,000 in 2060

Table 4C.31-3.
Recommended Plan Costs by Decade for Stephens County Mining

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(7,621)	(8,234)	(8,473)	(8,704)	(8,930)	(9,253)
Conservation						
Supply From Plan Element (acft/yr)	261	466	670	686	702	724
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Water Supply from BRA (Possum Kingdom Reservoir)						
Supply From Plan Element (acft/yr)	7,796	8,234	8,281	8,508	8,729	9,046
Annual Cost ($/yr)	$425,000	$449,000	$451,000	$464,000	$476,000	$493,000
Unit Cost ($/acft)	$54.5	$54.5	$54.5	$54.5	$54.5	$54.5

4C.31.7 Irrigation

Projections indicate a surplus of water for Irrigation and no changes in water supply are recommended.

4C.31.8 Livestock

No future shortages are projected for Livestock supply and no changes in water supply are recommended.

4C.32 Stonewall County Water Supply Plan

Table 4C.32-1 lists each water user group in Stonewall County and their corresponding surplus or shortage in years 2030 and 2060. There are no shortages projected for any water user groups in Stonewall County. A brief description of each water user group has been developed and is presented in the following subsections.

Table 4C.32-1.
Stonewall County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Aspermont	106	139	Projected surplus
County-Other	37	54	Projected surplus
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	178	178	Projected surplus
Irrigation	3,268	3,295	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.

4C.32.1 City of Aspermont

The City of Aspermont is supplied from NCTMWA and from local groundwater sources, primarily from the Seymour Aquifer. There is projected surplus through 2060 and no changes in water supply are recommended.

4C.32.2 County-Other

The water supply entities for Stonewall County-Other show a projected surplus and no changes in water supply are recommended.

4C.32.3 Manufacturing

No Manufacturing demand exists or is projected for the county.

4C.32.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.32.5 Mining

Stonewall County Mining shows no projected shortages and no changes in water supply are recommended.

4C.32.6 Irrigation

Stonewall County Irrigation shows a projected surplus and no changes in water supply are recommended.

4C.32.7 Livestock

No Livestock shortage is projected.

4C.33 Taylor County Water Supply Plan

Table 4C.33-1 lists each water user group in Taylor County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.33-1.
Taylor County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1] 2030 (acft/yr)	Surplus/(Shortage)[1] 2060 (acft/yr)	Comment
City of Abilene	(19,155)	(17,812)	Projected shortage –see Section 4C.38
Coleman County WSC			See Callahan County for Plan
Hawley WSC			See Jones County for Plan
City of Merkel	(116)	(83)	Projected shortage –see plan below
Potosi WSC	(120)	(84)	Projected shortage –see plan below
Steamboat Mountain WSC	(34)	(4)	Projected shortage –see plan below
City of Tuscola	0	0	Supply equals demand
City of Tye	3	17	Projected surplus
County-Other	602	639	Projected surplus
Manufacturing	0	0	Demand equals supply
Steam-Electric	0	0	No projected demand
Mining	27	0	Projected surplus/No projected need
Irrigation	242	250	Projected surplus
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.

4C.33.1 City of Abilene

The City of Abilene obtains its water supply from a 50 acft/yr BRA contract and surface water from Fort Phantom Hill, Hubbard Creek and O.H. Ivie 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 2060. This WUG is located in multiple counties (Taylor and Jones). Refer to Section 4C.38.13 for the City's plan as a Wholesale Water Provider.

4C.33.2 City of Merkel

4C.33.2.1 Description of Supply

The City of Merkel obtains surface water from local sources and from the City of Abilene. A shortage is projected through year 2060 for the City of Merkel.

4C.33.2.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and the TWDB, the following water supply plan is recommended to meet the projected shortage of the City of Merkel:

- Purchase additional supply from City of Abilene.
- Conservation was also considered; however, the current per capita use rate is below the selected target rate of 140 gpcd after 2020.

4C.33.2.3 Costs

Cost of the Recommended Plan for the City of Merkel.

a. Water Supply from City of Abilene:

- Cost Source: Assumed treated wholesale rate
- Date to be Implemented: 2010
- Total Project Cost: $0 (Current infrastructure assumed to be adequate)
- Annual Unit Cost: $1,007/acft ($3.09/1,000 gallons)

Table 4C.33-2.
Recommended Plan Costs by Decade for the City of Merkel

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(105)	(116)	(116)	(109)	(97)	(83)
Water Supply from Abilene						
Supply From Plan Element (acft/yr)	128	139	139	132	120	105
Annual Cost ($/yr)	$129,000	$140,000	$140,000	$133,000	$121,000	$106,000
Unit Cost ($/acft)	$1,007	$1,007	$1,007	$1,007	$1,007	$1,007

4C.33.3 Potosi WSC

4C.33.3.1 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 4C.33-5 represent the cumulative totals for Potosi WSC.

4C.33.3.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and the TWDB, the following water supply plan is recommended to meet the projected shortage of the Potosi WSC:

- Purchase additional supply from City of Abilene.
- Conservation was also considered; however, the current per capita use rate is below the selected target rate of 140 gpcd.

4C.33.3.3 Costs

Cost of the Recommended Plan for the Potosi WSC.

a. Water Supply from City of Abilene:

- Cost Source: Assumed treated wholesale rate
- Date to be Implemented: 2010
- Total Project Cost: $0 (Current infrastructure assumed to be adequate)
- Annual Unit Cost: $1,007/acft ($3.09/1,000 gallons)

Table 4C.33-3
Recommended Plan Costs by Decade for Potosi WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(115)	(121)	(120)	(108)	(96)	(84)
Water Supply from Abilene						
Supply From Plan Element (acft/yr)	136	142	141	129	116	104
Annual Cost ($/yr)	$137,000	$143,000	$142,000	$130,000	$117,000	$105,000
Unit Cost ($/acft)	$1,007	$1,007	$1,007	$1,007	$1,007	$1,007

4C.33.4 Steamboat Mountain WSC

4C.33.4.1 Description of Supply

Steamboat Mountain WSC purchases water from the City of Abilene, and shows a projected shortage.

4C.33.4.2 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 shortage of the Steamboat Mountain WSC:

- Purchase additional supply from City of Abilene.
- Conservation was also considered; however, the current per capita use rate is below the selected target rate of 140 gpcd.

4C.33.4.3 Costs

Cost of the Recommended Plan for the Potosi WSC.

a. Water Supply from City of Abilene:

- Cost Source: Assumed treated wholesale rate
- Date to be Implemented: 2010
- Total Project Cost: $0 (Current infrastructure assumed to be adequate)
- Annual Unit Cost: $1,007/acft ($3.09/1,000 gallons)

Table 4C.33-4
Recommended Plan Costs by Decade for Steamboat Mountain WSC

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(38)	(37)	(34)	(26)	(14)	(4)
Water Supply from Abilene						
Supply From Plan Element (acft/yr)	55	54	51	43	30	20
Annual Cost ($/yr)	$55,000	$54,000	$51,000	$43,000	$30,000	$20,000
Unit Cost ($/acft)	$1,007	$1,007	$1,007	$1,007	$1,007	$1,007

4C.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.

4C.33.6 City of Tye

4C.33.61 Description of Supply

The City of Tye purchases water from the City of Abilene, and shows a projected surplus through year 2060. Although a surplus is projected, the supply does not exceed 105% of the demand, therefore a water supply plan is provided below for this WUG.

4C.33.6.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and the TWDB, the following water supply plan is recommended to increase supply to the City of Tye:

- Purchase additional supply from City of Abilene.
- Conservation was also considered; however, the current per capita use rate is below the selected target rate of 140 gpcd.

4C.33.6.3 Costs

Cost of the Recommended Plan for the City of Tye.

a. Water Supply from City of Abilene:

- Cost Source: Assumed treated wholesale rate
- Date to be Implemented: 2010
- Total Project Cost: $0 (Current infrastructure assumed to be adequate)
- Annual Unit Cost: $1,007/acft ($3.09/1,000 gallons)

Table 4C.33-5
Recommended Plan Costs by Decade for City of Tye

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	6	3	3	7	12	17
Water Supply from Abilene						
Supply From Plan Element (acft/yr)	3	6	6	2	—	—
Annual Cost ($/yr)	$3,000	$6,000	$6,000	$2,000	—	—
Unit Cost ($/acft)	$1,007	$1,007	$1,007	$1,007	—	—

4C.33.7 County-Other

The water supply entities for Taylor County-Other show a projected surplus and no changes in water supply are recommended.

4C.33.8 Manufacturing

The water supply for Manufacturing equals demand and no changes in water supply are recommended.

4C.33.9 Steam-Electric

The water supply entities for Taylor County Steam-Electric show no projected demand.

4C.33.10 Mining

The current supply comes from the Trinity aquifer; Taylor County Mining shows a projected surplus through 2060.

4C.33.11 Irrigation

Taylor County Irrigation shows a projected surplus and no changes in water supply are recommended.

4C.33.12 Livestock

Supplies for Livestock water use equal demand and no changes in water supply are recommended.

4C.34 Throckmorton County Water Supply Plan

Table 4C.34-1 lists each water user group in Throckmorton County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.34-1.
Throckmorton County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)*[1]		*Comment*
	2030 (acft/yr)	*2060 (acft/yr)*	
Fort Belknap WSC			See Young County for Plan
Stephens Regional SUD[2]			See Stephens County for Plan
City of Throckmorton	(9)	32	Projected shortage –see plan below
County-Other	(14)	4	Projected shortage –see plan below
Manufacturing	0	0	No projected demand
Steam-Electric	0	0	No projected demand
Mining	6	0	Projected surplus/ Demand equals supply
Irrigation	(3,988)	(3,988)	Projected shortage –see plan below
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.
[2] Previously listed as Stephens County RWSC

4C.34.1 City of Throckmorton

4C.34.1.1 Description of Supply

The City of Throckmorton obtains water from Lake Throckmorton and shows a projected shortage through 2030. Since the city's supply is solely Lake Throckmorton, an alternate source is desired in case of severe drought.

4C.34.1.2 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:

- Conservation, and
- Additional supply through the Midway Group and the West Central Brazos Water Distribution System (WCBWDS).
- An alternate strategy is to construct a pipeline to purchase water from the City of Graham.

4C.34.1.3 Costs

Cost of the recommended Plan for the City of Throckmorton.

a. Conservation

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: by 2010
- Annual Cost: $6,650 maximum in 2020
- Unit Cost: $475/acft of water saved

b. Water Supply from Midway Group and WCBWDS:

- Cost Source: Volume II, Section 4B.14.2
- Date to be Implemented: 2010
- Annual Cost: $395,000 ($2,046/acft or $6.28/kgal)

Table 4C.34-2.
Recommended Plan Costs by Decade for the City of Throckmorton

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(32)	(22)	(9)	9	23	32
Conservation						
Supply From Plan Element (acft/yr)	6	14	10	7	5	5
Annual Cost ($/yr)	$2,850	$6,650	$4,750	$3,325	$2,375	$2,375
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Water Supply from Midway Group and WCBWDS						
Supply From Plan Element (acft/yr)	193	193	193	193	193	193
Annual Cost ($/yr)	$395,000	$395,000	$125,000	$125,000	$125,000	$125,000
Unit Cost ($/acft)	$2,046	$2,046	$648	$648	$648	$648

4C.34.2 County-Other

4C.34.2.1 Description of Supply

The Throckmorton County-Other shows a projected shortage through 2040.

4C.34.2.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG, the following water supply plan is recommended for Throckmorton County Other:

- Additional supply through the Midway Group and the West Central Brazos Water Distribution System (WCBWDS).
- Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target rate of 140 gpcd.

4C.34.2.3 Costs

Costs for the recommended plan for Throckmorton County-Other.

a. Water Supply from City of Throckmorton:

- Cost Source: Unit cost for City of Throckmorton Strategy Evaluation (Volume II, Section 4B.14.2)
- Date to be Implemented: by 2010
- Annual Cost: $72,000
- Unit Cost: $2,046/acft or $6.28/kgal

Table 4C.34-3.
Recommended Plan Costs by Decade for the Throckmorton County-Other

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(26)	(21)	(14)	(6)	—	4
Water Supply from City of Throckmorton (WCBDS)						
Supply From Plan Element (acft/yr)	35	35	35	35	35	35
Annual Cost ($/yr)	$72,000	$72,000	$72,000	$72,000	$72,000	$72,000
Unit Cost ($/acft)	$2,046	$2,046	$2,046	$2,046	$2,046	$2,046

4C.34.3 Manufacturing

No Manufacturing demand exists or is projected for the county.

4C.34.4 Steam-Electric

No Steam-Electric demand exists or is projected for the county.

4C.34.5 Mining

No Mining shortages are projected and no changes in water supply system are recommended.

4C.34.6 Irrigation

4C.34.6.1 Description of Supply

- Source: Clear Fork of the Brazos River.
- Estimated Reliable Supply: 12 acft/yr in 2060

4C.34.6.2 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 Throckmorton County Irrigation:

- Run-of-river water right for unappropriated flows.
- Conservation was also considered; however, this is would be an entirely new irrigation system and would utilize the most water-efficient irrigation technologies that are economically feasible.

4C.34.6.3 Costs

Costs of the recommended plan for Throckmorton County Irrigation to meet the projected shortages are:

a. Run-of-river water right for unappropriated flows in the Clear Fork of the Brazos River

   This strategy would be implemented as an interruptible supply. No estimate of supply was developed for this strategy, and there is no cost estimate provided. The supply and costs of this strategy would be dependent on the location of the applicant and the amount of land anticipated to be irrigated.

   - Cost Source: N/A
   - Date to be Implemented: By year 2010
   - Annual Cost: N/A

Table 4C.34-4.
Recommended Plan Costs by Decade for Throckmorton County Irrigation

Plan Element	2010	2020	2030	2040	2050	2060
Projected Shortage (acft/yr)	(3,988)	(3,988)	(3,988)	(3,988)	(3,988)	(3,988)
Run-of-river water right for unappropriated flows						
Supply From Plan Element (acft/yr)	—	—	—	—	—	—
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.34.7 Livestock

No projected shortage exists and no change in water supply is recommended.

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4C.35 Washington County Water Supply Plan

Table 4C.35-1 lists each water user group in Washington County and their corresponding surplus or shortage in years 2030 and 2060. No shortages are projected for these water user groups and no water supply plans have been developed for them. A brief summary of the water user groups are presented in the following subsections.

Table 4C.35-1.
Washington County Surplus/(Shortage)

Water User Group	*Surplus/(Shortage)*[1] 2030 (acft/yr)	*Surplus/(Shortage)*[1] 2060 (acft/yr)	*Comment*
City of Brenham	840	728	Projected surplus
County-Other	234	135	Projected surplus
Manufacturing	131	2	Projected surplus
Steam-Electric	0	0	No projected demand
Mining	20	0	Projected surplus
Irrigation	2,791	2,791	Projected surplus
Livestock	0	0	Demand equals supply

[1] From Tables C-69 and C-70, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

4C.35.1 City of Brenham

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. This contract exceeds its year 2060 projected demand of 3,415 acft/yr. No changes in water supply are recommended.

4C.35.2 County-Other

County-Other is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.35.3 Manufacturing

Washington County Manufacturing obtains its water supply from groundwater from the Gulf Coast Aquifer. Washington County Manufacturing is projected to have a surplus of water through the year 2060 and no changes in water supply are recommended.

4C.35.4 Steam-Electric

No Steam-Electric demand exists nor is projected for the county.

4C.35.5 Mining

No shortages are projected for Mining use and no changes in water supply are recommended.

4C.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.

4C.35.7 Livestock

No shortages are projected for Livestock use and no changes in water supply are recommended.

4C.36 Williamson County Water Supply Plan

Table 4C.36-1 lists each water user group in Williamson County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

Table 4C.36-1.
Williamson County Surplus/(Shortage)

Water User Group	***Surplus/(Shortage)[1]***		***Comment***
	2030 (acft/yr)	***2060 (acft/yr)***	
Aqua WSC			See Lee County for Plan
City of Bartlett	(136)	(179)	Projected shortage – see plan below
Bell-Milam Falls WSC			See Bell County for Plan
Blockhouse MUD	(418)	(2,058)	Projected shortage – see plan below
Brushy Creek MUD	(478)	(478)	Projected shortage – see plan below
City of Cedar Park	(6,100)	(10,156)	Projected shortage – see Section 4B.38
Chisholm Trail SUD	3,140	(3,795)	Projected shortage – see plan below
Fern Bluff MUD	0	0	Supply equals demand
City of Florence	(161)	(344)	Projected shortage – see plan below
City of Georgetown	(763)	(16,082)	Projected shortage – see plan below
City of Granger	106	47	Projected surplus
City of Hutto	3,397	386	Projected surplus – see plan below
Jarrell	(169)	(164)	Projected shortage – see plan below
Jarrell-Schwertner WSC	(442)	(1,499)	Projected shortage – see plan below
Jonah Water SUD	(1)	(1,575	Projected shortage – see plan below
City of Leander	(719)	(7,039)	Projected shortage – see plan below
Liberty Hill	(863)	(1,797)	Projected shortage – see plan below
Manville WSC	1,361	210	Projected surplus
City of Round Rock	(24,046)	(62,612)	Projected shortage – see Section 4B.38
Southwest Milam WSC			See Milam County for Plan
City of Taylor	0	0	Supply equals demand
City of Thrall	(185)	(293)	Projected shortage – see plan below
City of Weir	(288)	(568)	Projected shortage – see plan below
Wells Branch MUD	0	0	Supply equals demand
Williamson-Travis County MUD #1	(784)	(2,267)	Projected shortage – see plan below
County-Other	596	(3,677)	Projected shortage – see plan below
Manufacturing	(1,785)	(2,521)	Projected shortage – see plan below
Steam-Electric	0	0	No projected demand
Mining	(2,312)	(2,797)	Projected shortage – see plan below
Irrigation	1,004	1,007	Projected surplus
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.

4C.36.1 City of Bartlett

4C.36.1.1 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 2060. This WUG is located in multiple counties (Williamson and Bell). The shortages shown in Table 4C.36-2 represent the cumulative totals for the City of Bartlett.

4C.36.1.2 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 the City of Bartlett:

- Conservation, and
- Purchase from the BRA (Lake Granger) through the EWCRWTS.

4C.36.1.3 Costs

Costs of the Recommended Plan for the City of Bartlett.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum $14,250 in 2020

b. Purchase from the BRA (Lake Granger) through the EWCRWTS:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2010
   - Total Project Cost: $44,706,000 (assuming full implementation in 2010)
   - Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-2.
Recommended Plan Costs by Decade for the City of Bartlett

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Surplus/(Shortage) (acft/yr)	(102)	(119)	(136)	(148)	(163)	(179)
Conservation						
Supply From Plan Element (acft/yr)	12	30	25	19	18	18
Annual Cost ($/yr)	$5,700	$14,250	$11,875	$9,025	$8,550	$8,550
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	180	180	180	180	180	180
Annual Cost ($/yr)	$306,836	$225,989	$97,995	$97,995	$80,273	$80,273
Unit Cost ($/acft)	$1,705	$1,255	$544	$544	$446	$446

4C.36.2 Blockhouse MUD

4C.36.2.1 Description of Supply

Blockhouse MUD obtains its water supply from the City of Cedar Park. Blockhouse MUD is projected to have shortages from 2030 through the year 2060.

4C.36.2.2 Water Supply Plan

The following water supply plan is recommended to meet the projected shortages for Blockhouse MUD:

- Increase supply from Cedar Park.
- Conservation was also considered; however, the MUD’s current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.2.3 Costs

Costs of the Recommended Plan for Blockhouse MUD.

a. Increase contract with Cedar Park:
   - Cost Source: Volume II, Section 4B.17. Assumed wholesale treated water cost of $829/acft ($2.54/1,000 gallons).
   - Date to be Implemented: before 2030
   - Annual Cost: $1,764,000 in 2060

Table 4C.36-3.
Recommended Plan Costs by Decade for Blockhouse MUD

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	428	43	(418)	(911)	(1,465)	(2,058)
Increase Supply from Cedar Park						
Supply From Plan Element (acft/yr)	—	—	500	1,000	1,500	2,100
Annual Cost ($/yr)	—	—	$468,000	$935,000	$1,268,000	$1,764,000
Unit Cost ($/acft)	—	—	$935	$935	$845	$840

4C.36.3 Brushy Creek MUD

4C.36.3.1 Description of Supply

Brushy Creek MUD obtains its water supply from a contract with the Brazos River Authority for water from Stillhouse Hollow Reservoir. Brushy Creek MUD has a projected shortage through 2060.

4C.36.3.2 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 Brushy Creek MUD:

- Conservation, and
- Rehabilitate existing well supply to increase capacity. The MUD is in the process of improving some existing wells (not counted as part of existing supplies) to increase the wells' reliable supply to approximately 700 to 800 gpm from the Northern Edwards (BFZ) Aquifer. This would supply approximately 1,100 acft/yr of reliable supply.

4C.36.3.3 Costs

Costs of the Recommended Plan for Brushy Creek MUD.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $63,175 in 2030 through 2060

b. Rehabilitate Existing Well Supply:
- Cost Source: Volume II, Section 4B.17.
- Date to be Implemented: 2020
- Total Project Cost: $350,000
- Annual Cost: $33,000

Table 4C.36-4.
Recommended Plan Costs by Decade for Brushy Creek MUD

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	748	(205)	(478)	(478)	(478)	(478)
Conservation						
Supply From Plan Element (acft/yr)	92	124	133	133	133	133
Annual Cost ($/yr)	$43,700	$58,900	$63,175	$63,175	$63,175	$63,175
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Rehabilitate Existing Wells						
Supply From Plan Element (acft/yr)	—	1,100	1,100	1,100	1,100	1,100
Annual Cost ($/yr)	—	$33,000	$33,000	$33,000	$33,000	$33,000
Unit Cost ($/acft)	—	$30	$30	$30	$30	$30

4C.36.4 City of Cedar Park

The recommended water supply plan for the City of Cedar Park is included in Section 4C.38 with the wholesale water providers.

4C.36.5 Chisholm Trail SUD

4C.36.5.1 Description of Supply

Chisholm Trail SUD 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 2050. This WUG is located in multiple counties (Williamson and Bell). The surplus/shortages shown in Table 4C.36-5 represent the cumulative totals for Chisholm Trail SUD. An estimated 9,410 acft/yr can be supplied by the supply contracted from the BRA through Lake Georgetown (11,100 acft/yr). This amount is less than the district's projected demands.

4C.36.5.2 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 Chisholm Trail SUD:

- Conservation
- Obtain supply through the LCRA/BRA Alliance through the Brushy Creek RUA Water Supply Project (Round Rock portion). This would allow Chisholm Trail to utilize 3,272 acft/yr of supply already contracted for from the LCRA/BRA Alliance.
- Additional BRA Supply from Lake Granger (EWCRWTS). This would firm up a portion of the supply already contracted from the BRA that Lake Georgetown is unable to provide, and provide new supply.

Projected demands for Chisholm Trail SUD do not exceed current supplies until between 2040 and 2050. Chisholm Trail SUD has expressed no plans to utilize the Highland Lakes Supply. This strategy is recommended to ensure future supplies are planned for appropriately.

4C.36.5.3 Costs

Costs of the Recommended Plan for Chisholm Trail SUD.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: by year 2010
   - Annual Cost: Maximum of $874,950 in 2060.

b. BRA/LCRA Alliance supply treated and delivered through the Brushy Creek RUA Water Supply Project (Round Rock portion):
   - Cost Source: Volume II, Section 4B.11.2
   - Date to be Implemented: before 2050
   - Total Project Cost: $13,264,000
   - Annual Cost: $5,460,000

c. Firm up BRA supply through the Lake Granger Augmentation Project:
   - Cost Source: Volume II, Section 4B.5
   - Date to be Implemented: before 2050
   - Total Project Cost: $229,822,000 (Based on full implementation in 2050.)
   - Annual Cost: $33,212,000 (Based on full implementation in 2050.)

4C.36.6 Fern Bluff MUD

Fern Bluff MUD obtains its water supply from the City of Round Rock. No shortages are projected for Fern Bluff MUD and no changes in water supply are recommended.

4C.36.7 City of Florence

4C.36.7.1 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 2060.

Table 4C.36-5.
Recommended Plan Costs by Decade for Chisholm Trail SUD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	6,660	5,055	3,140	966	(1,393)	(3,795)
Conservation						
Supply From Plan Element (acft/yr)	213	665	925	1,207	1,513	1,842
Annual Cost ($/yr)	$101,175	$315,875	$439,375	$573,325	$718,675	$874,950
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
BRA/LCRA Alliance Supply through the Brushy Creek RUA Water Supply Project (Round Rock portion)						
Supply From Plan Element (acft/yr)	—	—	—	—	3,272	3,272
Annual Cost ($/yr)	—	—	—	—	$5,460,000	$5,460,000
Unit Cost ($/acft)	—	—	—	—	$1,669	$1,669
BRA Supply (Lake Granger) via Lake Granger Augmentation – firm up existing BRA contract						
Supply From Plan Element (acft/yr)	—	—	—	—	1,690	1,690
Annual Cost ($/yr)	—	—	—	—	$1,370,590	$1,370,590
Unit Cost ($/acft)	—	—	—	—	$811	$811

4C.36.7.2 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 the City of Florence:

- Conservation, and

- Additional groundwater development.

4C.36.7.3 Costs

Costs of the Recommended Plan for the City of Florence.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $12,825 in 2060

b. Trinity Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2010
   - Total Project Cost: $1,648,000
   - Annual Cost: $191,000
   - Project costs include drilling two 200 gpm wells into the Trinity Aquifer at a depth of 750 feet.

Table 4C.36-6.
Recommended Plan Costs by Decade for the City of Florence

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(71)	(112)	(161)	(215)	(276)	(344)
Conservation						
Supply From Plan Element (acft/yr)	9	24	22	21	23	27
Annual Cost ($/yr)	$4,275	$11,400	$10,450	$9,975	$10,925	$12,825
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	322	322	322	322	322	322
Annual Cost ($/yr)	$191,000	$191,000	$47,700	$47,700	$47,700	$47,700
Unit Cost ($/acft)	$593	$593	$148	$148	$148	$148

4C.36.8 City of Georgetown

4C.36.8.1 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 2060.

4C.36.8.2 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 the City of Georgetown:

- Conservation, and
- Increase surface water treatment capacity for existing contractual BRA supply.

4C.36.8.3 Costs

Costs of the Recommended Plan for the City of Georgetown.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $955,700 in 2060

b. Increase surface water treatment capacity to fully utilize current BRA supply:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 7.2 MGD by 2040, 18.3 MGD by 2050 and 31 MGD by 2060
   - Total Project Cost: $50,722,000
   - Annual Cost: $5,162,000

Table 4C.36-7.
Recommended Plan Costs by Decade for the City of Georgetown

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	7,082	3,468	(763)	(5,402)	(10,555)	(16,082)
Conservation						
Supply From Plan Element (acft/yr)	274	1,049	1,185	1,371	1,680	2,012
Annual Cost ($/yr)	$130,150	$498,275	$562,875	$651,225	$798,000	$955,700
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Increase Water Treatment Capacity						
Supply From Plan Element (acft/yr)	—	—	—	4,031	10,274	17,379
Annual Cost ($/yr)	—	—	—	$1,893,000	$3,950,000	$5,162,000
Unit Cost ($/acft)	—	—	—	$469	$384	$297

4C.36.9 City of Granger

4C.36.9.1 Description of Supply

The City of Granger obtains its water supply from groundwater from the Trinity Aquifer. While no shortages are projected for the City of Granger, the City has expressed a desire to obtain an additional water supply to improve water quality.

4C.36.9.2 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 the City of Granger:

- Purchase water from the BRA (Lake Granger) through the EWCRWTS.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.9.3 Costs

Costs of the Recommended Plan for the City of Granger.

a. Purchase from the BRA (Lake Granger) through the EWCRWTS:
- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: 2020
- Total Project Cost: $44,706,000 (assuming full implementation in 2010)
- Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-8.
Recommended Plan Costs by Decade for the City of Granger

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	133	121	106	92	72	47
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	—	300	300	300	300	300
Annual Cost ($/yr)	—	$376,649	$163,326	$163,326	$133,788	$133,788
Unit Cost ($/acft)	—	$1,255	$544	$544	$446	$446

4C.36.10 City of Hutto

4C.36.10.1 Description of Supply

The City of Hutto obtains its water supply from Heart of Texas WSC, Manville WSC and City of Taylor Based on the available supplies, the City of Hutto is projected to have a surplus assuming that existing water contracts are renewed through 2060.

4C.36.10.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended to provide future supplies for the City of Hutto:

- Purchase water from the City of Taylor. The City has recently entered into an agreement with the City of Taylor to purchase 2,016 acft/yr through 2010, increasing to 3,136 acft/yr in years 2020 through 2060. The City of Taylor is supplied by the BRA through Lake Granger. Supply analyses have allocated 7,003 acft/yr to Taylor from the EWCRWTS, of which 5,342 acft/yr would be used to meet Taylor's 2060 demands. The remaining supply available to CTWSC and Hutto from the Taylor allocation of the EWCRWTS would then be 410 acft/yr and 1,251 acft/yr respectively.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.10.3 Costs

Costs of the Recommended Plan for the City of Hutto.

a. Purchase from City of Taylor:
   - Cost Source: EWCRWTS Volume II, Section 4B.17
   - Date to be Implemented: 2010
   - Total Project Cost: $44,706,000 (assuming full implementation in 2010)
   - Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-9.
Recommended Plan Costs by Decade for the City of Hutto

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	4,709	4,108	3,397	2,730	1,309	386
Purchase from City of Taylor (BRA supply from Lake Granger through the EWCRWTS)						
Supply From Plan Element (acft/yr)	1,251	1,251	1,251	1,251	1,251	1,251
Annual Cost ($/yr)	$2,132,514	$1,570,625	$681,068	$681,068	$557,896	$557,896
Unit Cost ($/acft)	$1,705	$1,255	$544	$544	$446	$446

4C.36.11 City of Jarrell

4C.36.11.1 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 are insufficient to meet projected demands and the City is projected to have shortages through 2060.

4C.36.11.2 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 shortages of the City of Jarrell:

- Purchase water from the BRA (Lake Granger) through the EWCRWTS.
- Conservation was also considered; however, the City’s current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.11.3 Costs

a. Purchase from the BRA (Lake Granger) through the EWCRWTS:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2010

- Total Project Cost: $44,706,000 (assuming full implementation in 2010)
- Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-10.
Recommended Plan Costs by Decade for the City of Jarrell

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(165)	(167)	(169)	(173)	(176)	(164)
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	190	190	190	190	190	190
Annual Cost ($/yr)	$323,883	$238,544	$103,440	$103,440	$84,732	$84,732
Unit Cost ($/acft)	$1,705	$1,255	$544	$544	$446	$446

4C.36.12 Jarrell-Schwertner WSC

4C.36.12.1 Description of Supply

Jarrell-Schwertner WSC obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer. Based on the available groundwater water supply, Jarrell-Schwertner WSC is projected to have a shortage from 2030 the year 2060. The WSC also has a contract with BRA for 1,000 acft, however no infrastructure exists to access this supply. This WUG is located in multiple counties (Williamson and Bell). The surplus/shortages shown in Table 4C.36-11 represent the cumulative totals for Jarrell-Schwertner WSC.

4C.36.12.2 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 Jarrell-Schwertner WSC:

- Conservation, and
- Purchase from the BRA (Lake Granger) through the EWCRWTS.

4C.36.12.3 Costs

Costs of the Recommended Plan for Jarrell-Schwertner WSC.

a. Conservation:
    - Cost Source: Volume II, Section 4B.2.1
    - Date to be Implemented: 2010
    - Annual Cost: maximum of $66,025 in 2060

b. Purchase from the BRA (Lake Granger) through the EWCRWTS:
   - Cost Source: Volume II, 4B.17
   - Date to be Implemented: 2020
   - Total Project Cost: $44,706,000 (assuming full implementation in 2010)
   - Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-11.
Recommended Plan Costs by Decade for Jarrell-Schwertner WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	153	(126)	(442)	(763)	(1,120)	(1,499)
Conservation						
Supply From Plan Element (acft/yr)	22	83	94	97	117	139
Annual Cost ($/yr)	$10,450	$39,425	$44,650	$46,075	$55,575	$66,025
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	—	1,359	1,359	1,359	1,359	1,359
Annual Cost ($/yr)	—	$1,705,545	$739,296	$739,296	$606,114	$606,114
Unit Cost ($/acft)	—	$1,255	$544	$544	$446	$446

4C.36.13 Jonah Water SUD

4C.36.13.1 Description of Supply

Jonah Water SUD obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and a needs met contract with the BRA for treated supply through Lake Granger and the East Williamson County WTP. The SUD also has a contract with the BRA for 2,439 acft/yr supply from Stillhouse Hollow Reservoir, of which 2,068 acft/yr could be reliably supplied but is not being utilized because treatment infrastructure is not in place. Based on the available groundwater and surface water supply, Jonah Water SUD is projected to have a shortage from 2040 through the year 2060.

4C.36.13.2 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 Jonah Water SUD:

- Firm up existing BRA supplies and purchase new supplies from the BRA (Lake Granger Augmentation) .

- Conservation was also considered; however, the SUD's current per capita use rate is below the selected target rate of 140 gpcd after 2030.

4C.36.13.3 Costs

Costs of the Recommended Plan for Jonah Water SUD.

a. BRA System Operation – Lake Granger Augmentation (conjunctive use):
   - Cost Source: Volume II, Section 4B.5
   - Date to be Implemented: 2040
   - Total Project Cost: $229,822,000 (assuming full implementation in 2040)
   - Annual Cost: $33,212,000(assuming full implementation in 2040)

Table 4C.36-12.
Recommended Plan Costs by Decade for Jonah Water SUD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1)	(1)	)1)	(145)	(822)	(1,575)
BRA System Operation – Lake Granger Augmentation (conjunctive use)						
Supply From Plan Element (acft/yr)	—	—	—	314	1,025	1,816
Annual Cost ($/yr)	—	—	—	$272,000	$887,000	$1,571,000
Unit Cost ($/acft)	—	—	—	$865	$865	$865

4C.36.14 City of Leander

4C.36.14.1 Description of Supply

The City of Leander obtains its water supply from groundwater from the Edwards-BFZ (Northern Segment) Aquifer and contracts with the Lower Colorado River Authority for water from Lake Travis. 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 2060. Actual projected shortages for Leander will likely include some of the shortages projected for Cedar Park. Accordingly, a portion of the Brushy Creek RUA supply contracted for Leander has been made available within this plan to meet projected shortages for Cedar Park, which will most likely be Leander shortages in the future.

4C.36.14.2 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 the City of Leander:

- Conservation
- Increase supply from the LCRA

4C.36.14.3 Costs

Costs of the Recommended Plan for the City of Leander.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $345,325 in 2060

b. Additional supply from Lake Travis (Brushy Creek Regional Utility Authority Water Supply Project):
   - Cost Source: Volume II, Section 4B.11.2
   - Date to be Implemented: before 2040
   - Total Project Cost: $169,147,000
   - Annual Cost: $33,185,000 (includes existing and future supply of 24,600 acft)

Table 4C.36-13.
Recommended Plan Costs by Decade for the City of Leander

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	3,732	1,020	(719)	(2,628)	(4,756)	(7,039)
Conservation						
Supply From Plan Element (acft/yr)	129	393	430	489	603	727
Annual Cost ($/yr)	$61,275	$186,675	$204,250	$232,275	$286,425	$345,325
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Additional Supply from Lake Travis (Brushy Creek RUA Water Supply Project)						
Supply From Plan Element (acft/yr)	—	—	7,039	7,039	7,039	7,039
Annual Cost ($/yr)	—	—	$9,488,572	$9,488,572	$5,272,000	$5,272,000
Unit Cost ($/acft)	—	—	$1,348	$1,348	$749	$749

4C.36.15 City of Liberty Hill

4C.36.15.1 Description of Supply

The City of Liberty Hill obtains its water supply from groundwater from the Trinity Aquifer. Based on the available groundwater, the City of Liberty Hill is projected to have a shortage through the year 2060.

4C.36.15.2 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 the City of Liberty Hill:

- Conservation, and
- Purchase water from the Brazos River Authority.
- An alternative is to obtain a short term supply from the City of Leander until larger needs develop.

4C.36.15.3 Costs

Costs of the Recommended Plan for the City of Liberty Hill.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $77,425 in 2060

b. Brushy Creek Water Supply Project (BRA/LCRA Alliance Supply):
   - Cost Source: Assumed wholesale treated water rate of $1,380/acft ($4.23/1,000 gallons) Volume II, Section 4B.11.2
   - Date to be Implemented: before 2010
   - Annual Cost: $1,723,000

c. Purchase Water from Leander:
   - Cost Source: Assumed wholesale treated water rate of $1,348/acft ($4.14/1,000 gallons) and will utilize transmission infrastructure for BCWSP water
   - Date to be Implemented: before 2030
   - Annual Cost: $1,710,000

Table 4C.36-14.
Recommended Plan Costs by Decade for the City of Liberty Hill

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(262)	(596)	(863)	(1,146)	(1,460)	(1,797)
Conservation						
Supply From Plan Element (acft/yr)	17	62	87	107	134	163
Annual Cost ($/yr)	$8,075	$29,450	$41,325	$50,825	$63,650	$77,425
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Brushy Creek RUA Water Supply Project (BRA/LCRA Alliance Supply)						
Supply From Plan Element (acft/yr)	600	600	600	600	600	600
Annual Cost ($/yr)	$1,723,200	$1,723,200	$874,200	$874,200	$874,200	$874,200
Unit Cost ($/acft)	$2,872	$2,872	$1,457	$1,457	$1,457	$1,457
Purchase from Leander						
Supply From Plan Element (acft/yr)	—	—	1,200	1,200	1,200	1,200
Annual Cost ($/yr)	—	—	$1,710,000	$1,710,000	$1,710,000	$1,710,000
Unit Cost ($/acft)	—	—	$1,425	$1,425	$1,425	$1,425

4C.36.16 Manville WSC

Manville 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 and no changes in water supply are recommended. This WUG is located in multiple counties (Williamson and Lee). The surplus shown in Table 4C.36-1 represents the cumulative totals for Manville WSC.

4C.36.17 City of Round Rock

The recommended water supply plan for the City of Round Rock is included in Section 4C.38 with the wholesale water providers

4C.36.18 City of Taylor

The City of Taylor obtains its water supply from a contract with the Brazos River Authority for water from Lake Granger. No shortages are projected for the City of Taylor and no changes in water supply are recommended.

4C.36.19 City of Thrall

4C.36.19.1 Description of Supply

The City of Thrall obtains its water supply from groundwater from a minor aquifer. Based on the available groundwater, the City of Thrall is projected to have a shortage through the year 2060.

4C.36.19.2 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 the City of Thrall:

- Purchase from the BRA (Lake Granger) through the EWCRWTS.
- Conservation was also considered; however, the City's current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.19.3 Costs

Costs of the Recommended Plan for the City of Thrall.

a. Purchase from the BRA (Lake Granger) through the EWCRWTS:
    - Cost Source: Section 4B.17
    - Date to be Implemented: 2010
    - Total Project Cost: $44,706,000 (assuming full implementation in 2010)
    - Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-15.
Recommended Plan Costs by Decade for the City of Thrall

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(129)	(154)	(185)	(217)	(252)	(293)
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	300	300	300	300	300	300
Annual Cost ($/yr)	$511,394	$376,649	$163,326	$163,326	$133,788	$133,788
Unit Cost ($/acft)	$1,705	$1,255	$544	$544	$446	$446

4C.36.20 City of Weir

4C.36.20.1 Description of Supply

The City of Weir obtains its water supply from groundwater from the Edwards-BZF (Northern Segment) Aquifer. Based on the available groundwater, the City of Weir is projected to have a shortage through the year 2060.

4C.36.20.2 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 the City of Weir:

- Conservation, and
- Purchase from the BRA (Lake Granger) through the EWCRWTS.

4C.36.20.3 Costs

Costs of the Recommended Plan for the City of Weir.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: before 2010
   - Annual Cost: maximum of $11,400 in 2060

b. Purchase from the BRA (Lake Granger) through the EWCRWTS:
   - Cost Source: Section 4B.17
   - Date to be Implemented: before 2010
   - Total Project Cost: $44,706,000 (assuming full implementation in 2010)
   - Annual Cost: $7,844,000 (assuming full implementation in 2010)

Table 4C.36-16.
Recommended Plan Costs by Decade for the City of Weir

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(143)	(210)	(288)	(373)	(467)	(568)
Conservation						
Supply From Plan Element (acft/yr)	7	12	14	16	20	24
Annual Cost ($/yr)	$3,325	$5,700	$6,650	$7,600	$9,500	$11,400
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	580	580	580	580	580	580
Annual Cost ($/yr)	$988,695	$728,188	$315,763	$315,763	$258,657	$258,657
Unit Cost ($/acft)	$1,705	$1,255	$544	$544	$446	$446

4C.36.21 Wells Branch MUD

Wells Branch MUD obtains its water supply from the City of Austin (Region K). No shortages are projected for Wells Branch MUD and no changes in water supply are recommended.

4C.36.22 Williamson-Travis County MUD #1

4C.36.22.1 Description of Supply

Williamson-Travis County MUD #1 obtains its water supply from the City of Cedar Park.

4C.36.22.2 Water Supply Plan

- Obtain additional water from Cedar Park.
- Conservation was also considered; however, the MUD's current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.22.3 Costs

Costs of the Recommended Plan for the Williamson-Travis County MUD #1

a. Purchase from Cedar Park:
   - Cost Source: assumed unit cost for wholesale treated water of $2.54/1,000 gals (existing infrastructure assumed adequate)
   - Date to be Implemented: before 2020
   - Annual Cost: maximum of $1,906,700 in 2060

Table 4C.36-17.
Recommended Plan Costs by Decade for Williamson-Travis County MUD #1

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	54	(337)	(784)	(1,228)	(1,731)	(2,267)
Purchase from Cedar Park						
Supply From Plan Element (acft/yr)	—	350	800	1,250	1,750	2,300
Annual Cost ($/yr)	—	$290,150	$663,200	$1,036,250	$1,450,750	$1,906,700
Unit Cost ($/acft)	—	$829	$829	$829	$829	$829

4C.36.23 County-Other

4C.36.23.1 Description of Supply

Williamson County-Other obtains its water supply from groundwater from the Trinity and Edwards 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, and run-of-river rights. Based on the available groundwater and surface water supply, Williamson County-Other is projected to have a shortage from 2040 through year 2060.

4C.36.23.2 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 Williamson County-Other:

- Trinity aquifer development, and
- BRA System Operation – EWCRWTS and Lake Granger Augmentation (conjunctive use).
- Conservation was also considered; however, the County-Other's current per capita use rate is below the selected target rate of 140 gpcd.

4C.36.23.3 Costs

Costs of the Recommended Plan for Williamson County-Other.

a. Trinity Aquifer Development:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: 2040
   - Total Project Cost: $1,995,000
   - Annual Cost: $216,000

b. Purchase from the BRA (Lake Granger) through the EWCRWTS:
- Cost Source: Volume II, Section 4B.17
- Date to be Implemented: 2040
- Total Project Cost: $44,706,000 (assuming full implementation in 2010)
- Annual Cost: $7,844,000 (assuming full implementation in 2010)

c. BRA System Operation – Lake Granger Augmentation (conjunctive use):
- Cost Source: Volume II, Section 4B.5
- Date to be Implemented: 2050
- Total Project Cost: $229,822,000
- Annual Cost: $33,212,000

Table 4C.36-18.
Recommended Plan Costs by Decade for Williamson County-Other

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	603	707	596	(755)	(2,559)	(3,677)
Trinity Aquifer Development						
Supply From Plan Element (acft/yr)	—	—	—	280	280	280
Annual Cost ($/yr)	—	—	—	$216,000	$216,000	$42,000
Unit Cost ($/acft)	—	—	—	$770	$770	$149
BRA Supply (Lake Granger) through the EWCRWTS						
Supply From Plan Element (acft/yr)	—	—	—	698	698	698
Annual Cost ($/yr)	—	—	—	$379,712	$311,308	$311,308
Unit Cost ($/acft)	—	—	—	$544	$446	$446
BRA System Operation – Lake Granger Augmentation (conjunctive use)						
Supply From Plan Element (acft/yr)	—	—	—	—	1,624	2,704
Annual Cost ($/yr)	—	—	—	—	$1,404,760	$2,388,960
Unit Cost ($/acft)	—	—	—	—	$865	$865

4C.36.24 Manufacturing

4C.36.24.1 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 2060.

4C.36.24.2 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 Williamson County Manufacturing:

- Conservation,
- Purchase from the City of Round Rock.

4C.36.24.3 Costs

Costs of the Recommended Plan for Williamson County Manufacturing.

a. Conservation:
  - Date to be Implemented: 2010
  - Annual Cost: Not determined

b. Purchase supply from the City of Round Rock:
  - Cost Source: Assumed wholesale treated water rate of $865/acft based on cost of Lake Granger Augmentation – Conjunctive Use Project (Volume II, Section 4B.5)
  - Date to be Implemented: 2010
  - Annual Cost: $2,138,000 in 2060

Table 4C.36-19.
Recommended Plan Costs by Decade for Williamson County Manufacturing

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,252)	(1,519)	(1,785)	(2,053)	(2,295)	(2,521)
Conservation						
Supply From Plan Element (acft/yr)	48	93	149	167	184	200
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Purchase Supply from Round Rock						
Supply From Plan Element (acft/yr)	1,472	1,572	1,772	2,072	2,272	2,472
Annual Cost ($/yr)	$1,273,000	$1,360,000	$1,533,000	$1,792,000	$1,965,000	$2,138,000
Unit Cost ($/acft)	$865	$865	$865	$865	$865	$865

4C.36.25 Steam-Electric

There is no Steam-Electric demand or supply in Williamson County.

4C.36.26 Mining

4C.36.26.1 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 2060.

4C.36.26.2 Water Supply Plan

The majority of the mining demand in Williamson County is likely dewatering at quarry operations, and a lack of groundwater supply is not detrimental. Therefore, the following plan only includes conservation recommendations as proffered by the Brazos G RWPG. 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 Williamson County Mining:

- Conservation.

4C.36.26.3 Costs

Costs of the Recommended Plan for Williamson County Mining.

a. Conservation:
   - Date to be Implemented: 2010
   - Annual Cost: Not determined

Table 4C.36-20.
Recommended Plan Costs by Decade for Williamson County Mining

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,871)	(2,132)	(2,312)	(2,489)	(2,666)	(2,797)
Conservation						
Supply From Plan Element (acft/yr)	71	131	196	208	220	230
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—

4C.36.27 Irrigation

No shortages are projected for Williamson County Irrigation and no changes in water supply are recommended.

4C.36.28 Livestock

No shortages are projected for Williamson County Livestock and no changes in water supply are recommended.

4C.37 Young County Water Supply Plan

Table 4C.37-1 lists each water user group in Young County and their corresponding surplus or shortage in years 2030 and 2060. No shortages are projected for these water user groups; however, one water supply plans has been developed. A brief summary of the water user groups and the plan for the selected water user are presented in the following subsections.

Table 4C.37-1.
Young County Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1]		Comment
	2030 (acft/yr)	2060 (acft/yr)	
Fort Belknap WSC	8	9	Projected surplus – see plan below.
City of Graham	1,599	1,367	Projected surplus
City of Newcastle	54	54	Projected surplus
County-Other	57	73	Projected surplus
Manufacturing	11	2	Projected surplus
Steam-Electric	11,977	10,656	Projected surplus
Mining	30	0	Projected surplus
Irrigation	901	893	Projected surplus
Livestock	0	0	Demand equals supply

[1] From Tables C-73 and C-74, Appendix C – Comparison of Water Demands with Water Supplies to Determine Needs.

4C.37.1 Fort Belknap WSC

4C.37.1.1 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 4C.37-2 represents the cumulative totals for Fort Belknap WSC. Although there are no shortages, total supplies are not greater than 105% of demands, therefore, the following water supply plan is recommended.

4C.37.1.2 Water Supply Plan

Working within the planning criteria established by the Brazos G RWPG and TWDB, the following water supply plan is recommended for Fort Belknap WSC:

- Purchase additional water from City of Graham.

- Conservation was also considered; however, the WSC's current per capita use rate is below the selected target rate of 140 gpcd.

4C.37.1.3 Costs

Costs of the Recommended Plan for Fort Belknap WSC.

a. Purchase Additional Water from City of Graham:
   - Cost Source: Assumed wholesale cost of treated water
   - Date to be Implemented: before 2010
   - Unit Cost: $880/acft ($2.70/kgal) assumed treated wholesale rate
   - Annual Cost: $10,560
   - Existing infrastructure is assumed sufficient for additional supply.

Table 4C.37-2.
Recommended Plan Costs by Decade for Fort Belknap WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	9	9	8	9	9	9
Purchase Additional Water from City of Graham						
Supply From Plan Element (acft/yr)	12	12	12	12	12	12
Annual Cost ($/yr)	$10,560	$10,560	$10,560	$10,560	$10,560	$10,560
Unit Cost ($/acft)	$880	$880	$880	$880	$880	$880

4C.37.2 City of Graham

The City of Graham obtains surface water from Lakes Graham and Eddleman and a contract with BRA for 1,000 acft/yr. No future shortages are projected and no changes in water supply are recommended.

4C.37.3 City of Newcastle

No future shortages are projected for the City of Newcastle and no changes in water supply are recommended.

4C.37.4 County-Other Category

No future shortages are projected and no changes in water supply are recommended.

4C.37.5 Manufacturing

No future shortages are projected and no changes in water supply are recommended.

4C.37.6 Steam-Electric

No future shortages are projected and no changes in water supply are recommended.

4C.37.7 Mining

No future shortages are projected and no changes in water supply are recommended.

4C.37.8 Irrigation

Irrigation use shows a projected surplus and no changes in water supply are recommended.

4C.37.9 Livestock

Livestock water use category shows no projected shortage and no changes in water supply are recommended.

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4C.38 Wholesale Water Providers

Table 4C.38-1 lists each wholesale water provider in the Brazos G Area and its corresponding surplus or shortage in years 2030 and 2060. Table 3.1-3 in Section 3 and Tables 4A-6 through 4A-23 in Section 4A provide detailed information about existing contracts, supplies and projected balances for each of the wholesale water providers. For each wholesale water provider with a projected shortage, a water supply plan has been developed and is presented in the following subsections. **Note that shortages shown reflect full contractual commitments compared to existing supplies. Actual customer demands are often substantially less than the full contracted amounts and therefore, many of the shortages (needs) are shown as occurring earlier than an actual supply shortage might develop.**

Table 4C.38-1.
Wholesale Water Provider Surplus/(Shortage)

Water User Group	Surplus/(Shortage)[1,2] 2030 (acft/yr)	2060 (acft/yr)	Comment
Brazos River Authority (Lake Aquilla System)	641	(1,913)	Projected shortage – see plan below
Brazos River Authority (Little River System)	(39,182)	(78,002)	Projected shortage – see plan below
Brazos River Authority (Main Stem System)[3]	(107,223)	(302,926)	Projected shortage – see plan below
Aquilla Water Supply District	(117)	(1,116)	Projected shortage – see plan below
Bell County WCID No. 1	(9,081)	(9,081)	Projected shortage – see plan below
Bluebonnet WSC	3,098	2,598	Projected surplus
Central Texas WSC	3,020	2,754	Projected surplus – see plan below
Upper Leon MWD	600	490	Projected surplus
Eastland County WSD	3,637	3,599	Projected surplus
Palo Pinto County MWD No. 1	(5,196)	(6,930)	Projected shortage – see plan below
West Central Texas MWD	(437)	(341)	Projected shortage – see plan below
North Central Texas MWA	(1,619)	(1,649)	Projected shortage – see plan below
City of Abilene	(24,320)	(23,694)	Projected shortage – see plan below
Bistone MWSD	(2,870)	(3,539)	Projected shortage – see plan below
City of Cedar Park	(7,400)	(14,556)	Projected shortage – see plan below
City of Round Rock	(24,046)	(62,612)	Projected shortage – see plan below
City of Stamford	(2,750)	(2,684)	Projected shortage – see plan below
City of Sweetwater	(3,435)	(3,117)	Projected shortage – see plan below
City of Temple	1,929	(3,577)	Projected shortage – see plan below
City of Waco	7,595	1,505	Projected surplus – see plan below
City of Bryan	1,463	(809)	Projected shortage – see plan below

1 From Section 4A.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.

4C.38.1 Brazos River Authority (Lake Aquilla System)

4C.38.1.1 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 641 acft/yr in the year 2030, and a shortage of 1,913 acft/yr by year 2060. Table 3.1-3 in Section 3 and Table 4A-6 in Section 4A include additional information on contracts and water supplies for the Lake Aquilla System.

4C.38.1.2 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 the Brazos River Authority (Lake Aquilla System):

- Storage Reallocation of Federal Reservoirs – Lake Aquilla – from Flood Control to Conservation Storage (Volume II, Section 4B.18.1). The BRA has initiated a study with the U.S. Army Corps of Engineers (USACE) to study the potential for reallocating flood control storage in Federal reservoirs to water supply. The purpose would be to increase water supply yield to meet the growing water needs in the Brazos River Basin. During Phase I, four alternative reallocation scenarios were analyzed in each of nine reservoirs, taking into account hydrology and hydraulics, geotechnical data, engineering and design information, socioeconomic, environmental and cultural issues, and recreational considerations. Of the nine reservoirs studied, Lake Aquilla appears to be the most promising candidate and a detailed feasibility study is currently being conducted by the USACE and the BRA.
- Alternative: Lake Aquilla Augmentation (Volume II, Section 4B.19). This project would transfer supply from Lake Whitney into Lake Aquilla to add to Lake Aquilla yield. This project would produce a significant supply for Lake Aquilla that is not required based on current demand projections. If demands in the area increase beyond those currently projected, or if the storage reallocation project is determined to be unfeasible, this project would be a viable means to increase supply from Lake Aquilla. This project would be developed in cooperation with the City of Cleburne.
- Alternative: Sediment Reduction Program (not studied for 2011 Brazos G Plan). The BRA is monitoring the sediment accumulation rates in the agency's reservoirs, and is cognizant that a sediment reduction program at specific reservoirs may be required to maintain yield.

4C.38.1.3 Costs

Costs for the recommended plan for the BRA Lake Aquilla System are shown below.

a. Storage Reallocation of Federal Reservoirs – Lake Aquilla:
- Cost Source: Volume II, Section 4B.18.1
- Date to be Implemented: 2040
- Total Project Cost: $11,447,000
- Annual Cost: $832,000

Table 4C.38-2.
Recommended Plan Costs by Decade for the BRA Lake Aquilla System

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	2,343	1,492	641	(211)	(1,062)	(1,913)
Storage Reallocation of Federal Reservoirs – Lake Aquilla (Volume II, Section 4B.18.1)						
Supply From Plan Element (acft/yr)	-	-	-	2,050	2,050	2,050
Annual Cost ($/yr)				$832,000	$832,000	$832,000
Unit Cost ($/acft)				$406	$406	$406
Alternative: Lake Aquilla Augmentation (Volume II, Section 4B.20)						
Supply From Plan Element (acft/yr)	-	5,000	5,000	5,000	5,000	5,000
Annual Cost ($/yr)		$2,760,000	$2,760,000	$2,760,000	$1,160,000	$1,160,000
Unit Cost ($/acft)		$552	$552	$552	$232	$232
Alternative: Sediment Reduction Program						
Supply From Plan Element (acft/yr)	Supplies and Costs not Determined					
Annual Cost ($/yr)						
Unit Cost ($/acft)						

4C.38.2 Brazos River Authority (Little River System)

4C.38.2.1 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, the Brazos River Authority Little River System is projected to have a shortage of 39,182 acft/yr in the year 2030 and 78,002 acft/yr in the year 2060. 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 41,000 acft/yr by year 2040.

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. 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 Section 3 and Table 4A-6 in Section 4A include 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 horizon and the shortages shown are more likely to occur later than shown here. Without the additional interruptible supply, 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.

4C.38.2.2 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 shortages for the BRA Little River System:

- BRA Systems Operation and Lake Granger Augmentation (Volume II, Sections 4B.4 and 4B.5). The BRA has applied to the TCEQ for an additional appropriation of water that can be developed by utilizing its system of reservoirs to firm up uncontrolled runoff and return flows entering the basin below its reservoir system. Several of the water management strategies recommended to meet Water User Group needs would utilize this large potential supply of water. In addition to the firm supply, the BRA has requested appropriation of a large interruptible supply. The Lake Granger Augmentation project would utilize interruptible water in conjunction with groundwater development to dramatically increase firm supply from the reservoir. It should be noted that the Lake Granger Augmentation is not solely dependent on the BRA Systems Operation interruptible supply and that existing System Order provisions do allow diversions from Lake Granger in excess of the existing annual diversion authorization
- Belton to Stillhouse Pipeline (Volume II, Section 4B.20). The Belton to Stillhouse Hollow pipeline project is primarily intended to delay the need for development of new sources of water by making use of unused Lake Belton water in the decades prior to 2060. With the implementation of this pipeline, the combined supplies from the three reservoirs can meet the projected demands of the BRA's existing contractual customers well into the future. The proposed pipeline would transfer up to 30,000 acft/yr to Lake Stillhouse Hollow. From Stillhouse Hollow, some of the Lake Belton

water could be transferred to Lake Georgetown via the existing Williamson County Regional Raw Water Pipeline. The Belton to Stillhouse Hollow Pipeline will allow the BRA to operate these three lakes as a system, increasing the reliability of the supplies to the area.

- Coryell County Off-Channel Reservoir (Volume II, Section 4B.13.7). While the Brazos River Authority is listed in this plan as a potential project sponsor, the project could be developed by a number of potential local sponsors.
- Alternative: Groundwater Development (Volume II, Section 4B.15.1). The BRA is exploring areas where groundwater resources could be used to better serve Little River System needs by providing additional supply. Some or all of these supplies might be used within the Lake Granger Augmentation Project.
- Alternative: Little River Off-Channel Reservoir (Volume II, Section 4B.13.5). The BRA would develop the Little River Off-Channel Reservoir in coordination with local sponsors/customers to meet future water demands in Brazos G. Supplies not utilized in Brazos G could be made available by the BRA to lower basin customers in Region H.
- Alternative: Storage Reallocation of Federal Reservoirs (Volume II, Section 4B.18.2). Little River System Reservoirs currently identified as candidates for storage reallocation are Lake Stillhouse Hollow and Lake Granger.
- Alternative: Sediment Reduction Program (not studied for 2011 Plan). The BRA is monitoring the sediment accumulation rates in the agency's reservoirs, and is cognizant that a sediment reduction program at specific reservoirs may be required to maintain yield.

4C.38.2.3 Costs

Costs of the Recommended Plan for the BRA Little River System are shown below.

a. BRA Systems Operation & Lake Granger Augmentation:
   - Cost Source: Volume II, Section 4B.4 and 4B.5
   - Date to be Implemented: 2010 – Phase 1; 2050 – Phase 2
   - Total Project Cost: $113,060,000 – Phase 1
$530,868,000 – Phase 2
   - Annual Cost: $22,219,000 – Phase 1
$68,676,000 – Phase 2

b. Belton to Stillhouse Pipeline:
   - Cost Source: Volume II, Section 4B.20
   - Date to be Implemented: 2020
   - Total Project Cost: $36,038,000
   - Annual Cost: $3,979,000

Table 4C.38-3.
Recommended Plan Costs by Decade for the BRA Little River System

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(36,481)	(38,340)	(39,182)	(39,772)	(76,709)	(78,002)
BRA Systems Operation & Lake Granger Augmentation Project (Volume II, Sections 4B.4 and 4B.5) – Phase 1						
Trinity Aquifer Supply (acft/yr)	*8,835*	*8,667*	*8,499*	*8,330*	*8,162*	*7,994*
Surface Water Supply (acft/yr)	*17,670*	*17,334*	*16,997*	*16,660*	*16,324*	*15,987*
Total Supply From Plan Element (acft/yr)	26,505	26,001	25,496	24,990	24,486	23,981
Annual Cost ($/yr)	$22,219,000	$22,219,000	$22,219,000	$12,362,000	$12,362,000	$12,362,000
Unit Cost ($/acft)	$838	$854	$871	$495	$505	$515
BRA Systems Operation & Lake Granger Augmentation Project (Volume II, Sections 4B.4 and 4B.5) – Phase 2						
Carrizo-Wilcox Aquifer (acft/yr)					*30,832*	*30,832*
Surface Water Supply (acft/yr)					*15,433*	*15,433*
Total Supply From Plan Element (acft/yr)					46,265	46,265
Annual Cost ($/yr)					$68,676,000	$68,676,000
Unit Cost ($/acft)					$1,484	$1,484
Belton to Stillhouse Pipeline (Volume II, Section 4B.20)						
Supply From Plan Element (acft/yr)	—	30,000	30,000	30,000	30,000	30,000
Annual Cost ($/yr)		$3,979,000	$3,979,000	$3,979,000	$1,361,000	$1,361,000
Unit Cost ($/acft)		$133	$133	$133	$45	$45
Coryell County Off-Channel Reservoir (Volume II, Section 4B.13)						
Supply From Plan Element (acft/yr)	—	3,365	3,365	3,365	3,365	3,365
Annual Cost ($/yr)		$3,389,000	$3,389,000	$2,351,000	$2,351,000	$651,000
Unit Cost ($/acft)		$1,007	$1,007	$699	$699	$193
Alternative: Groundwater Development (Volume II, Section 4B.15.1)						
Supply From Plan Element (acft/yr)	—	35,000	35,000	35,000	35,000	35,000
Annual Cost ($/yr)		$29,475,000	$29,475,000	$29,475,000	$10,988,000	$10,988,000
Unit Cost ($/acft)		$842	$842	$842	$314	$314
Alternative: Little River Off-Channel Reservoir (Volume II, Section 4B.13.5)						
Supply From Plan Element (acft/yr)	—	27,725	27,725	27,725	27,725	27,725
Annual Cost ($/yr)		$11,875,000	$11,875,000	$11,875,000	$11,875,000	$8,793,000
Unit Cost ($/acft)		$436	$436	$436	$436	$323
Alternative: Storage Reallocation of Federal Reservoirs (Volume II, Section 4B.18)						
Supply From Plan Element (acft/yr)	Supplies and Costs not Determined					
Annual Cost ($/yr)						
Unit Cost ($/acft)						
Alternative: Sediment Reduction Program						
Supply From Plan Element (acft/yr)	Supplies and Costs not Determined					
Annual Cost ($/yr)						
Unit Cost ($/acft)						

c. Coryell County Off-Channel Reservoir:
   - Cost Source: Volume II, Section 4B.13
   - Date to be Implemented: 2020
   - Total Project Cost: $37,489,000
   - Annual Cost: $3,389,000

4C.38.3 Brazos River Authority (Main Stem/Lower Basin System)

4C.38.3.1 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 107,223 acft/yr in the year 2030 and 302,926 acft/yr in the year 2060, including the projected demands on the BRA Main Stem/Lower Basin System from Region H and supplies to Regions C and O. Table 3.1-3 in Section 3 and Table 4A-6 in Section 4A include additional information on contracts and water supplies for the Main Stem/Lower Basin System. Note that the shortages shown are based on full contracted supplies. Actual full use of those contracts is unlikely to occur until later years of the planning horizon and the shortages shown are more likely to occur later than shown here.

4C.38.3.2 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 shortages for the BRA Main Stem/Lower Basin System:

- BRA Systems Operation (Volume II, Section 4B.4). The BRA has applied to the TCEQ for an additional appropriation of water that can be developed by utilizing its system of reservoirs to firm up uncontrolled runoff entering the basin below its reservoir system. Several of the water management strategies recommended to meet WUG needs would utilize this large potential supply of water. In addition to the firm supply, the BRA has requested appropriation of a large interruptible supply. Conjunctive use of groundwater or other supplies along the main stem and lower basin similar to the Lake Granger Augmentation strategy could be developed with the interruptible appropriation requested by the BRA. Interruptible supplies at Lake Somerville that are in excess of the firm yield of the reservoir could be firmed up through conjunctive use of nearby Carrizo-Wilcox groundwater.
- Stonewall, Kent, and Garza County Chloride Control Project (Volume II, Section 4B.19). The BRA, in coordination with representatives from Stonewall, Kent and Garza Counties is studying the feasibility of installing shallow recovery wells that

would intercept chloride-laden groundwater before it discharges to major salt water-producing seeps and springs, and would lower the artesian pressure of the underlying saline aquifer so that the seeps and springs cease to flow. It is estimated that brine control at the site proposed in Stonewall County would reduce chloride concentration in the Brazos River above Possum Kingdom Reservoir by 41 percent. It should be noted that BRA is not actively involved in pursing this strategy. BRA recognizes downstream benefits from upper basin chloride control and is not opposed to the project; however, BRA's long-range financial planning does not currently contemplate large financial participation in 2020.

- Alternative: Storage Reallocation of Federal Reservoirs (Volume II, Section 4B.18). The BRA has initiated a study with the U.S. Army Corps of Engineers to study the potential for reallocating storage in Federal reservoirs from flood control to water supply. The purpose would be to increase water supply yield to meet the growing water needs in the Brazos River Basin. Main Stem/Lower Basin reservoirs that are candidates for storage reallocation are Lake Whitney and Lake Somerville. Reallocation of Lake Whitney was studied for the 2001 Plan, but was not a recommended water management strategy.
- Alternative: Sediment Reduction Program (not studied for the 2011 Brazos G Plan). The BRA is monitoring the sediment accumulation rates in the agency’s reservoirs, and is cognizant that a sediment reduction program at specific reservoirs may be required to maintain yield.

4C.38.3.3 Costs

Costs of the Recommended Plan for the BRA Main Stem/Lower Basin System.

a. BRA Systems Operation:
   - Cost Source: Volume II, Section 4B.4
   - Date to be Implemented: 2010
   - Total Project Cost: Costs for permitting are not developed

b. Stonewall, Garza, Kent County Chloride Control Project:
   - Cost Source: Volume II, Section 4B.19
   - Date to be Implemented: 2020
   - Total Project Cost: $163,226,000
   - Annual Cost: $14,231,000

Table 4C.38-4.
Recommended Plan Costs by Decade for the BRA Main Stem/Lower Basin System

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)[1]	(69,193)	(103,208)	(107,223)	(294,739)	(298,754)	(302,926)
BRA Systems Operation (Volume II, Section 4B.4)						
Supply From Plan Element (acft/yr)[2]	201,800	201,800	201,800	201,800	201,800	201,800
Annual Cost ($/yr)	ND	ND	ND	ND	ND	ND
Unit Cost ($/acft)	ND	ND	ND	ND	ND	ND
Stonewall, Kent, and Garza County Chloride Control Project (Volume II, Section 4B.19)						
Supply From Plan Element (acft/yr)		0	0	0	0	0
Annual Cost ($/yr)		$14,231,000	$14,231,000	$14,231,000	0	0
Unit Cost ($/acft)		ND	ND	ND	ND	ND
Alternative: Storage Reallocation of Federal Reservoirs (Volume II, Section 4B.18)						
Supply From Plan Element (acft/yr)	Supplies and Costs not Determined					
Annual Cost ($/yr)						
Unit Cost ($/acft)						
Alternative: Sediment Reduction Program						
Supply From Plan Element (acft/yr)	Supplies and Costs not Determined					
Annual Cost ($/yr)						
Unit Cost ($/acft)						

ND – Costs for supply not determined

[1] Shortages include demands in Region H.

[2] Includes 83,929 acft/yr of firm supply from BRA System Operations allocated to Brazos G (Region H allocation is 117,871 acft/yr). Additional supply from BRA System Operations would originate from interruptible supplies firmed up with available groundwater, off-channel storage, or operated conjunctively with other existing water supplies.

4C.38.4 Aquilla Water Supply District

4C.38.4.1 Description of Supply

Aquilla WSD obtains is water supply from Lake Aquilla through a contract with the Brazos River Authority. The district is projected to have shortages of 117 acft/yr starting in 2010, increasing to 1,116 acft/yr in 2060. The projected shortages for Aquilla WSD are based on a comparison of supplies and contracts. Table 4A-7 in Section 4A includes additional information on contracts and water supplies for Aquilla WSD.

4C.38.4.2 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 shortages of the Aquilla WSD:

- Storage Reallocation in Lake Aquilla from Flood Control to Conservation Storage. This strategy will firm up the existing contracts that Aquilla WSD has with the BRA for supplies from Lake Aquilla, and potentially make additional water available for contracting.

4C.38.4.3 Costs

Costs of the Recommended Plan for the Aquilla WSD.

a. Increase BRA Contract:

- Cost Source: This strategy will have zero cost for Aquilla WSD, as the necessary supplies are already contracted.[1]
- Date to be Implemented: before 2040
- Total Project Cost: no costs for Aquilla WSD
- Annual Cost: $0

Table 4C.38-5.
Recommended Plan Costs by Decade for Aquilla Water Supply District

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(117)	(117)	(117)	(375)	(745)	(1,116)
Storage Reallocation in Lake Aquilla (Volume II, Section 4B.18)						
Supply From Plan Element (acft/yr)				375	745	999
Annual Cost ($/yr)				$0	$0	$0
Unit Cost ($/acft)				$0	$0	$0

4C.38.5 Bell County WCID No. 1

4C.38.5.1 Description of Supply

Bell County WCID No. 1 obtains its water supply from Lake Belton through BRA contracts (62,509 acft/yr) and is projected to have a shortage of 9,081 acft/yr immediately, based on the district's full contractual commitments. The district's customers have year 2060 projected demands of 62,509 acft/yr, compared to the district's total supply from the BRA of 53,428 acft/yr (the full 62,509 acft/yr is not currently firm). Therefore, the district has needs projected

[1] Future increases in the Brazos River Authority System rate will account for costs of the BRA augmenting its existing supplies.

for its customers through 2060. Table 4A-8 in Section 4A includes additional information on contracts and water supplies for Bell County WCID No.1.

Note that BRA's plan to augment supplies from Lake Granger will reduce demands on Lake Belton and Stillhouse Hollow and firm up the District's contractual supplies from the BRA.

4C.38.5.2 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 shortages for the Bell County WCID No. 1:

- Firm up existing BRA contracts through Lake Granger Augmentation
- Develop Reuse Supplies.

4C.38.5.3 Costs

Costs of the Recommended Plan for the Bell County WCID No. 1.

a. Firm up Existing BRA contracts through Lake Granger Augmentation:
   - Cost Source: no cost to the district
   - Date to be Implemented: before 2060
   - Total Project Cost: $0 (assumes existing infrastructure is adequate)
   - Annual Cost: $0

b. Develop Reuse Supplies:
   - Cost Source: Volume II, Section 4B.3.1.7
   - Date to be Implemented: 2010
   - Unit Cost: $756/acft
   - Annual Cost: $2,021,000

Table 4C.38-6.
Recommended Plan Costs by Decade for the Bell County WCID No. 1

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Surplus/(Shortage) (acft/yr)	(9,081)	(9,081)	(9,081)	(9,081)	(9,081)	(9,081)
Firm up Existing BRA Contracts through Lake Granger Augmentation						
Supply From Plan Element (acft/yr)	9,081	9,081	9,081	9,081	9,081	9,081
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/acft)	$0	$0	$0	$0	$0	$0
Develop Reuse Supplies (Volume II, Section 4B.3.1.7)						
Supply From Plan Element (acft/yr)	2,673	2,673	2,673	2,673	2,673	2,673
Annual Cost ($/yr)	$2,021,000	$2,021,000	$423,000	$423,000	$423,000	$423,000
Unit Cost ($/acft)	$756	$756	$158	$158	$158	$158

4C.38.6 Bluebonnet WSC

Bluebonnet WSC obtains its water supply through contracts with the Brazos River Authority. No shortages are projected for Bluebonnet WSC and no changes in water supply are recommended. Table 4A-9 in Section 4A includes additional information on contracts and water supplies for Bluebonnet WSC.

4C.38.7 Central Texas WSC

4C.38.7.1 Description of Supply

Central Texas WSC obtains its water supply from BRA contracts for water from Lake Stillhouse Hollow (13,795 acft/yr). Based on the available surface water supply, currently contracted supplies, and projected demands for its current customers, Central Texas WSC is not projected to have shortages through 2060, assuming that all demands can be treated and delivered through current infrastructure. Table 4A-10 in Section 4A includes additional information on contracts and water supplies for Central Texas WSC.

4C.38.7.2 Water Supply Plan

BRA supplies available to the WSC (11,695 acft/yr) are less than the full contract amounts (13,795 acft/yr), though the BRA will honor its full contract amount. An additional supply from the BRA through the EWCRWTP would assist Central Texas WSC in diversifying supply and distributing water to the east side of Bell County, and provide a means for the WSC to obtain its fully contracted BRA supply. Accordingly, the following water supply plan is recommended for Central Texas WSC:

- Pipeline to EWCRWTS. Supplies would be made available from Lake Granger (EWCRWTP) delivered to a point near the City of Holland. Supplies would be made available from a portion of the City of Taylor allocation from Lake Granger and from a portion of the remaining unallocated supply from Lake Granger.

4C.38.7.3 Costs

Costs of the Recommended Plan for the Central Texas WSC.

a. Pipeline to EWCRWTS:
   - Cost Source: Volume II, Section 4B.17
   - Date to be Implemented: By 2030, although the project can be delayed until projected demands for customers approaches the current reliable BRA supply.

- Total Project Cost: $44,706,000 (shared portion of transmission from the EWCRWTP)
- Annual Cost: $3,465,309 in 2010 (Includes treatment costs but not raw water costs, which are already contracted).

Table 4C.38-7.
Recommended Plan Costs by Decade for the Central Texas WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	3,254	3,150	3,020	2,916	2,842	2,754
Lake Granger through the EWCRWTS (pass through portion of excess City of Taylor supply)						
Supply From Plan Element (acft/yr)	410	410	410	410	410	410
Annual Cost ($/yr)	$676,560	$492,408	$200,867	$200,867	$160,498	$160,498
Unit Cost ($/acft)	$1,650	$1,201	$490	$490	$391	$391
Supply through EWCRWTS – firm up existing BRA contract						
Supply From Plan Element (acft/yr)	1,690	1,690	1,690	1,690	1,690	1,690
Annual Cost ($/yr)	$2,788,749	$2,029,683	$827,963	$827,963	$661,567	$661,567
Unit Cost ($/acft)	$1,650	$1,201	$490	$490	$391	$391

4C.38.8 Upper Leon Municipal Water District

Upper Leon MWD obtains its water supply through a contract with the Brazos River Authority for water from Lake Proctor. No shortages are projected for Upper Leon MWD and no changes in water supply are recommended. Table 4A-11 in Section 4A includes additional information on contracts and water supplies for Upper Leon MWD.

4C.38.9 Eastland County Water Supply District

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 4A-12 in Section 4A includes additional information on contracts and water supplies for Eastland County WSD.

4C.38.10 Palo Pinto County Municipal Water District No. 1

4C.38.10.1 Description of Supply

Palo Pinto County MWD No. 1 obtains its water supply from Lake Palo Pinto. Based on the available surface water supply, Palo Pinto County MWD No. 1 is projected to have shortages beginning in 2010. Table 4A-13 in Section 4A includes additional information on contracts and water supplies for Palo Pinto County MWD No.1.

4C.38.10.2 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 the Palo Pinto County MWD No. 1:

- Turkey Peak Reservoir (Volume II, Section 4B.12.5). This project would restore permitted storage in the Lake Palo Pinto System, thus restoring existing permitted yield.
- New 15 MGD Water Treatment Plant (Volume II, Section 4B.17). This project is necessary to provide treated supply to the City of Mineral Wells from Turkey Peak Reservoir
- Alternative: Lake Palo Pinto Off-Channel Reservoir (Volume II, Section 4B.13.6). Shortages shown in year 2010 are due to projected mining demands (2,000 acft/yr) in Parker County (Region C). It is anticipated that these mining demands would be met through a series of short-term contracts as supply is available from Lake Palo Pinto.

4C.38.10.3 Costs

Costs of the Recommended Plan for the Palo Pinto County MWD No. 1.

a. Turkey Peak Reservoir:
    - Cost Source: Volume II, Section 4B.12.5
    - Date to be Implemented: before 2020
    - Total Project Cost: $50,227,000
    - Annual Cost: $7,019,000

b. New WTP (15 MGD)
    - Cost Source: Volume II, Section 4B.17
    - Date to be Implemented: before 2020
    - Total Project Cost: $35,822,000
    - Annual Cost: $5,268,000

Table 4C.38-8.
Recommended Plan Costs by Decade for the Palo Pinto County MWD No. 1

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,038)	(4,628)	(5,196)	(5,718)	(6,302)	(6,930)
Turkey Peak Reservoir (Volume II, Section 4B.12.5)						
Supply From Plan Element (acft/yr)	—	7,600	7,600	7,600	7,600	7,600
Annual Cost ($/yr)		$7,019,000	$7,019,000	$5,618,000	$5,618,000	$3,348,000
Unit Cost ($/acft)		$924	$924	$739	$739	$440
New Water Treatment Plant (Volume II, Section 4B.17)						
Supply From Plan Element (acft/yr)	—	8,400	8,400	8,400	8,400	8,400
Annual Cost ($/yr)		$5,268,000	$5,268,000	$2,142,000	$2,142,000	$2,142,000
Unit Cost ($/acft)		$627	$627	$255	$255	$255
Alternative: Lake Palo Pinto Off-Channel (Volume II, Section 4B.13.6)						
Supply From Plan Element (acft/yr)	—	3,110	3,110	3,110	3,110	3,110
Annual Cost ($/yr)		$2,501,700	$2,501,700	$2,501,700	$286,000	$286,000
Unit Cost ($/acft)		$804	$804	$804	$92	$92

4C.38.11 West Central Texas Municipal Water District

4C.38.11.1 Description of Supply

West Central Texas MWD 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 a shortage of 437 acft/yr in the year 2030 and a shortage of 340 acft/yr in the year 2060. Table 4A-14 in Section 4A includes additional information on contracts and water supplies for West Central Texas MWD.

4C.38.11.2 Water Supply Plan

- Restructure City of Abilene Contract to Eliminate Shortages

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.

The City and the District have previously pursued components of what was described in the 2006 Plan as the West Central Brazos System Optimization Plan (WCBSOP). The WCBSOP was a combination of various projects that were to be implemented to provide additional supply for the City and the District through Fort Phantom Hill and Hubbard Creek Reservoirs. Some components of the WCBSOP have already been implemented by the City and the District, including:

- Priority Calls Agreement regarding the BRA's Possum Kingdom Reservoir and Hubbard Creek Reservoir, and
- Priority Calls Agreement regarding the BRA's Possum Kingdom Reservoir and the City's Fort Phantom Hill Reservoir Clear Fork Scalping Diversion.

Some additional components of the WCBSOP are currently being pursued by the City with the support of the District. However, the WCBSOP is no longer referred to as a single strategy since various components have been implemented, or are currently awaiting permitting status. The District is a full supporter of the City's efforts and could participate in several aspects of the plan in the future.

4C.38.11.3 Costs

Costs of the Recommended Plan for the West Central Texas MWD.

a. Restructure City of Abilene Contract:

- Cost Source: no cost
- Date to be Implemented: before 2020
- Total Project Cost: none
- Annual Cost: none

Table 4C.38-9.
Recommended Plan Costs by Decade for the West Central Texas MWD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(501)	(468)	(437)	(406)	(373)	(341)
Restructure City of Abilene Contract						
Supply From Plan Element (acft/yr)	502	470	437	406	373	341
Annual Cost ($/yr)	$0	$0	$0	$0	$0	$0
Unit Cost ($/acft)	$0	$0	$0	$0	$0	$0

4C.38.12 North Central Texas Municipal Water Authority

4C.38.12.1 Description of Supply

North Central Texas MWA obtains its water supply from Millers Creek Reservoir. Based on the available surface water supply, North Central Texas MWA is projected to have a shortage of 1,619 acft/yr in year 2030 and a shortage of 1,649 acft/yr in year 2060. Table 4A-15 in Section 4A includes additional information on contracts and water supplies for North Central Texas MWA.

4C.38.12.2 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 the North Central Texas MWA:

- Millers Creek Reservoir Augmentation (Lake Creek Diversion – Canal Option with a Priority Calls Agreement with the BRA and Expansion of Millers Creek Reservoir)

4C.38.12.3 Costs

Costs of the Recommended Plan for the North Central Texas MWA.

a. Millers Creek Reservoir Augmentation:
   - Cost Source: Volume II, Section 4B.7
   - Date to be Implemented: before 2020
   - Total Project Cost: $46,948,000
   - Annual Cost: $3,811,000

Table 4C.38-10.
Recommended Plan Costs by Decade for the North Central Texas MWA

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(1,599)	(1,609)	(1,619)	(1,629)	(1,639)	(1,649)
Millers Creek Reservoir Augmentation (Volume II, Section 4B.7)						
Supply From Plan Element (acft/yr)	17,582	17,582	17,582	17,582	17,582	17,582
Annual Cost ($/yr)	$3,811,000	$3,811,000	$3,811,000	$3,811,000	$3,811,000	$3,811,000
Unit Cost ($/acft)	$217	$217	$217	$217	$217	$217

4C.38.13 City of Abilene (Wholesale Water Provider)

4C.38.13.1 Description of Supply

The City of Abilene is located in Jones and Taylor Counties. Surface water supplies are obtained from Fort Phantom Hill, Hubbard Creek and O.H. Ivie Reservoirs. Abilene also has a wastewater reuse system for non-potable use, with water stored in Lake Kirby. The City has contracts to provide 15,600 acft/yr to nearby water user groups and is projected to have supply shortages through 2060. Table 4A-16 in Section 4A includes additional information on contracts and water supplies for the City of Abilene.

4C.38.13.2 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 City of Abilene:

- Conservation
- Cedar Ridge Reservoir (Volume II, Section 4B.12.1)
- City of Abilene Indirect Reuse System
- Water Treatment Plant Expansion
- Alternate Strategy: BRA System purchase - Possum Kingdom Reservoir (Volume II, Section 4B.14.5). The City currently has a 50 acft reservation contract with the BRA for this water.

The City and the West Central Texas Municipal Water District (WCTMWD) have previously pursued components of what was described in the 2006 Plan as the West Central Brazos System Optimization Plan (WCBSOP). The WCBSOP was a combination of various projects that were to be implemented to provide additional supply for the City and the WCTMWD through Fort Phantom Hill and Hubbard Creek Reservoirs. Some components of the WCBSOP have already been implemented by the City and the District, including:

- Priority Calls Agreement: Possum Kingdom/Hubbard, and
- Priority Calls Agreement: Possum Kingdom/Fort Phantom Clear Fork Scalping.

Some components of the WCBSOP are currently being pursued by the City. However, the WCBSOP is no longer referred to as a single strategy since various components have been implemented, or are currently awaiting permitting status. A water right permit application is pending at the TCEQ for the City of Abilene's indirect reuse system, and the City is pursuing the Cedar Ridge Reservoir as a stand alone project.

The strategies presented for the City of Abilene are considered stand-alone projects or combinations of projects, but are no longer referred to as the WCBSOP. Cedar Ridge Reservoir is the primary WMS selected to meet the bulk of the City's needs into the future. The City's indirect reuse system is shown as part of the water supply plan. The indirect reuse system is anticipated to be used to meet local industrial, steam-electric and irrigation demands, and also as supplementing the yield of Cedar Ridge Reservoir. Modeling analysis has shown that allowing about 12,900 acft/yr of the City's return flows to flow down to Cedar Ridge Reservoir increases the one-year safe yield of the reservoir by about 5,500 acft/yr. The City's indirect reuse supplies also could be utilized to increase supplies from Fort Phantom Hill Reservoir and/or Hubbard Creek Reservoir. There are no infrastructure costs associated with the implementation of the indirect reuse system for increasing supplies in Cedar Ridge. However, there would be infrastructure costs to increase supplies from Fort Phantom Hill Reservoir and Hubbard Creek Reservoir. 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.

4C.38.13.3 Costs

Cost of the Recommended Plan for the City of Abilene.

a. Water Treatment Plant Expansion

- Cost Source: Volume II, Section 4B.17
- Date to be implemented: 2020
- Total Project Cost: $49,304,000
- Annual Cost: $7,424,000
- Unit Cost: $571

b. Conservation

- Cost Source: Volume II, Section 4B.2
- Date to be Implemented: 2010
- Total Project Cost: N/A
- Annual Cost: $1,039,775 in 2020

c. Water Supply from the Cedar Ridge Reservoir:

- Cost Source: Volume II, Section 4B.12.1
- Date to be Implemented: 2030
- Total Project Cost: $285,214,000
- Annual Cost: $27,297,000
- Unit Cost: $1,168/acft (3.56/1,000 gallons)

d. Abilene Indirect Reuse System

- Cost Source: N/A – Can be used to provide raw water supply and/or to supplement the yield of Cedar Ridge Reservoir and/or Fort Phantom Hill Reservoir and/or Hubbard Creek Reservoir.
- Date to be implemented: 2010
- Total Project Cost: N/A
- Annual Cost: N/A
- Unit Cost: N/A

e. Alternate: Possum Kingdom Supply

- Cost Source: Volume II, Section 4B.14.5
- Date to be implemented: By the year 2020
- Total Project Cost: $189,947,000
- Annual Cost: $25,752,000
- Unit Cost: $2,077/acft

Table 4C.38-11.
Recommended Plan Costs by Decade for the City of Abilene

Plan Element	2010	2020	2030	2040	2050	2060
Treated Surplus/(Shortage) (acft/yr)	7,033	(7,781)	(7,895)	(7,631)	(7,077)	(6,444)
Raw Surplus/(Shortage) (acft/yr)	(3,954)	(15,430)	(24,320)	(24,331)	(24,051)	(23,694)
Water Treatment Plant Expansion[1] (Volume II, Section 4B.17)						
Supply From Plan Element (acft/yr)		13,000	13,000	13,000	13,000	13,000
Annual Cost ($/yr)		$7,424,000	$7,424,000	$3,125,000	$3,125,000	$3,125,000
Unit Cost ($/acft)		$571	$571	$240	$240	$240
[1] Water Treatment Plant expansion does not create additional supply, but is necessary to meet treated water demands.						
Conservation (Volume II, Section 4B.2)						
Supply From Plan Element (acft/yr)	977	2,189	1,785	1,346	1,173	1,136
Annual Cost ($/yr)	$464,075	$1,039,775	$847,875	$639,350	$557,175	$539,600
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Cedar Ridge Reservoir (Volume II, Section 4B.12.1)						
Supply From Plan Element (acft/yr)		23,380	23,380	23,380	23,380	23,380
Annual Cost ($/yr)		$27,297,000	$27,297,000	$15,960,000	$15,960,000	$5,646,000
Unit Cost ($/acft)		$1,168	$1,168	$683	$683	$241
Abilene Indirect Reuse System						
Supply From Plan Element (acft/yr)	3,245	3,848	4,370	5,550	5,550	5,550
Annual Cost ($/yr)	N/A	N/A	N/A	N/A	N/A	N/A
Unit Cost ($/acft)	N/A	N/A	N/A	N/A	N/A	N/A
Alternate: Possum Kingdom Supply (Volume II, Section 4B.14.5)						
Supply From Plan Element (acft/yr)		12,400	12,400	12,400	12,400	12,400
Annual Cost ($/yr)		$25,752,000	$25,752,000	$9,193,000	$9,193,000	$9,193,000
Unit Cost ($/acft)		$2,077	$2,077	$741	$741	$741

4C.38.14 Bistone Municipal Water Supply District (Wholesale Water Provider)

4C.38.14.1 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 5,534 acft/yr to nearby water user groups and is projected to have supply shortages through 2060. Table 4A-17 in Section 4A includes additional information on contracts and water supplies for Bistone MWSD.

4C.38.14.2 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 Bistone MWSD:

- Conservation
- Development of Carrizo-Wilcox Aquifer.[2]

4C. 38.14.3 Costs

Costs of the recommended plan for Bistone MWSD to meet the projected shortages are:

a. Conservation:
   - Cost Source: Volume II Section 4B.2
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $4,275 in 2020.

b. Development of the Carrizo-Wilcox Aquifer:
   - Cost Source: Section 4B.17
   - Date to be Implemented: 2010
   - Total Project Cost: $18,458,000
   - Annual Cost: $2,024,000
   - The project includes eight 450 gpm wells drilled to a depth of 650 feet in the Carrizo-Wilcox Aquifer, transmission pipeline and water treatment plant improvements.

Table 4C.38-12.
Recommended Plan Costs by Decade for the Bistone MWSD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	(2,426)	(2,648)	(2,870)	(3,092)	(3,315)	(3,539)
Conservation						
Supply From Plan Element (acft/yr)	4	9	7	5	4	4
Annual Cost ($/yr)	$1,900	$4,275	$3,325	$2,375	$1,900	$1,900
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Carrizo-Wilcox Aquifer Development (Volume II, Section 4B.17)						
Supply From Plan Element (acft/yr)	2,500	3,000	3,000	3,600	3,600	3,600
Annual Cost ($/yr)	$1,405,000	$1,686,000	$345,000	$414,000	$414,000	$414,000
Unit Cost ($/acft)	$562	$562	$115	$115	$115	$115

[2] Possibly in cooperation with City of Kosse.

4C.38.15 City of Cedar Park (Wholesale Water Provider)

4C.38.15.1 Description of Supply

The City of Cedar Park obtains its water supply from a contract with the Lower Colorado River Authority (LCRA) in Region K. This contract is for 18,000 acft/yr, of which 14,560 can currently be utilized because the supply is constrained by treatment capacity. This supply to Brazos G has been further reduced to account for the portion of Cedar Park located in Travis County (Region K). 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 2060. Note that the shortages shown in Table 4C.38-13 and Table 4A-18 include additional anticipated contractual commitments to meet the shortages projected for Blockhouse MUD and Williamson-Travis MUD No. 1.

4C.38.15.2 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 the City of Cedar Park:

- Conservation, and
- Purchase additional water from LCRA through the Brushy Creek RUA Water Supply Project. Note that the supply volumes for this strategy includes utilization of the remaining 3,440 acft/yr of the 18,000 acft/yr supply currently contracted from the LCRA, plus 9,180 acft/yr from the LCRA that have been contracted to the City of Leander. The shortages projected for Cedar Park will more likely develop in Leander, because the Cedar Park projections are considered too great and the Leander projections are considered too small. The utilization of a portion of the Leander contracted supply appears appropriate in this instance.

4C.38.15.3 Costs

Costs of the Recommended Plan for the City of Cedar Park.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $919,600 in 2060

b. Purchase water from LCRA through Brushy Creek RUA Water Supply Project:
   - Cost Source: Volume II, Section 4B.11.2
   - Date to be Implemented: before 2030

- Total Project Cost: $61,858,000
- Annual Cost: $14,952,000

Table 4C.38-13.
Recommended Plan Costs by Decade for the City of Cedar Park

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(1,174)	(5,017)	(7,400)	(12,278)	(13,341)	(14,556)
Conservation (Volume II, Section 4B.2)						
Supply From Plan Element (acft/yr)	461	1,557	1,593	1,935	1,935	1,936
Annual Cost ($/yr)	$218,975	$739,575	$756,675	$919,125	$919,125	$919,600
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Purchase water from LCRA (Brushy Creek RUA Water Supply Project) (Volume II, Section 4B.11.2)						
Supply From Plan Element (acft/yr)	—	12,620	12,620	12,620	12,620	12,620
Annual Cost ($/yr)		14,952,000	$14,952,000	$14,952,000	$14,952,000	$14,952,000
Unit Cost ($/acft)		1,185	$1,185	$1,185	$1,185	$1,185

4C.38.16 City of Round Rock (Wholesale Water Provider)

4C.38.16.1 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. 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 2010 through 2060. The shortages shown include projected needs for Williamson County Manufacturing. Table 4A-19 in Section 4A includes additional information on contracts and water supplies for the City of Round Rock.

4C.38.16.2 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 the City of Round Rock:

- Conservation,
- Reuse,
- Brushy Creek RUA Water Supply Project, and
- BRA System Operation – Lake Granger Augmentation (conjunctive use).

Note: Round Rock has contracted for 20,928 acft/yr of supply from the LCRA to be delivered through the Brushy Creek RUA Water Supply Project. An additional 3,472 acft/yr of that project's capacity has been allocated within this plan to meet projected needs for Chisholm Trail SUD, which has contracted for that supply as part of the BRA/LCRA Alliance.

4C.38.16.3 Costs

Costs of the Recommended Plan for the City of Round Rock.

a. Conservation:
   - Cost Source: Volume II, Section 4B.2.1
   - Date to be Implemented: 2010
   - Annual Cost: maximum of $2,060,550 in 2060

b. Reuse:
   - Cost Source: Volume II, Section 4B.3.1
   - Date to be Implemented: before 2010
   - Total Project Cost: $6,369,000 (prior to 2040)
   - Annual Cost: $772,000 (prior to 2040); $3,751,270 (after 2040 at full reuse potential)

c. Brushy Creek RUA Water Supply Project:
   - Cost Source: Volume II, Section 4B.11.2
   - Date to be Implemented: before 2020
   - Total Project Cost: $147,264,000
   - Annual Cost: $28,004,000

d. BRA System Operation – Lake Granger Augmentation (conjunctive use):
   - Cost Source: Volume II, Section 4B.5
   - Date to be Implemented: before 2050
   - Total Project Cost: $229,822,000 (Based on full implementation in 2050.)
   - Annual Cost: $33,212,000 (Based on full implementation in 2050.)

Table 4C.38-14.
Recommended Plan Costs by Decade for the City of Round Rock[1]

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(4,379)	(13,352)	(24,046)	(35,818)	(48,758)	(62,612)
Conservation (Volume II, Section 4B.2)						
Supply From Plan Element (acft/yr)	704	2,248	2,546	2,949	3,620	4,338
Annual Cost ($/yr)	$334,400	$1,067,800	$1,209,350	$1,400,775	$1,719,500	$2,060,550
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Reuse (Volume II, Section 4B.3)						
Supply From Plan Element (acft/yr)	1,532	1,532	1,532	7,443	7,443	7,443
Annual Cost ($/yr)	$772,000	$772,000	$772,000	$3,751,270	$3,751,270	$3,751,270
Unit Cost ($/acft)	$504	$504	$504	$504	$504	$504
Brushy Creek RUA Water Supply Project (Volume II, Section 4B.11.2)						
Supply From Plan Element (acft/yr)	—	20,928	20,928	20,928	20,928	20,928
Annual Cost ($/yr)		$28,004,000	$28,004,000	$1,5165,000	$1,5165,000	$1,5165,000
Unit Cost ($/acft)		$1,148	$1,148	$621	$621	$621
BRA System Operation – Lake Granger Augmentation (conjunctive use) (Volume II, Section 4B.5)						
Supply From Plan Element (acft/yr)	—	—	—	33,500	33,500	33,500
Annual Cost ($/yr)				$28,977,500	$28,977,500	$28,977,500
Unit Cost ($/acft)				$865	$865	$865

[1]Supplies shown from water management strategies are sufficient to meet projected municipal needs for Round Rock as well as those for Williamson County Manufacturing (4C.36.24)

4C.38.17 City of Stamford (Wholesale Water Provider)

4C.38.17.1 Description of Supply

The City of Stamford located in Jones and Haskell counties has contracts to provide 3,574 acft/yr to nearby water user groups and is projected to have supply shortages through 2060. The City of Stamford is supplied from Lake Stamford, supplemented by a priority call agreement with BRA (1,820 acft contract). The existing supply is constrained by treatment capacity to 1,441 acft/yr. Table 4A-20 in Section 4A includes additional information on contracts and water supplies for the City of Stamford.

4C.38.17.2 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 the City of Stamford:

- Increase treatment plant capacity.

4C.38.17.3 Costs

Costs of the Recommended Plan for the City of Stamford:

a. Increase treatment plant capacity:
   - Cost Source: 6 MGD Water Treatment Plant expansion costs (Volume II, Section 4B.17)
   - Date to be Implemented: before 2010
   - Total Project Cost: $13,662,000
   - Annual Cost: $1,958,583

Table 4C.38-15.
Recommended Plan Costs by Decade for City of Stamford

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(2,761)	(2,764)	(2,750)	(2,728)	(2,706)	(2,684)
Increase Treatment Plant Capacity (Volume II, Section 4B.17)						
Supply From Plan Element (acft/yr)	3,360	3,360	3,360	3,360	3,360	3,360
Annual Cost ($/yr)	$1,958,583	$1,958,583	$766,080	$766,080	$766,080	$766,080
Unit Cost ($/acft)	$583	$583	$228	$228	$228	$228

4C.38.18 City of Sweetwater (Wholesale Water Provider)

4C.38.18.1 Description of Supply

Surface water supplies are obtained from Oak Creek Reservoir (Region F, Colorado River Basin) and the Dockum Aquifer. Firm yield supplies from Oak Creek Reservoir are zero. The long-term, firm annual supply from the City's Champion Well Field is about 2,000 acft/yr. The City of Sweetwater has contracts to provide 2,354 acft/yr to nearby water user groups and is projected to have supply shortages through 2060. Table 4A-21 in Section 4A includes additional information on contracts and water supplies for the City of Sweetwater.

4C.38.18.2 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 shortage of the city of Sweetwater:

- Conservation
- Expansion of Champion Well Field. Expansion of the existing Champion Well Field would provide an increase from 2,000 acft/yr firm annual supply to 3,000 acft/yr firm annual supply. The expanded well field would provide a maximum single year supply of 5,435 acft/yr.
- Oak Creek Reservoir Subordination (see the regional water plans for Planning Areas F and K for a description of this strategy). The available supply for Sweetwater from Oak Creek Reservoir would increase from zero to approximately 1,535 acft/yr with the subordination agreement.
- Conjunctive management of Oak Creek Reservoir and Champion Well Field. The surface water would be the primary supply and groundwater would be secondary (Volume II, Section 4B.5.2). Operated conjunctively, the combined yield of Oak Creek Reservoir and the Champion Well Field could be increased by approximately 900 acft/yr to a total system supply of 5,435 acft/yr in 2030 (1,535 acft/yr from Oak Creek plus 3,000 acft/yr from the Champion Well Field plus 900 acft/yr from conjunctive operation). This conjunctive operation would overdraft (take greater than the firm yield) Oak Creek Reservoir during most years and would overdraft the Champion Well Field during dry years when the surface water supply would not be available.
- An alternative water management strategy is to obtain supply from the City of Abilene (Volume II, Section 4B.14.3)

4C. 38.18.3 Costs

Cost of the Recommended Plan for the City of Sweetwater.

a. Conservation
    - Cost Source: Volume II, Section 4B.2
    - Date to be Implemented: 2010
    - Annual Cost: maximum of $92,625 in 2020

b. Champion Well Field Expansion
   - Cost Source: Volume II, Section 4B.5.2
   - Total Project Cost: $15,015,000
   - Annual Cost: $1,643,000

c. Oak Creek Reservoir Subordination Agreement (Intake, pump station, pipeline and water treatment plant exists)
   - Total Project Cost: none
   - Annual Cost: none

d. Conjunctive Management of Oak Creek Reservoir and Champion Well Field
   - Total Project Cost: none
   - Annual Cost: none

e. Alternative: Purchase Treated Water from the City of Abilene
   This strategy could potentially be developed in conjunction with Nolan County Steam-Electric meeting needs by purchasing raw water from Abilene.
   - Cost Source: Volume II, Section 4B.14.3
   - Total Project Cost: $46,964,000
   - Annual Cost: $9,461,000

Table 4C.38-16.
Recommended Plan Costs by Decade for the City of Sweetwater

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	(3,367)	(3,426)	(3,435)	(3,383)	(3,254)	(3,117)
Conservation (Volume II, Section 4B.2)						
Supply From Plan Element (acft/yr)	94	195	156	113	95	91
Annual Cost ($/yr)	$44,650	$92,625	$74,100	$53,675	$45,125	$43,225
Unit Cost ($/acft)	$475	$475	$475	$475	$475	$475
Expansion of Champion Well Field (Volume II, Section 4B.5.2)						
Supply From Plan Element (acft/yr)	1,000	1,000	1,000	1,000	1,000	1,000
Annual Cost ($/yr)	$1,643,000	$1,643,000	$334,000	$334,000	$334,000	$334,000
Unit Cost ($/acft)	$1,643	$1,643	$334	$334	$334	$334
Oak Creek Reservoir with Subordination Agreement						
Supply From Plan Element (acft/yr)	1,679	1,671	1,557	1,435	1,301	1,154
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Conjunctive Management of Champion Well Field and Oak Creek Reservoir with Subordination Agreement						
Supply From Plan Element (acft/yr)	688	755	878	948	953	963
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Alternative: Purchase Treated Water from City of Abilene (Volume II, Section 4B.14.3)						
Supply From Plan Element (acft/yr)	4,000	4,000	4,000	4,000	4,000	4,000
Annual Cost ($/yr)	$9,461,000	$9,461,000	$5,368,000	$5,368,000	$5,368,000	$5,368,000
Unit Cost ($/acft)	$2,365	$2,365	$1,342	$1,342	$1,342	$1,342

4C.38.19 City of Temple (Wholesale Water Provider)

4C.38.19.1 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 28,633 acft/yr and the City's water right can provide a reliable supply of almost its entire authorized diversion (supplies from the right increase over time due to sedimentation in the upstream Lake Belton and increased wastewater treatment plant discharges). Temple sells approximately 506 acft/yr of treated water to nearby water user groups. Although the City has sufficient raw water supply to meet its future needs, the City's water treatment plants have an average annual capacity of

16,800 acft. The water supply plans for Little River-Academy and Morgan's Point Resort include Temple supplying an additional 350 acft/yr of treated water to those entities by 2030, increasing to 413 acft/yr in 2060. Those needs are included in the overall shortages for the City of Temple. Table 4A-22 in Section 4A includes additional information on contracts and water supplies for the City of Temple.

4C.38.19.2 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 the City of Temple:

- Increase the surface water treatment capacity by 28 MGD to manage the future demand.
- TWDB projections of gpcd for Temple are more aggressive than the advanced conservation considered by the BGRWPG and no additional conservation would be realized.

4C.38.19.3 Costs

Costs of the Recommended Plan for the City of Temple.

a. Water Treatment Plant phased expansion (28 MGD):
    - Cost Source: Two 14 MGD expansions and related increase in operation and maintenance. Volume II. Section 4B.17.
    - Date to be Implemented: By year 2010 and by 2030
    - Annual Cost: ranges from $3,681,000 to $5,676,000 due to project phasing and 20 year debt service.

Table 4C.38-17.
Recommended Plan Costs by Decade for City of Temple

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Surplus/(Shortage) (acft/yr)	6,160	4,126	1929	177	(1,751)	(3,577)
Increase Treatment Capacity (Volume II, Section 4B.17)						
Supply From Plan Element (acft/yr)	7,840	7,840	15,680	15,680	15,680	15,680
Annual Cost ($/yr)	$3,681,000	$3,681,000	$5,676,000	$5,676,000	$3,685,000	$3,685,000
Unit Cost ($/acft)	$470	$470	$362	$362	$235	$235

4C.38.20 City of Waco (Wholesale Water Provider)

4C.38.20.1 Description of Supply

The City of Waco obtains its water supply from surface water 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 through the year 2060. The City has demonstrated a commitment to provide regional water supply in McLennan County, and has plans to extend regional water supplies beyond the 2060 planning horizon by actively pursuing a reuse program. The City has recently entered into a contract to supply up to 16,000 acft of reuse water per year to LS Power to provide cooling water for steam electric power generation, and has begun developing other reuse projects. Table 4A-22 in Section 4A includes additional information on contracts and water supplies for the City of Waco.

4C.38.20.2 Water Supply Plan

The Brazos G RWPG recommends that the City of Waco continue to pursue direct and indirect reuse as a water management strategy in order to diversify and extend regional water supplies in the McLennan County area. Accordingly, the following water supply plan is recommended for the City of Waco:

- Develop Reuse Supplies to Extend Lake Waco and Trinity Aquifer Supplies.

4C.38.20.3 Costs

Costs of the Recommended Plan for the City of Waco.

a. Reuse Supplies for the City of Waco:
   - Cost Source: Volume II, Section 4B.3
   - Date to be Implemented: ongoing
   - Unit Cost: Unit costs range widely, depending upon quantity used and type of use:
     - $1,025/acft (average) for small-quantity municipal irrigation use
     - $111/acft for industrial use (steam-electric)
   - Annual Cost: $6,355,800 (Annual costs would depend upon application, but is based here on a projected average of $223/acft for large-quantity uses.)

Table 4C.38-18.
Recommended Plan Costs by Decade for the City of Waco

Plan Element	2010	2020	2030	2040	2050	2060
Projected Surplus/(Shortage) (acft/yr)	11,877	9,556	7,595	5,221	3,721	1,505
Develop Reuse Supplies from WMARSS (Volume II, Section 4B.3)						
Supply From Plan Element (acft/yr)[1]	9,242	10,842	12,190	13,587	14,475	15,765
Annual Cost ($/yr)	$2,060,930	$2,417,670	$2,718,331	$3,029,985	$3,227,905	$3,515,533
Unit Cost ($/acft)	$200	$200	$200	$200	$200	$200

[1] Based on estimated year 2060 WMARSS effluent (Section 4B.3), less LS Power supplies. These volumes include WMARSS reuse strategies for other McLennan County WUGs.

4C.38.21 City of Bryan (Wholesale Water Provider)

4C.38.21.1 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 and is developing reuse supplies for non-potable demands within the City. The estimated reliable supply from groundwater is 18,304 acft/yr.

4C.38.21.2 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 the City of Bryan:

- Conservation
- Wastewater Reuse.
- In addition to the recommended plan element, additional Carrizo-Wilcox Aquifer Development, BRA System Operation, Millican Reservoir and the Little River Off-Channel Reservoir were considered as water management strategies to meet projected needs for the City of Bryan.

4C.38.21.3 Costs

Costs of the Recommended Plan for the City of Bryan.

a. Conservation
   - Cost Source: Volume II, Section 4B.2
   - Date to be Implemented: By year 2050
   - Annual Cost: $118,000

b. Wastewater Reuse for the City of Bryan:

- Cost Source: Strategy Evaluation (Volume II, Section 4B.3.1)
- Date to be Implemented: By year 2050
- Total Project Cost: $6,485,000
- Annual Cost: $576,000
- Note that the reuse strategy evaluation in Section 4B.3.1 contemplates use of the water to supplement steam-electric cooling supplies in Bryan Utilities Lake. However, the quantity of reuse supply could be utilized for miscellaneous irrigation along the pipeline corridor described in the reuse strategy evaluation.

Table 4C.38-19.
Recommended Plan Costs by Decade for the City of Bryan

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Projected Shortage (acft/yr)	3,727	2,505	1,463	662	(412)	(809)
Conservation						
Supply From Plan Element (acft/yr)	—	—	—	—	122	248
Annual Cost ($/yr)	—	—	—	—	$58,000	$118,000
Unit Cost ($/acft)	—	—	—	—	$475	$475
Wastewater Reuse						
Supply From Plan Element (acft/yr)	—	—	—	—	605	605
Annual Cost ($/yr)	—	—	—	—	$576,000	$576,000
Unit Cost ($/acft)	—	—	—	—	$952	$952

4C.39 Summary of Recommended Water Management Strategies

For convenient reference, the Table 4C.39-1 summarizes the water management strategies recommended by the Brazos G Regional Water Planning Group. The strategies listed below include only those related to developing new sources of supply in the Brazos G Area. Strategies involving system interconnections and purchasing water from existing supplies in Brazos G are not included.

The 2011 Brazos G Regional Water Plan includes recommendations for 18,952 acft/yr of municipal conservation savings; these savings are in addition to those savings already included in the TWDB water demand projections. Total new supplies of water into the Brazos G Area, whether conservation, newly developed groundwater, supply imported from other regions, newly developed surface water supplies, or augmentation of existing facilities, total 587,278 acft/yr. These totals do not reflect water trades between users of existing supplies in Brazos G, but are entirely new supplies to the Brazos G Area.

Implementation of the 2011 Brazos G Regional Water Plan will result in the development of new water supplies that will be reliable in the event of a repeat of the most severe drought on record. It is evident that implementation of all recommended water management strategies is not likely to be necessary in order to meet projected needs within the planning period. The Brazos G RWPG explicitly recognizes the difference between additional supplies and projected needs as System Management Supplies and has recommended the associated water management strategies in the 2011 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.

Table 4C.39-1.
Summary of Recommended Water Management Strategies Involving New Sources of Supply in the 2011 Brazos G Regional Water Plan

Strategy	WUG or WWP	New Supply by 2060 (acft/yr)	Total Project Cost (September2008 Prices)
Conservation Strategies			
Municipal	39 WUGs	21,346	N/D[1]
Manufacturing	5 Counties	594	N/D
Steam-Electric	6 Counties	11,803	N/D
Mining	3 Counties	973	N/D
Irrigation	5 Counties	7,041	N/D
Total Conservation		**41,757**	**N/D**
Reuse Strategies			
Reuse	City of Abilene	5,550	N/D
	City of Cleburne	4,533	$10,991,000
	City of Bryan	605	$6,485,000
	City of College Station	312	$3,292,000
	Steam Electric – Bell County	8,407	$17,404,000
	Steam-Electric – Robertson County	15,479	$23,126,000
	City of Waco	15,765	N/D
	Steam-Electric – Grimes County	11,000	$33,647,000
	City of Round Rock	7,443	$6,369,000
	City of Killeen	2,488	$18,323,000
	City of Harker Heights	185	
Total Reuse		**71,767**	**$119,637,000**
Water Supply from other Regions			
BCRUA	Chisholm Trail SUD	3,272	$13,264,000
	City of Round Rock	20,928	$147,264,000
	City of Leander	7,039	$169,147,000
	City of Cedar Park	12,620	$61,858,000
TRWD	Bethesda WSC	2,496	N/D
City of Arlington	Bethesda WSC	1,248	$16,334,000
City of Grand Prairie	Johnson County SUD	6,726	$35,646,000
Mansfield	Johnson County SUD	10,080	$27,182,000
Total from Other Regions		**64,409**	**$470,695,000**
Augmentation of Existing Surface Water Supplies			
Turkey Peak Reservoir	Palo Pinto County MWD No. 1	7,600	$50,227,000
Millers Creek Reservoir Augmentation	North Central Texas Municipal Water District	17,582	$46,948,000
Raise Level of Gibbons Creek Reservoir	Steam-Electric – Grimes County	3,870	$12,141,000
BRA System Operation (Lake Granger Augmentation)[2]	BRA	54,279	$643,928,000
Total Augmentation of Existing Surface Water Supplies		**83,331**	**$753,244,000**

Table 4C.39-1 (Continued)

Strategy	WUG or WWP	New Supply by 2060 (acft/yr)	Total Project Cost (September 2008 Prices)
New Reservoirs			
Groesbeck Off-Channel	City of Groesbeck	1,755	$10,412,000
Coryell County	BRA – Little River	3,365	$37,489,000
Cedar Ridge	City of Abilene	23,380	$285,214,000
Brushy Creek Reservoir	City of Marlin	2,090	$18,553,000
Total New Reservoirs		**30,590**	**$351,668,000**
Systems Approaches			
BRA System Operation (Excluding Lake Granger Augmentation)	Cleburne	1,530	$14,086,000
	Bosque County – Steam Electric	5,222	$24,725,000
	White Bluff Community WSC	600	$9,277,000
	City of Keene	157	$3,062,000
	Woodrow-Osceola WSC	150	$7,231,000
	Somervell County – Steam Electric	76,270	$136,032,000
	College Station	2,500	$23,954,000
Total from Systems Approaches		**86,429**	**$218,366,000**
Groundwater Development			
Carrizo-Wilcox Aquifer – Limestone County	Manufacturing – Limestone County	75	$347,000
	City of Kosse	100	$2,386,000
	Bistone MWSD	3,600	$18,458,000
Champion Well Field Expansion	City of Sweetwater	1,000	$15,015,000
Carrizo-Wilcox Aquifer – Brazos County	City of College Station	3,000	$28,101,000
	Wickson SUD	1,500	$1,201,000
Carrizo-Wilcox Aquifer – Burleson County	Southwest Milam WSC[4]	966	$3,502,000
Carrizo-Wilcox Aquifer – Lee County	Aqua WSC	403	$1,364,000
	Lee County WSC	806	$2,166,000
Carrizo-Wilcox Aquifer – Milam County	Steam Electric – Milam County	1,613	$3,160,000
	Mining – Milam County	100	$715,000
Edwards-Trinity Nolan County	Mining – Nolan County	114	$679,000
Trinity Aquifer – McLennan County	Chalk Bluff WSC	230	$2,707,000
	Western Hills WSC	198	$1,073,000
Trinity Aquifer – Hood County	Lipan	685	$8,524,000
	Tolar	150	$1,286,000
Trinity Aquifer – Johnson County	Parker WSC	160	$2,045,000

Table 4C.39-1 (Concluded)

Strategy	WUG or WWP	New Supply by 2060 (acft/yr)	Total Project Cost (September 2008 Prices)
Groundwater Development			
Trinity Aquifer – Williamson County	City of Florence	322	$1,648,000
	Williamson County-Other	280	$1,995,000
Gulf Coast Aquifer – Grimes County	Steam Electric – Grimes County	5,600	$31,630,000
Total Groundwater Development		**20,902**	**$128,002,000**
Total New Supplies		**799,185**	**>$2,041,612,000**

1. Not Determined or cost shared by multiple entities.
2. The Lake Granger Augmentation includes development of an average annual supply of groundwater from the Carrizo-Wilcox Aquifer of 30,832 acft/yr to develop the total new supply of 54,813 acft/yr (Volume II, Section 4B.5).
3. Includes additional BRA contractual commitments not specifically identified in Section 4B.4. Does not include Region H supplies, but does include minor increases to Region C.
4. Although Southwest Milam is primarily located in Milam County, supplies for this strategy are located in Burleson County.

In addition to the water management strategies recommended by the BGRWPG to meet future water needs, the BGRWPG has identified a number of alternative strategies that could be pursued should a recommended strategy prove infeasible. Water management strategies that were fully evaluated for consideration by the BGRWPG and are identified as alternatives to recommended strategies are summarized in Table 4C.39-2.

Table 4C.39-2.
Summary of Fully Evaluated Alternative Water Management Strategies

Wholesale Water Provider (WWP)	Alternative Water Management Strategy	Expected Implementation Date	Total Yield						Capital Cost	Supply Greater than 125% of Need?
			2010	2020	2030	2040	2050	2060		
Brazos River Authority (Lake Aquilla System)	Lake Aquilla Augmentation	2020		5,000	5,000	5,000	5,000	5,000	$64,749,000	Yes
Brazos River Authority (Little River System)	Groundwater Development	2020		35,000	35,000	35,000	35,000	35,000	$212,042,000	No
Brazos River Authority (Little River System)	Little River Off-Channel Reservoir	2020		27,725	27,725	27,725	27,725	27,725	$137,356,000	No
Palo Pinto County Municipal Water District No. 1	Lake Palo Pinto Off-Channel Reservoir	2020		3,110	3,110	3,110	3,110	3,110	$25,399,000	No
Grimes County Steam Electric	Millican Reservoir - Panther Creek Site	ND	ND	ND	ND	ND	ND	ND	$1,159,907,000	No
City of Sweetwater (WWP)	Purchase Supply from the City of Abilene	2010	4,000	4,000	4,000	4,000	4,000	4,000	$46,964,000	Yes
City of Abilene (WWP)	Purchase Supply from Possum Kingdom Reservoir	2020		12,400	12,400	12,400	12,400	12,400	$189,947,000	No

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Section 5
Impacts of Recommended Water Management Strategies on Key Parameters of Water Quality and Moving Water from Rural and Agricultural Areas

The guidelines for 2011 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.

5.1 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 5-1.

Water quality concerns affecting existing supplies are described in greater detail in Section 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 the 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.

5.2 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 in rural and agricultural areas.

The remaining water management strategies recommended to meet water needs (Section 4C) do not include transferring significant quantities of water needed by rural and agricultural users and, therefore, are not considered to impact them.

Table 5-1.
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***
Water Conservation	Varies	All municipal, industrial, and agricultural users with projected needs (shortages)*	total dissolved solids, sulfates, and chlorides
Treated Effluent Reuse	Brazos, Johnson, McLennan, Nolan, Williamson, Taylor, Jones	Steam/Electric (Nolan and McLennan Counties) Municipal (Cities of Round Rock, Bryan, College Station, Cleburne, Waco, Abilene)	indicator bacteria
Interbasin Transfer of Surface Water from Lower Colorado River (Region K)			
BCRUA	Varies	Municipal (Leander, Liberty Hill, Chisholm Trail SUD, Round Rock, Cedar Park)	none identified
New Reservoirs			
Coryell County Off-Channel Reservoir	Coryell	Municipal (Coryell County - Other , Gatesville)	none identified
Groesbeck Off-Channel Reservoir	Limestone	Municipal (City of Groesbeck)	none identified
Millican – Panther Creek Site	Navasota River	Municipal (College Station, Region H), Steam Electric	none identified
Cedar Ridge Reservoir	Clear Fork	Municipal (City of Abilene)	none identified
Brushy Creek Reservoir	Williamson	Municipal (City of Marlin)	none identified
Augmentation of Existing Surface Water Supplies			
Lake Palo Pinto Off-Channel Reservoir	Palo Pinto	Municipal (Palo Pinto County MWD No. 1)	none identified
Millers Creek Reservoir	Throckmorton, Baylor	Municipal (North Central Texas Municipal Water Authority)	none identified
Gibbons Creek Reservoir	Grimes	Steam/Electric (Grimes County)	indicator bacteria, temperature, pH
Lake Granger (BRA System Operations)	Williamson	Manufacturing (Williamson County); Municipal (Chisholm Trail SUD, Williamson County-Other, Cities of Georgetown and Round Rock, Jarrell-Schwetner WSC)	increasing trends in sulfates, chlorides, elevated nutrients, and sedimentation from total suspended solids

Table 5-1.
Summary of Water Management Strategies, Potential Water Quality Concerns, and WUGs Potentially Affected (Concluded)

Recommended WMS	***Project Origination***	***Beneficiaries of Project***	***Potential Water Quality Concerns Affecting Use of Supply***
Systems 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, Woodrow-Osceola WSC)	chlorides, total dissolved solids, total suspended solids, and nutrients
Groundwater Development			
Dockum Aquifer (Champion Wellfield)	Nolan	Municipal (City of Sweetwater)	none identified
Carrizo-Wilcox Aquifer	Brazos, Burleson, Lee, Milam, Robertson, Coryell, Erath, Falls, Lampasas, Williamson	Manufacturing (Brazos, Burleson, Limestone, Robertson counties); Irrigation (Burleson County) Steam/Electric (Milam County; Municipal (Wickson Creek SUD, Aqua WSC, Lee County WSC, Southwest Milam WSC; cities of Bryan, College Station, Giddings, Groesbeck, Hutto)	temperature
Trinity Aquifer	Coryell, Erath, Falls, Lampasas, Williamson	Manufacturing (Erath County); Municipal (Coryell County-Other, Falls County-Other, Lampasas County-Other, City of Florence)	chlorides, total dissolved solids
Gulf Coast Aquifer	Grimes	Manufacturing (Grimes County)	none identified

* For municipal users with shortages, additional conservation was recommended only for WUGs exceeding 140 gallons per capita per day.

Section 6
Water Conservation and
Drought Management Recommendations

The 2011 Plan includes water conservation and drought management recommendations pursuant to 31 Texas Administrative Code 357.7(a)11 and Texas Water Code 11.085. Conservation is the first water management strategy considered for water user groups with shortages.

Typically, water user groups address their goals and plans to conserve water in their Water Conservation Plan and identify factors used to initiate a drought response and actions to be taken as part of the response in a Drought Contingency Plan. The TCEQ provides guidance for Water Conservation and Drought Contingency Plans in 30 Texas Administrative Code Chapter 288, which requires entities applying for new water rights or an amendment to an existing water right to prepare and implement a water conservation/drought contingency plan to be submitted with their application. Furthermore, 30 TAC Chapter 288, requires "specific, quantified 5- and 10-year targets for water savings to be included in all water conservation plans to be submitted to the TCEQ no later than May 1, 2005."

The specific water conservation target savings for all entities in the Brazos G Area have not been compiled into a central database and are not shown here. Targets identified in specific conservation plans for water user groups in the Brazos G Area should be compiled and presented in future water planning efforts. The City of Abilene's Water Conservation and Drought Contingency Plan (WC&DCP) is included in Appendix J, along with the City of Waco's WC&DCP in Appendix K as example plans for two water user groups in the Brazos G Area.

6.1 Water Conservation

The Brazos G RWPG has considered water conservation and drought management measures for each water user group with a need (projected water shortage) in accordance with Regional Water Planning Guidelines. The Brazos G RWPG recommends water conservation for municipal and non-municipal entities.

6.1.1 Municipal Water Conservation

The four largest municipal water users in the Brazos G Area (Waco, Abilene, College Station, and Round Rock) constitute approximately 25% of the regional municipal water demand. Abilene, College Station, and Round Rock have projected shortages during the planning period and have projected water usage ranging from 164 gallons per capita per day (gpcd) to 221 gpcd in 2010.

The Brazos G RWPG encourages all municipal entities in the region to conserve water, regardless of per capita consumption. The current Texas Water Development Board (TWDB) municipal water demand projections account for expected water savings due to implementation of the 1991 State Water-Efficient Plumbing Act. In September 2004, the Brazos G RWPG recommended additional water conservation of 21 gpcd by Year 2020 for water entities with a projected need (shortage) that also exceed 140 gallons per capita per day. Specific conservation measures are not recommended for each user group, as each entity should choose those conservation strategies that best fit their individual situation using Best Management Practices (BMPs) described by the Water Conservation Implementation Task Force.[1] A discussion of municipal conservation water savings, program costs, and unit costs for the Brazos G Area are included in Section 4B.2.1. Conservation is recommended as a water management strategy for 39 municipal WUGs in the Brazos G Area, representing a total of 21,346 acft/yr of potential savings.

6.1.2 Non-municipal Water Conservation

In February 2005, the Brazos G RWPG recommended that counties with projected needs (shortages) for irrigation or industrial users (manufacturing, steam electric, or mining) reduce their water demands by 3 percent by 2010, 5 percent by 2020, and 7 percent from 2030 to 2060 by using Best Management Practices identified by the Water Conservation Implementation Task Force.

Irrigation needs are projected for six counties in the Brazos G Area: Eastland, Haskell, Knox, Nolan, Shackelford and Throckmorton. In 2060, the total expected water savings for these six counties is 7,041 acft/yr. There are multiple irrigation BMPs that irrigators can select from to attain this water savings, including furrow diking, low elevation spray applications (LESA), and low energy precision application (LEPA). The costs of these BMPs range from $96 to $449

[1] Texas Water Development Board, Water Conservation Best Management Practices Guide, November 2004.

per acft of water saved with a savings potential of 12,359 to 22,691 acft with 100 percent participation. A more detailed description of these irrigation BMPs, costs, and water savings for the Brazos G Area are included in Section 4B.2.2.

Irrigation BMPs have been identified by the Water Conservation Implementation Task Force. However, data to quantify savings and costs is not available. Brazos G recognizes that conservation savings and costs to implement irrigation BMPs are locale and crop- specific and assumes that irrigation users will implement those strategies that are practical, cost effective, and provide good water savings potential. Drip/Micro-Irrigation Systems have potential for effective water-use reductions in Haskell and Knox Counties as irrigated acres are migrated from furrow irrigation to drip irrigation. Implementation is dependent on crop-mix, cost reductions as new technology is implemented, and disease control for Cotton Root Rot.

Manufacturing needs are projected for five counties in the Brazos G Area: Johnson, Lampasas, Limestone, Nolan, and Williamson. The total water savings for these five counties after 7 percent water demand reduction in 2060 is 594 acft/yr.

Steam-Electric needs are projected for nine counties in the Brazos G Area: Bell, Bosque, Grimes, Johnson, Limestone, Milam, Nolan, Robertson and Somervell. The shortages for three of the counties (Bell, Nolan and Somervell) are due to anticipated new generating capacity and no conservation savings are expected. The total water savings for the remaining six counties after 7 percent water demand reduction in 2060 is 11,083 acft/yr.

Mining needs are projected for four counties in the Brazos G Area: Milam, Nolan, Stephens and Williamson. Mining needs in Williamson County are attributed to quarry dewatering, and no conservation is recommended for Williamson County Mining. The total water savings for the remaining three counties after 7 percent water demand reduction in 2060 is 973 acft/yr.

There are multiple industrial BMPs identified by the Water Conservation Implementation Task Force, however data to quantify savings and costs is unavailable. The Brazos G RWPG recognizes that conservation savings and costs to implement industrial BMPs are facility specific and assumes that industrial users will implement those strategies that are practical, cost effective, and provide good water savings potential. A more detailed description of suggested industrial BMPs for the Brazos G Area is included in Section 4B.2.3.

6.2 Drought Management

All water supply entities and some major water right holders are required by Senate Bill 1 regulations to submit for approval to the Texas Commission for Environmental Quality (TCEQ) a Drought Contingency and Water Conservation Plan. These plans must detail the entities' plans to reduce water demand at times when the demand threatens the total capacity of the water supply delivery system or overall supplies are low (like during a drought). In accordance with 31 Texas Administrative Code 357.7(a)1, the 2011 Plan identifies: 1) factors to consider in determining whether to initiate a drought response; and 2) actions to be taken as part of the response by including model drought contingency plans for City of Abilene (Appendix J) and City of Waco (Appendix K). The Brazos River Authority continues to receive water conservation and drought management plans from regional water user groups.

The cities of Abilene and Waco are comparable in size, but have different hydrologic conditions. The City of Waco depends upon essentially one water supply (Lake Waco), whereas the City of Abilene has multiple water sources. Lake Waco is a fairly drought resistant water supply, whereas the City of Abilene is experiencing a drought worse in severity than the drought of record. These two entities were selected to represent a range of different conservation and drought contingency approaches that may be applicable to other water user groups in the Brazos G Area.

Section 7
Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources

The 2011 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 2011 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 by adhering to pass-through requirements consistent with the Consensus Criteria for Environmental Flow Needs (Appendix H), and protection of existing water rights. For groundwater, the 2011 Plan recognizes principles for groundwater use in Texas, and estimates of groundwater availability take into consideration regional and local drawdown constraints (Appendix B).

The 2011 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 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 (Appendix I).

The 2011 Plan considers environmental information resulting from site-specific studies and ongoing water development 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 in the various evaluations of water management strategies. 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 habitats were considered for each water management strategy evaluated.

The 2011 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 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 7-1 shows how flows during the current drought are significantly less than those of the 14 years of the drought of record (1950's drought).

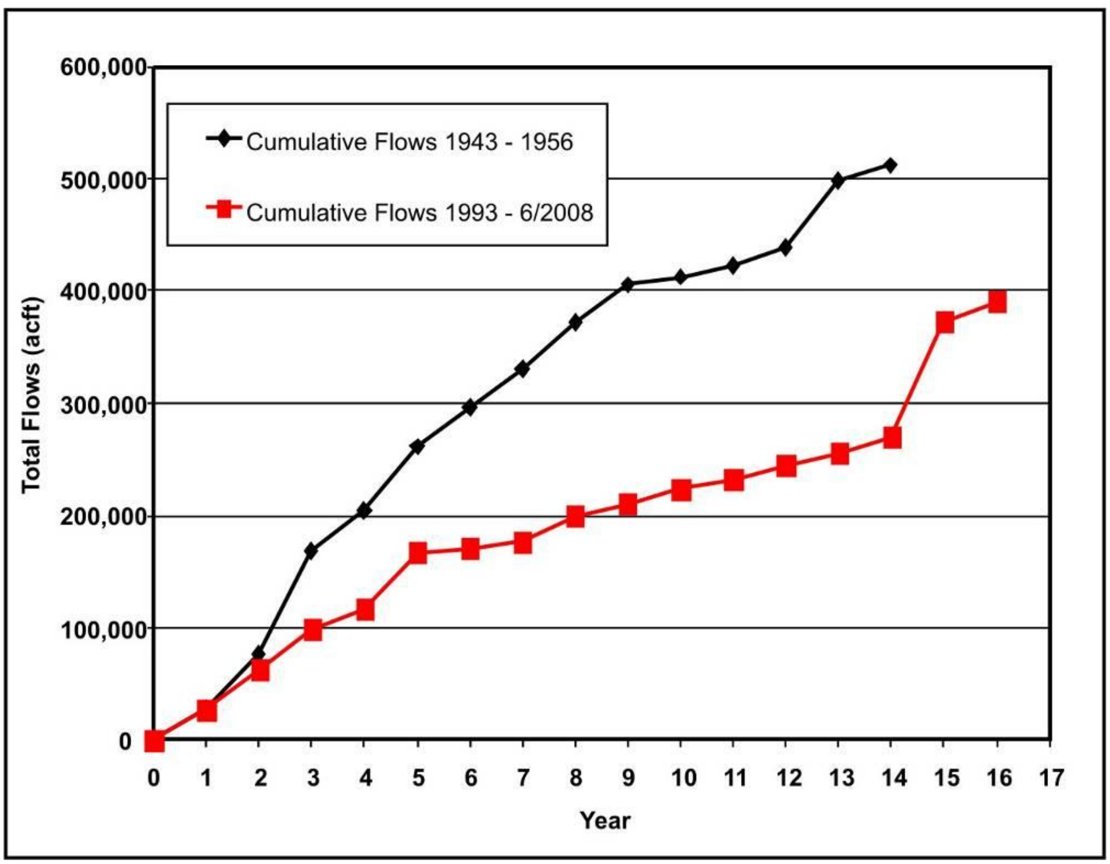


Figure 7-1. Cumulative Gaged Flows at Clear Fork of the Brazos near Nugent

The Brazos G RWPG conducted numerous meetings during the 2011 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 considered recommendations of stream segments with unique ecological value by Texas Parks and Wildlife and sites of unique value for reservoirs. At this time, the Brazos G RWPG recommends that no stream segments be designated as unique; however, there are recommendations to make certain reservoir sites unique (Section 8). The Brazos G RWPG developed policy recommendations regarding State water policy after extensive consideration and deliberation and these are presented in Section 8 of this report.

The following sections describe in more detail the hydrologic effects of the recommended water management strategies on surface water and groundwater resources.

7.1 Cumulative Hydrologic Effects of Regional Water Plan Implementation

7.1.1 Surface Water

Sophisticated hydrologic models have been employed to quantify the cumulative effects of implementation of the 2011 Plan through the year 2060. Surface water effects were quantified using the Brazos G WAM, which was the standard tool utilized to determine surface water supplies available in the region and also to evaluate potential water management strategies. The Brazos G WAM utilizes the Water Rights Analysis Package (WRAP) and a modified TCEQ WAM dataset that incorporates approved Brazos G planning assumptions concerning return flows, reservoir sedimentation and priority calls agreements, among others.

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. At the direction of the Brazos G RWPG, the base condition against which to compare conditions with the plan in place was streamflow computed by the Brazos G WAM model used to determine availability of surface water supplies in the year 2060. In this scenario, all existing water rights are fully utilized, all major reservoir capacities are reduced to expected year 2060 sedimentation conditions, wastewater effluent discharges (return flows) are include with an aggressive level of reuse assumed, and all BRA contractual commitments are placed at their actual diversion locations.

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, listed in Table 7-1, were incorporated into the model. Specific strategies not included in the analysis are reuse projects, conservation, strategies transferring water from one entity to another through new or increased purchases, and development of additional groundwater. The base condition already assumes a level of reuse that is somewhat greater than in the plan; therefore, the reuse aspects of the plan will not cause any further reductions in streamflow below the base conditions. 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 low. For example, groundwater availability model (GAM) simulations of the Carrizo-Wilcox Aquifer with pumping at the full estimated groundwater availability resulted in only 22 cubic feet per second (cfs) reduction in base streamflow, summed for all streams crossing the Carrizo-Wilcox Aquifer.

The Brazos G RWPG selected the eight locations presented in Table 7-2 at which to evaluate the cumulative effects of the 2011 Plan on streamflow. 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 that were included in the analysis.

The strategies were operated with seniority to the proposed appropriation under the BRA System Operations Permit. It was assumed that some form of priority calls agreement would be reached between the BRA and the entity developing a new water supply project, and the new water supply would not be required to pass flows to the new BRA appropriation. In all cases, the priorities of BRA's existing rights were honored, as simulated under system operations.

Table 7-1.
Recommended Water Management Strategies Included in Cumulative Impacts Analysis

Recommended Water Management Strategy	WUG or WWP	Plan Section
Millers Creek Reservoir Augmentation	North Central Texas Municipal Water District	4B.7
Cedar Ridge Reservoir	City of Abilene	4B.12.1
BRA System Operations	Bosque, Hill and Limestone County WUGs	4B.4
Turkey Peak Reservoir	Palo Pinto County MWD #1	4B.12.5
Federal Storage Reallocation – Aquila Reservoir	Brazos River Authority	4B.18.1
BRA System Operations – Lake Granger Augmentation	Williamson County WUGs	4B.5
Coryell County Reservoir	Brazos River Authority	4B.13.7
Groesbeck Off-Channel Reservoir	City of Groesbeck	4B.13.2
Millican Reservoir – Panther Creek Site	Brazos River Authority	4B.12.8
Raise Level of Gibbons Creek Reservoir	Grimes County Steam Electric	4C.12.5
Allens Creek Reservoir (Region H)[1]	Brazos River Authority	n/a
Brushy Creek Reservoir	City of Marlin	4B.12.10

[1] 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 7-2.
Locations for Evaluating the Effects of Recommended Strategies on Streamflow

Location	WAM Control Point Identifier
Brazos River at South Bend	BRSB23
Brazos River near Glen Rose	BRGR30
Brazos River near Aquilla	BRAQ33
Bosque River near Waco	BOWA40
Little River near Cameron	LRCA58
Brazos River near Bryan	BRBR59
Brazos River near Hempstead	BRHE68
Brazos River at Richmond	BRRI70

The Region H portion of the supply made available under BRA System Operations was diverted at the Richmond control point (BRRI70) in the model. The remaining Brazos G portion not assigned to specific WUG strategies (5,742 acft) was diverted in the model at the Brazos River near Hempstead location, the main stem location furthest downstream in the Brazos G Area. 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 streamflow were evaluated by comparing descriptive streamflow statistics for the base condition with those from the plan condition at the selected evaluation locations. Figures 7-2 through 7-9 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 7-10 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 follows the same pattern in the underlying natural flows upon which the simulations are based.

The results show that the streamflows generally tend to decrease between the base run and the implemented plan run for those locations downstream from where reservoirs have been recommended. However, some locations exhibit larger flows with implementation of the 2011 Plan than with the base condition. This is due primarily to the 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 and the Brazos River near Glen Rose are the only two locations that show that there are more months where the median streamflow decreased between the base and the plan than where it stayed the same or increased. These reductions are the result of the implementation of the Cedar Ridge Reservoir, Millers Creek Reservoir Augmentation, and the Turkey Peak Reservoir projects. The increases in median flow, especially at the Brazos River near Glen Rose, are the results of BRA System Operations releases from Possum Kingdom and Granbury. For the South Bend location the largest decrease occurs in March at 16%, and the largest increase occurs in July at 4%. For the Glen Rose location, the largest decrease occurs in July at 49%, and the largest increase occurs in May at 31%. Even with these modest differences in median streamflow, the frequency plots show that the overall change to the flow regime at these points is minor.

The Brazos River near Aquilla location shows increases in median streamflow for 9 of the 12 months. The range of differences at this location is a 19% decrease to a 65% 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 flows, apparently from non-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 Augmentation. While monthly median flows exhibit mostly increases up to 42%, 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 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 reservoir pass these locations to satisfy demands at downstream locations. The impacts of the Millican – Panther Creek Reservoir are evidenced in the reduction in flow at Hempstead and Richmond that is not reflective of the Bryan location. This is because the confluence of the Navasota River with the Brazos River is located between Bryan and Richmond. The Bryan location shows increases in median streamflow for 10 of the 12 months by as much as 28%, with the largest reduction of 11%. Hempstead sees 6 months with increase in median streamflow and 6 months with a reduction ranging from a decrease of 13% to a 16%

increase. Similarly, at the Richmond location the months with increases and decreases area about even ranging from an 11% decrease to a 15% increase. Only the Hempstead and Richmond locations show a noticeable reduction on the frequency plots for larger flows that occur about 40% of the time.

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 2011 Plan.

Also included in Figures 7-2 through 7-10 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. Differences between Run 8 and the implementation 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 and plan scenarios.

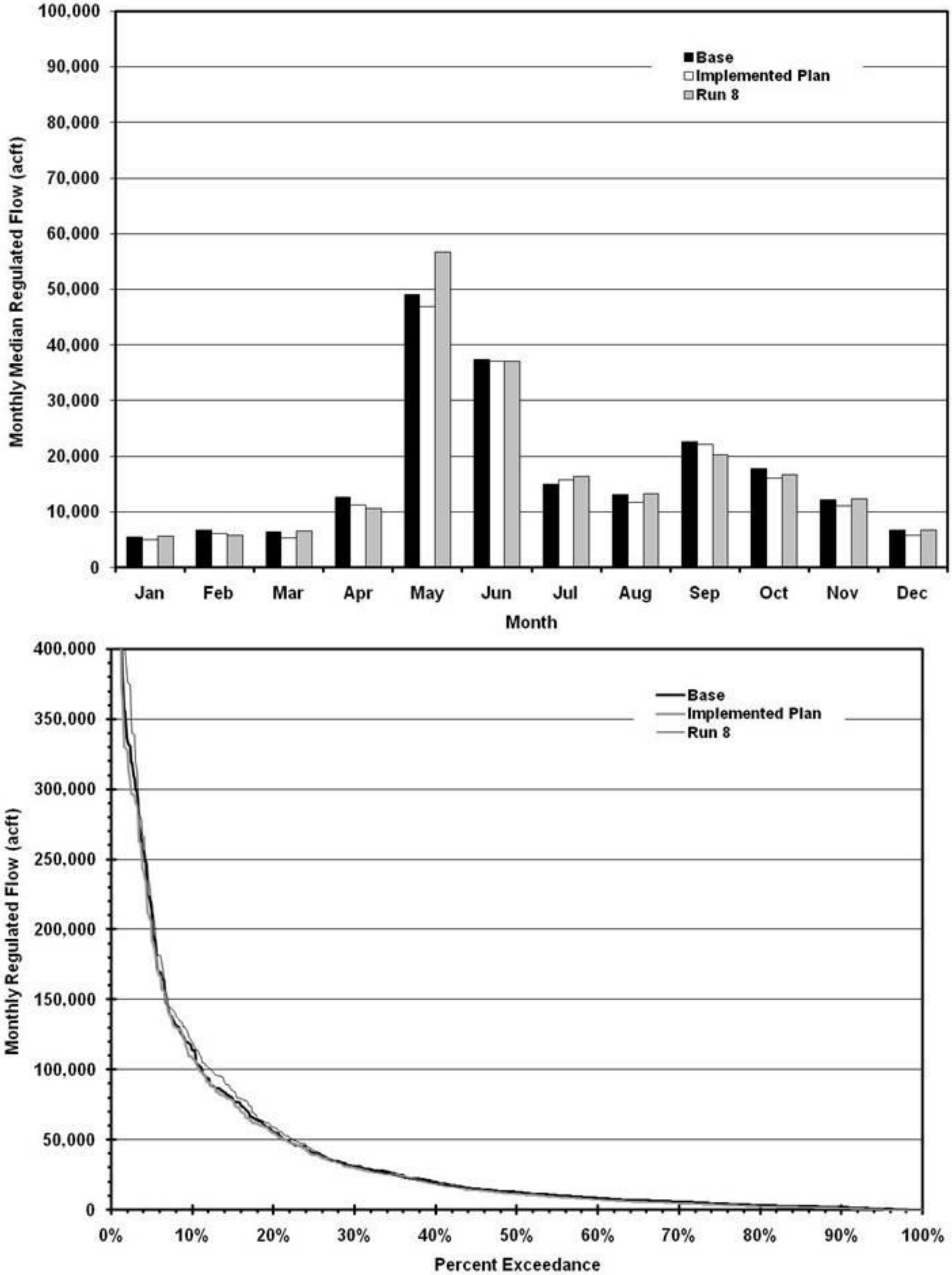
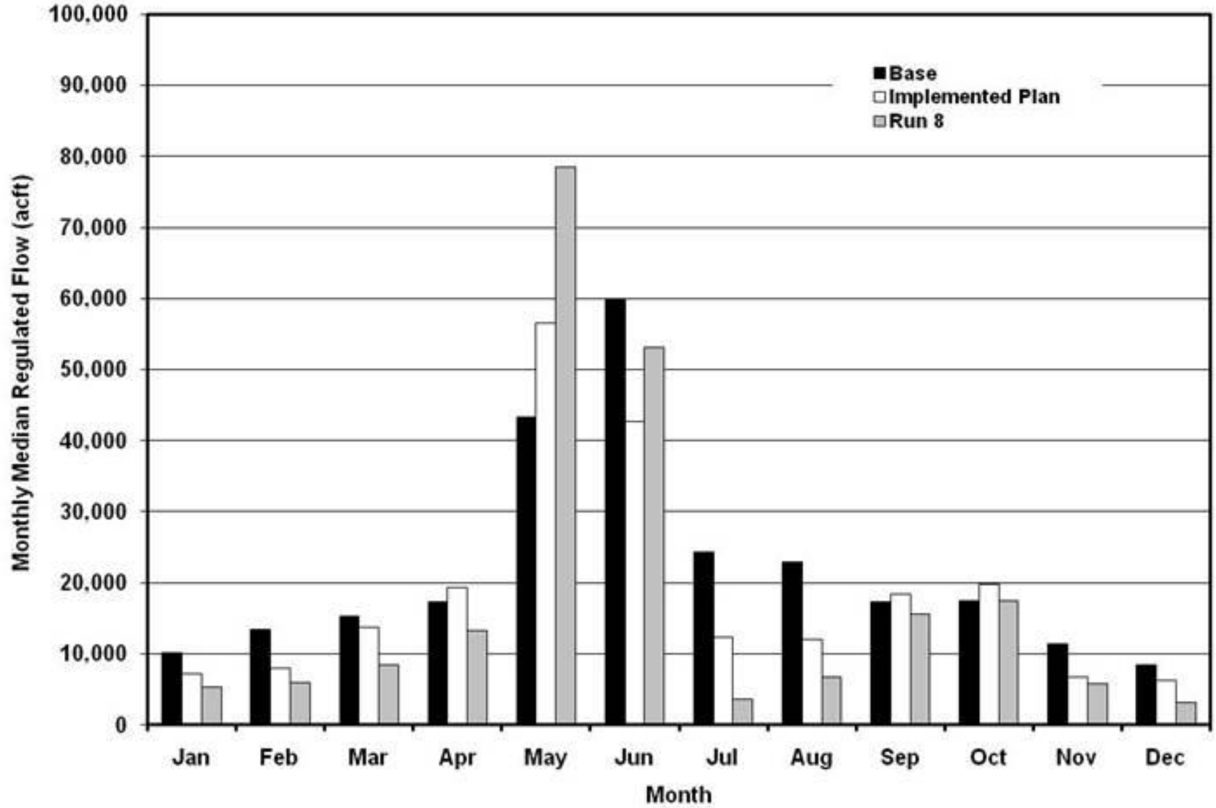


Figure 7-2. Brazos River at South Bend



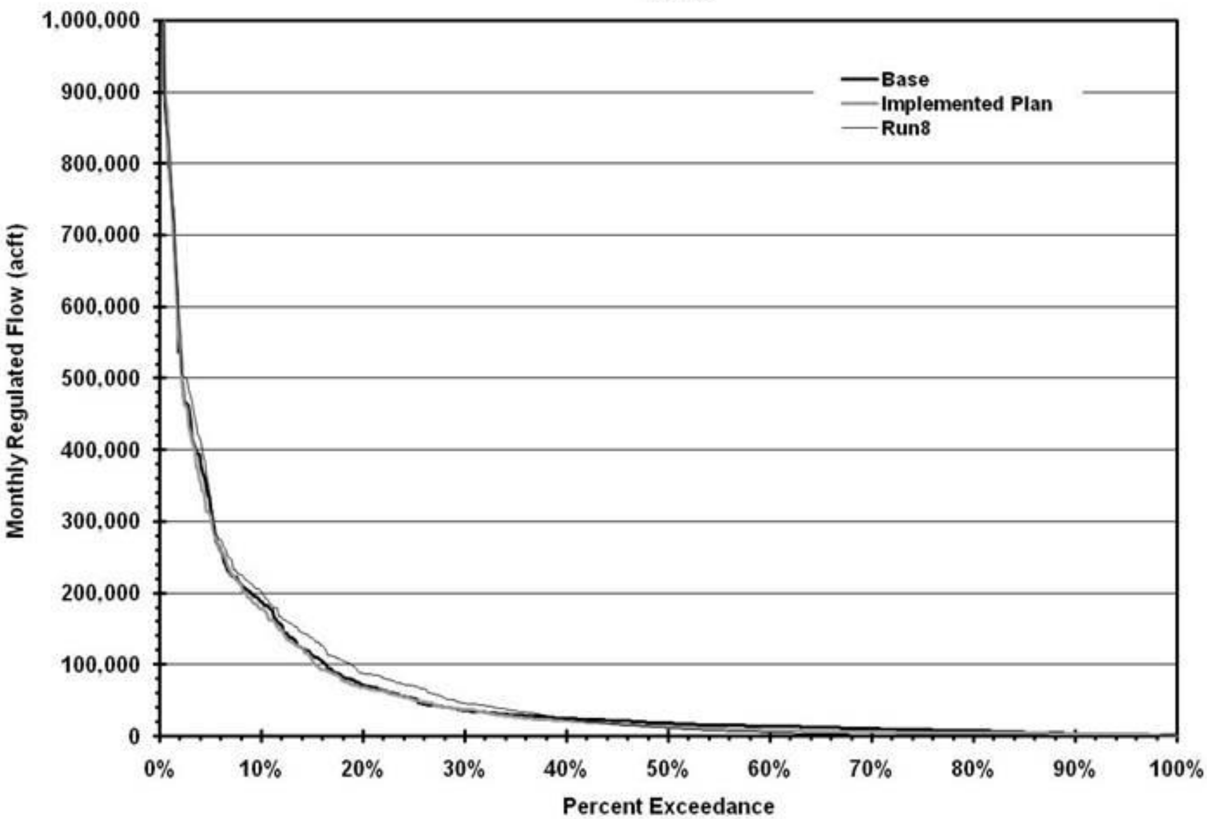
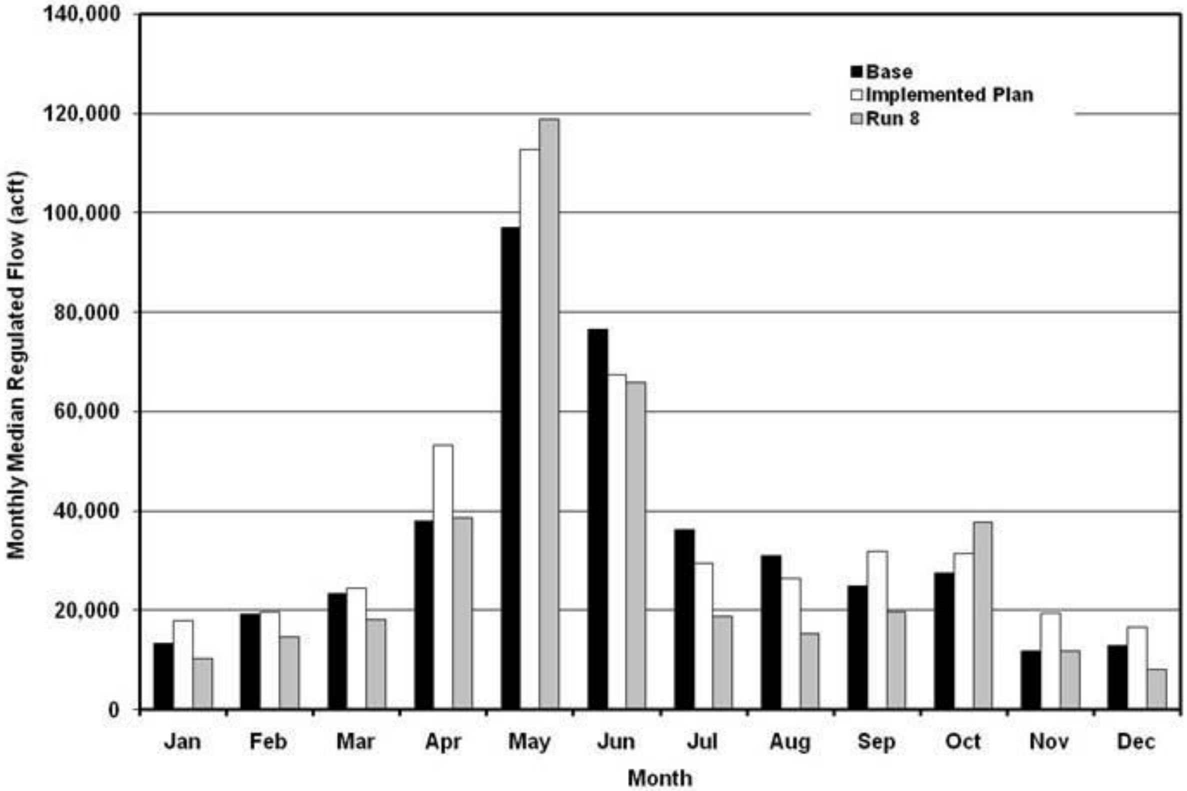


Figure 7-3. Brazos River near Glen Rose



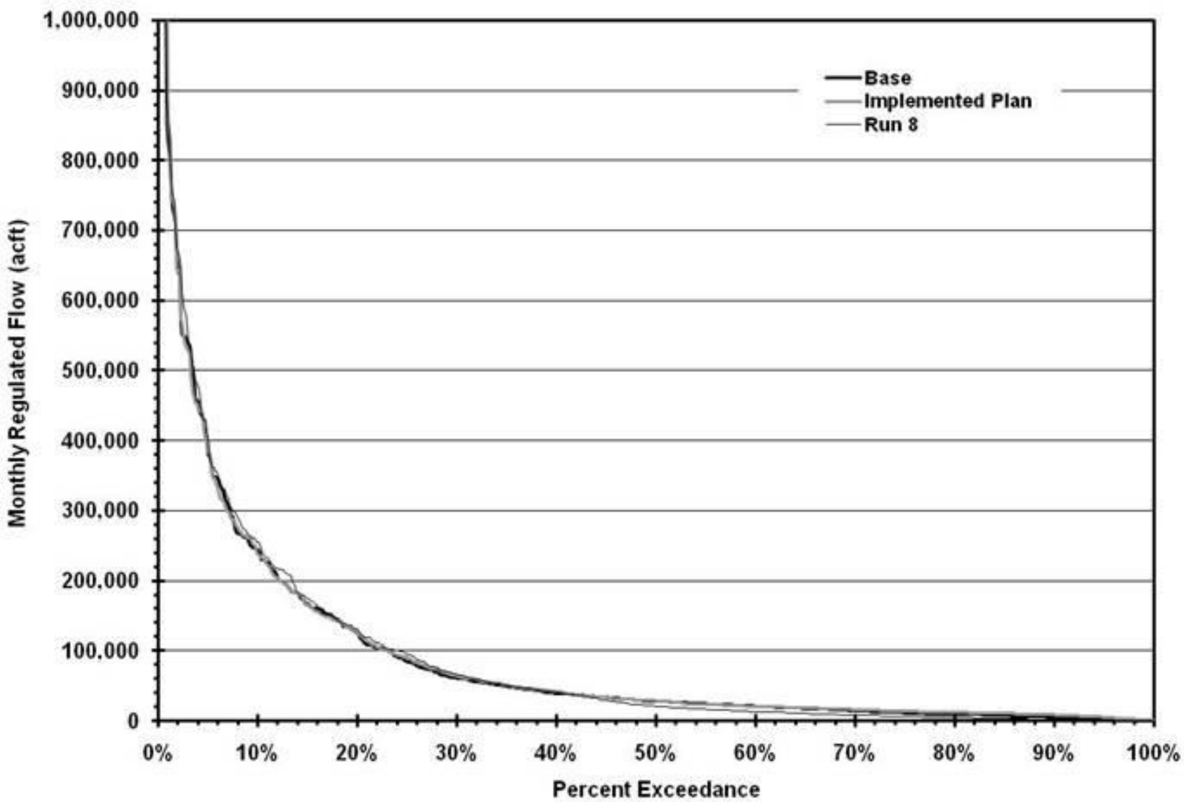
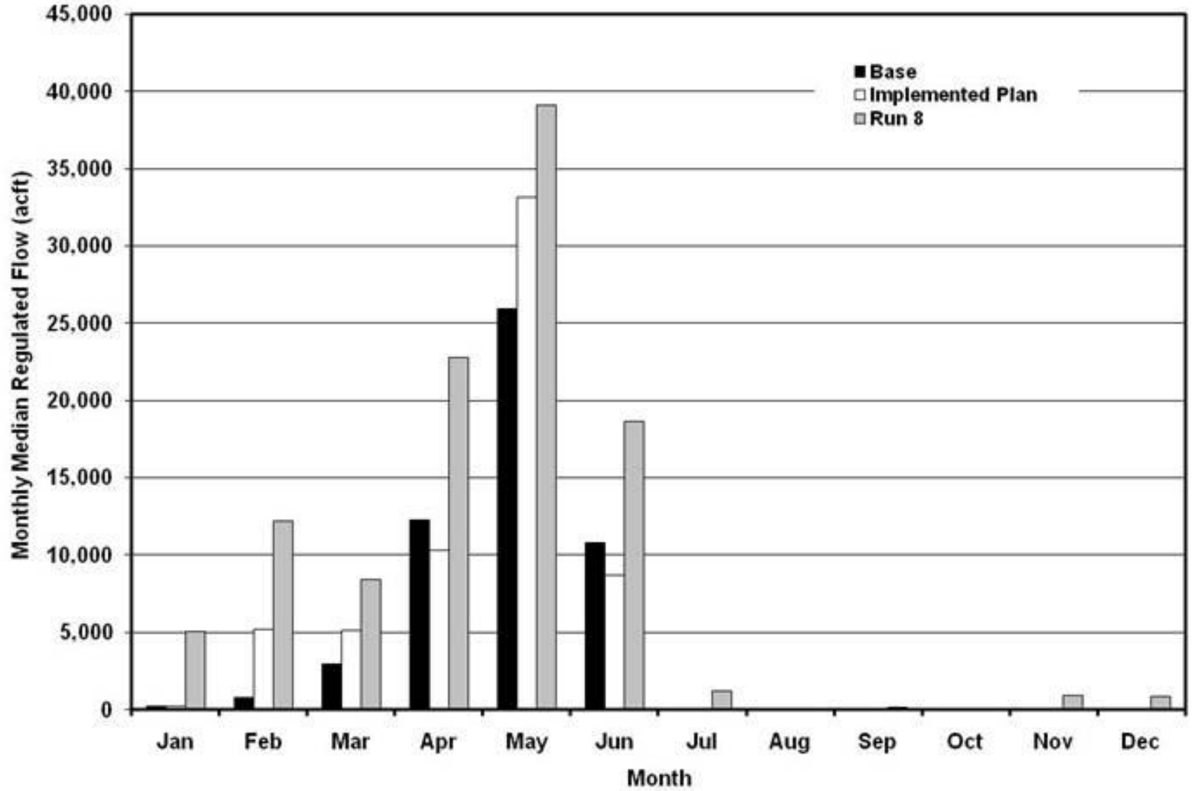


Figure 7-4. Brazos River near Aquilla



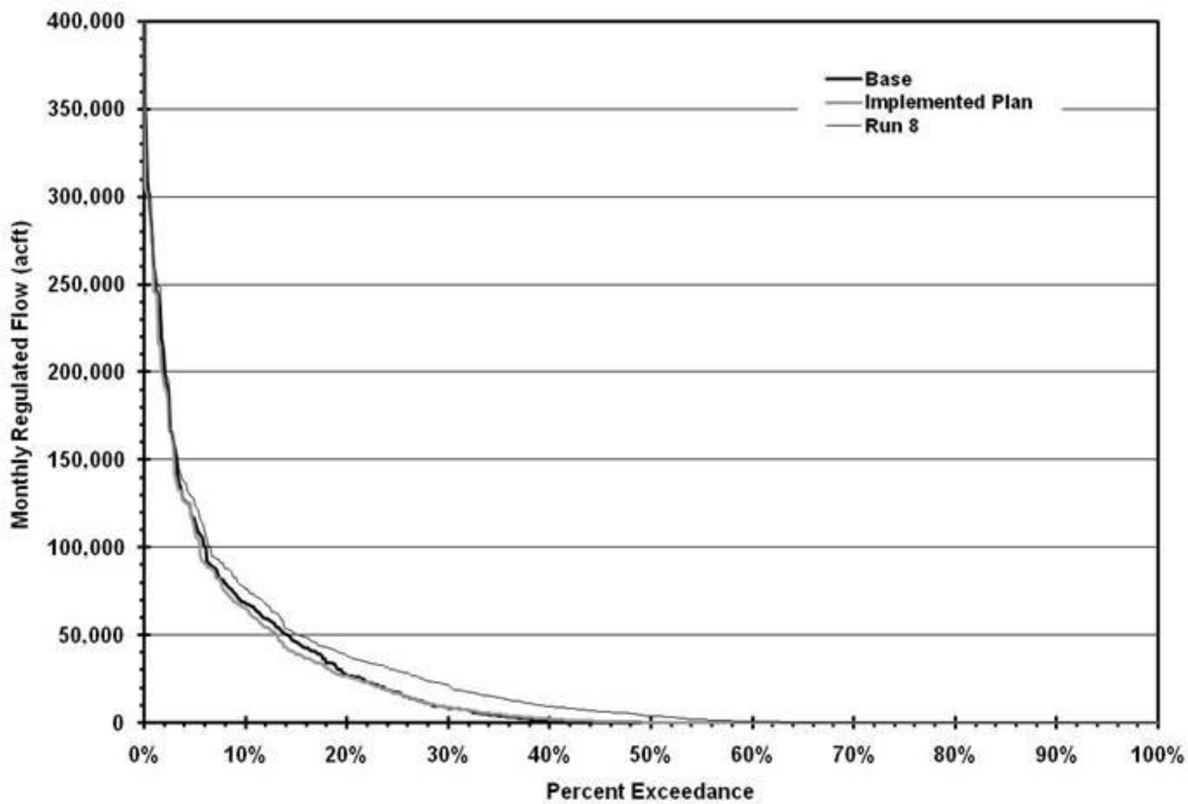
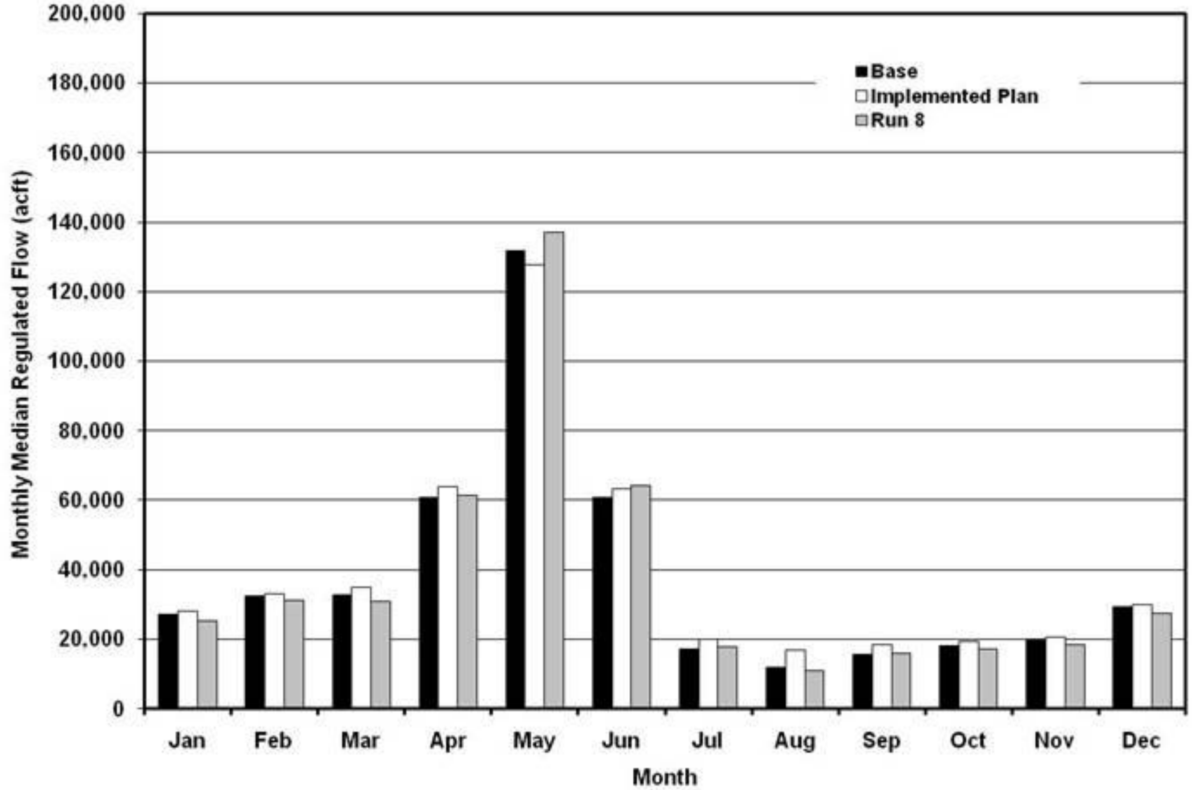


Figure 7-5. Bosque River near Waco



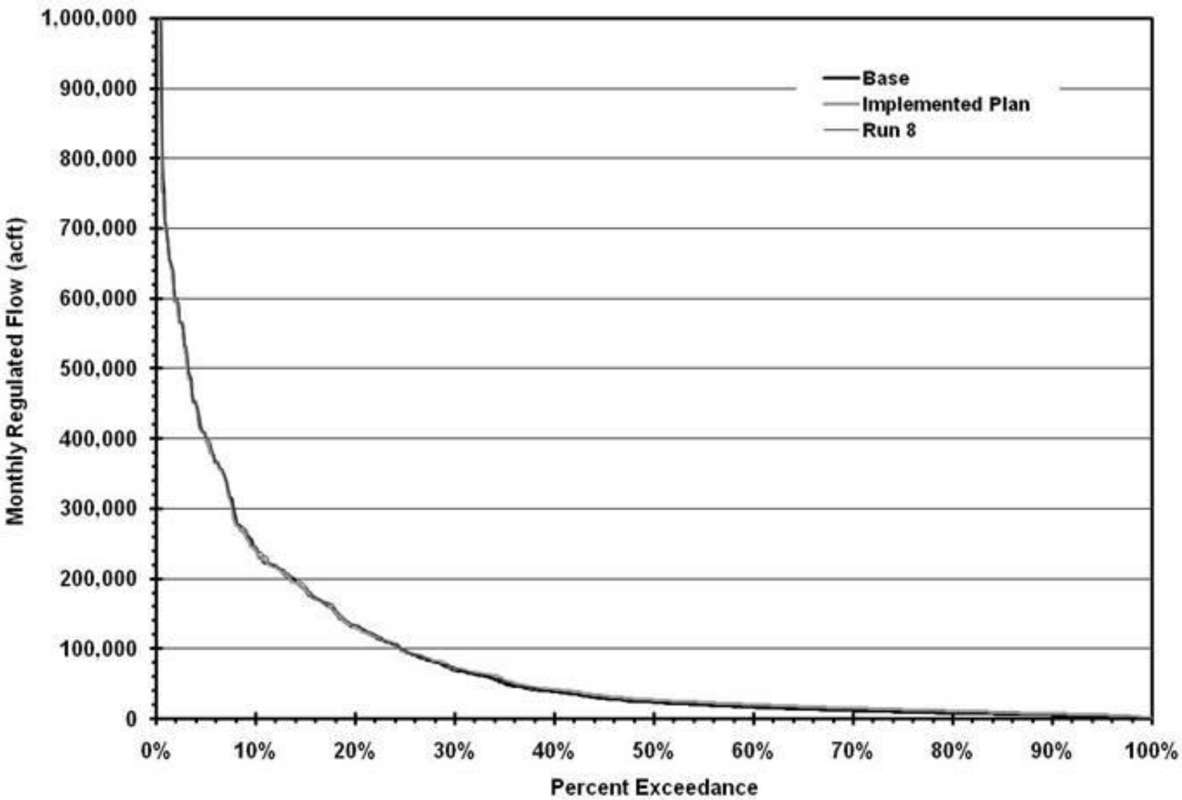


Figure 7-6. Little River near Cameron

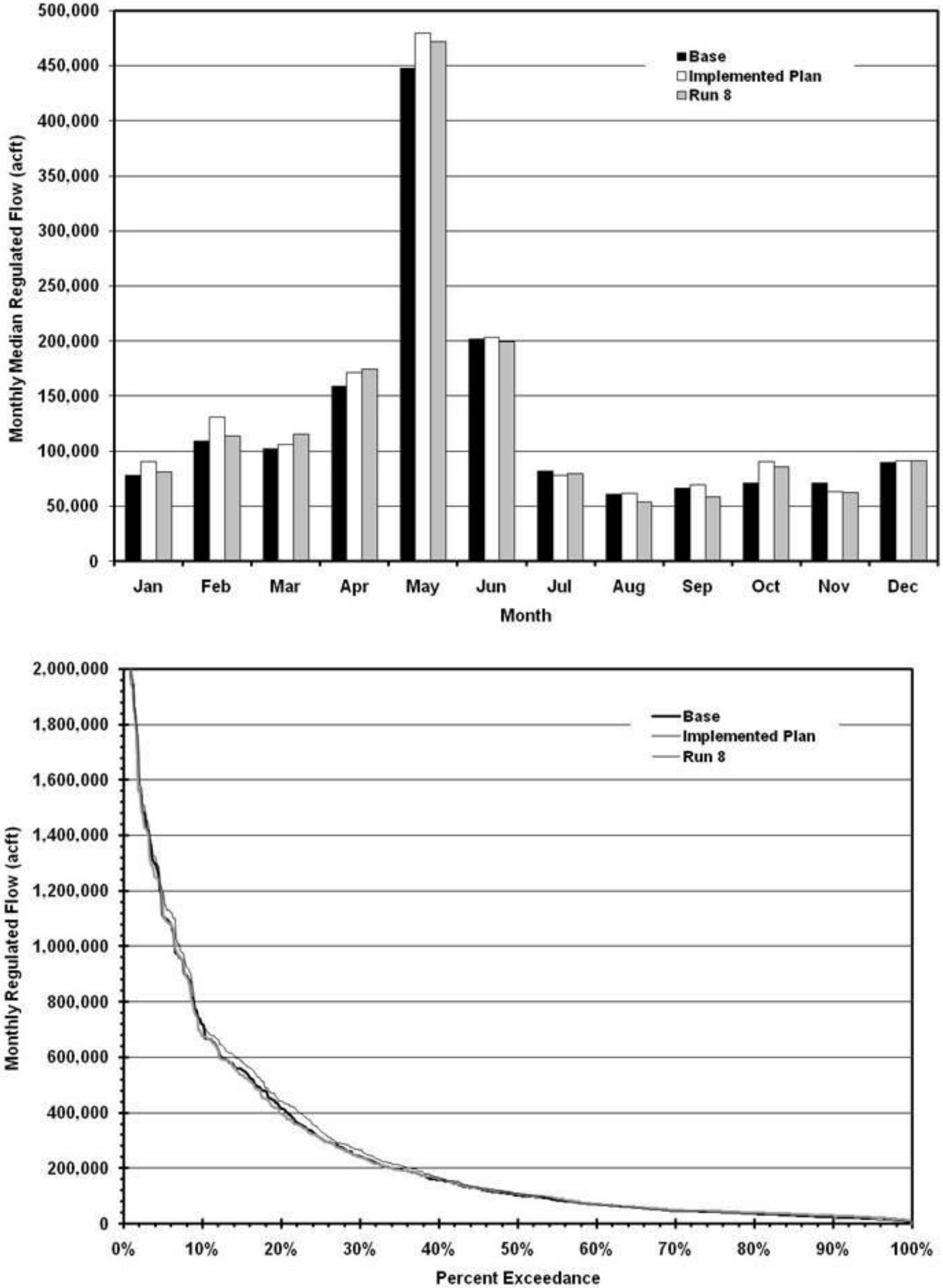
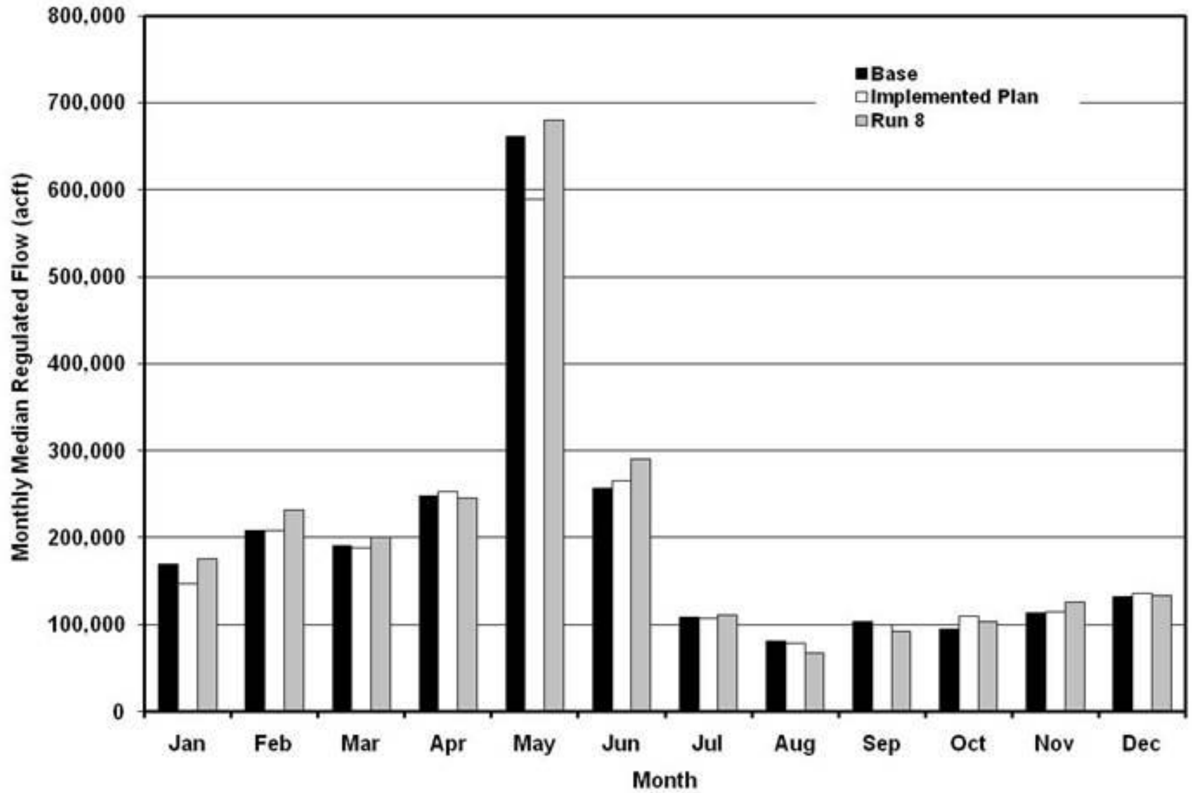


Figure 7-7. Brazos River near Bryan



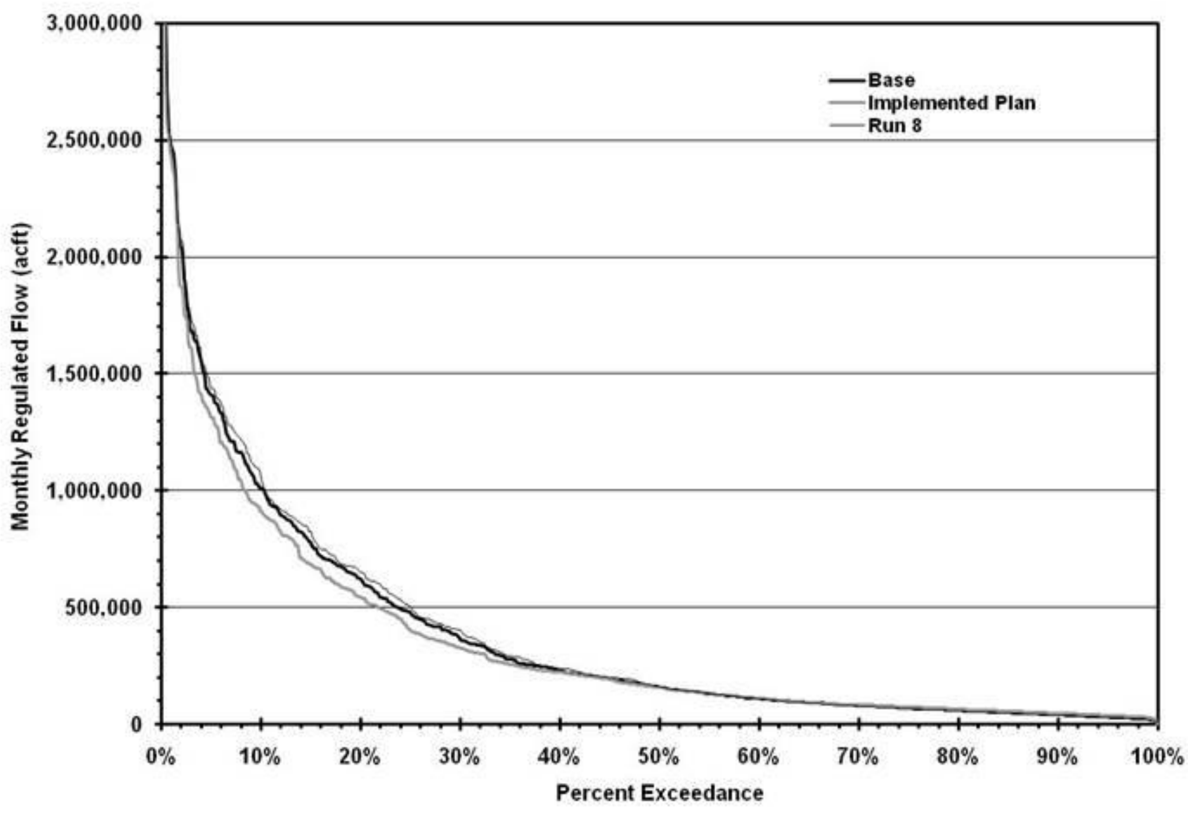
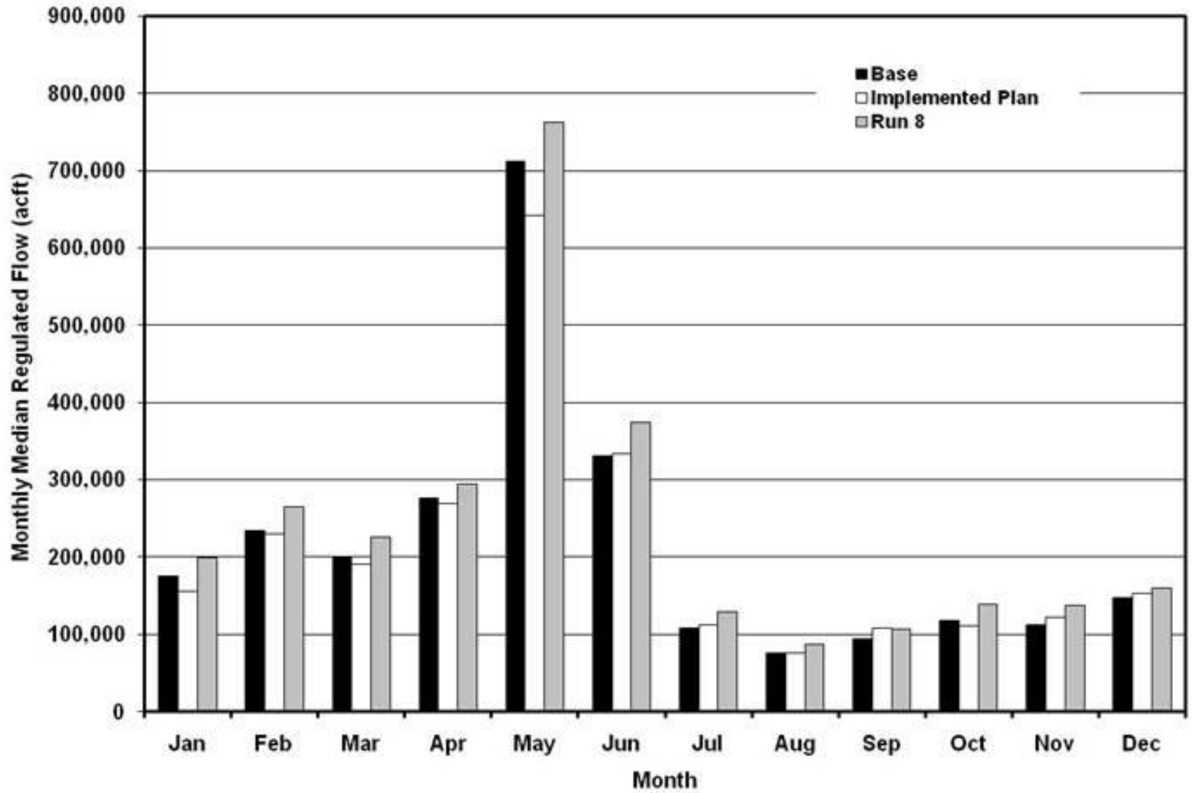


Figure 7-8. Brazos River near Hempstead



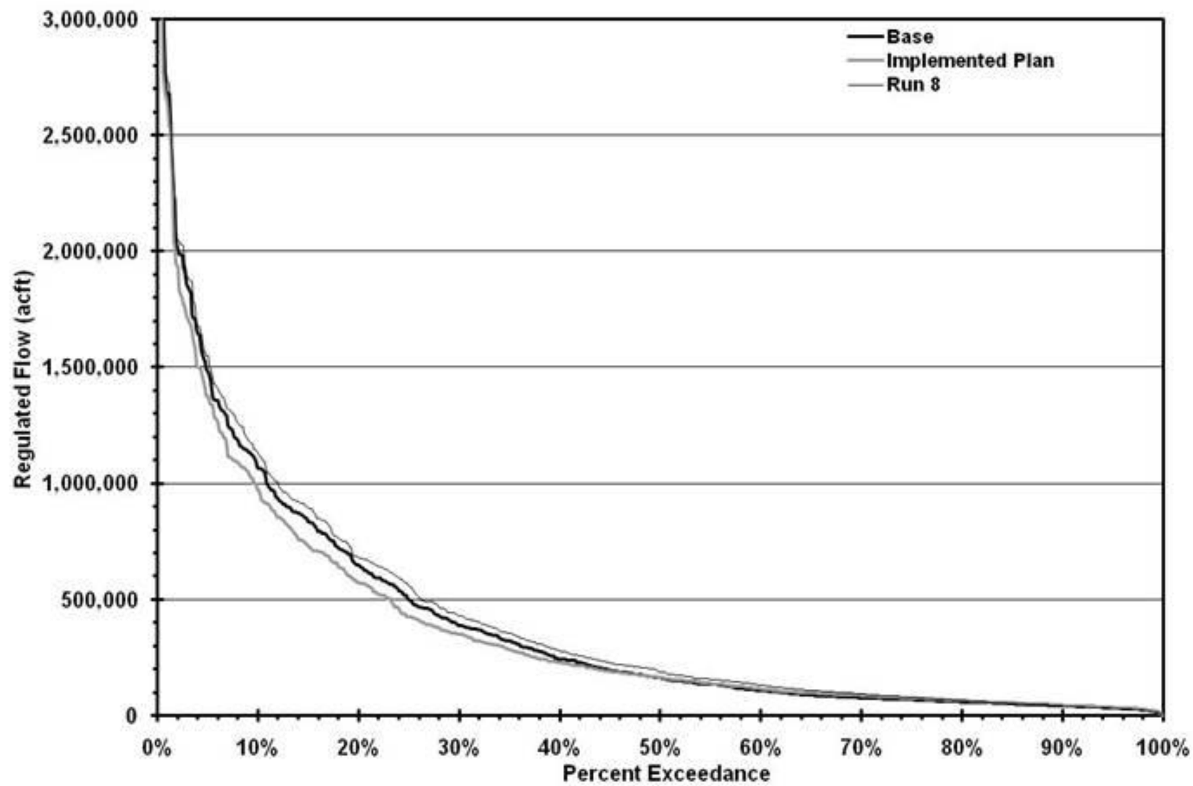


Figure 7-9. Brazos River at Richmond

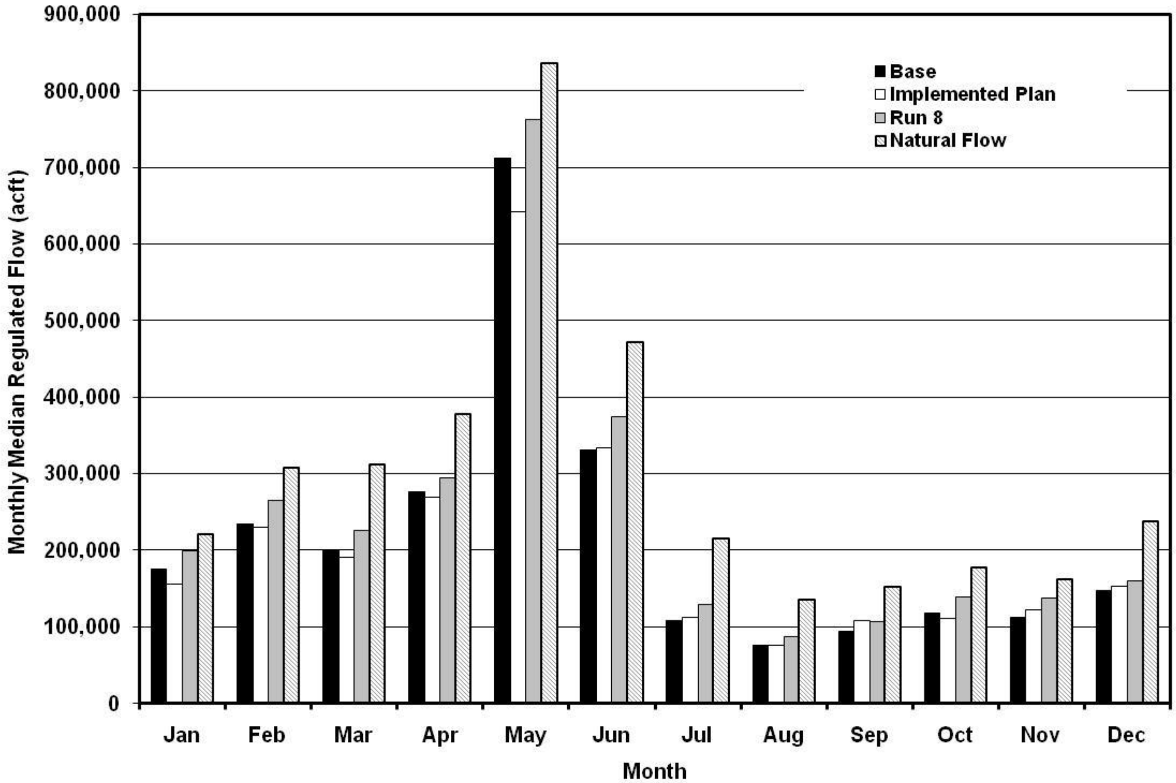


Figure 7-10. Brazos River at Richmond – Comparison of Regulated and Natural Flows

7.1.2 Groundwater

The development of groundwater as a water management strategy has the total production increasing from slightly less than 20,000 acft/yr in 2010 to slightly less than 70,000 acft/yr in 2060. The greatest increase occurs in the Carrizo-Wilcox where groundwater pumpage would increase from about 9,000 acft/yr in 2010 to about 50,300 acft/yr in 2060. In the Trinity Aquifer, the increase ranges from about 9,400 acft/yr in 2010 to about 9,700 in 2060. 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. None of the strategies increase projected groundwater pumpage beyond the estimated groundwater availability from any single aquifer in any county; thus, projected groundwater level declines are expected to be within a range that the Brazos G RWPG considers manageable.

7.2 Summary of the Environmental Effects of the Plan

Overall, the strategies recommended in the 2011 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 2011 Plan (Cedar Ridge Reservoir, Turkey Peak Reservoir, Millers Creek Diversion and new Dam, Coryell County Off-Channel Reservoir, City of Groesbeck Off-Channel, Millican Reservoir (Panther Creek Site), and Brushy Creek Reservoir) will inundate more than 84,000 acres (71,000 from the Millican Reservoir Panther Creek site project alone), reducing wildlife habitat, bottomland hardwood forestland and cultivated farmland as documented in the individual strategy evaluations (Volume II, Sections 4B.12 and 4B.13). However, 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 2011 Plan augment existing resources and delay or eliminate the need for new constructed projects. For example, the BRA's proposed System Operations 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 eliminates the need for a new major water supply project 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. Municipal conservation targets in the plan could increase supplies by roughly 19,000 acft/yr, with conservation overall accounting almost 40,000 acft/yr of new supply. Augmentation of Lake Granger through conjunctive use of groundwater reduces sole dependence on either supply, and maximizes the use of the existing reservoir facility.

Overall the strategies recommended in the 2011 Plan maximize use of existing resources and reduce the need for several large, costly reservoir projects, minimizing impacts to the environment.

Section 8
Recommendations for Unique Stream Segments, Unique Reservoir Sites, and Other Legislative 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.

In 2000, Hicks & Company prepared a report for the Brazos G RWPG identifying 19 stream segments within the Brazos G Area meeting one or more of the criteria[1]. The Hicks analysis identified 11 segments that had already been identified by the Texas Parks and Wildlife Department in 2000, plus an additional eight segments. A copy of the Hicks & Company report is posted on the Brazos G website (www.brazosgwater.org). In 2002, the TPWD updated its list with an additional four segments. Table 8-1 lists those stream segments identified in the Hicks & Company report and by TPWD as candidates for designation.

The Brazos G RWPG has chosen not to designate any stream segments as having unique ecological value.

[1] Hicks & Company, *River and Stream Segments of Unique Ecological Value in the Brazos G Regional Water Planning Area*, Final Report, prepared for the Brazos G Regional Water Planning Group, August 2000.

Table 8-1. Stream Segments in the Brazos G Regional Water Planning Area Identified as Candidates for Designation as Unique Stream Segments

Candidate Stream Segment	*Source of Original Identification*	*Year Identified*
Brazos River – Bosque, Johnson, Somervell & Hood Counties	TPWD	2000
Brazos River – Palo Pinto County	TPWD	2000
Clear Fork of the Brazos River – Stephens County	Hicks & Company	2000
Colony Creek – Eastland County	TPWD	2000
Colorado River – Lampasas County	TPWD	2000
Cow Bayou – Falls & McLennan Counties	TPWD	2000
East & Middle Yegua Creeks – Lee & Burleson Counties	Hicks & Company	2000
Lake Creek – Grimes County	TPWD	2000
Lampasas River – Lampasas & Hamilton Counties	Hicks & Company	2000
Leon River – Coryell & Bell Counties	Hicks & Company	2000
Little River – Milam & Bell Counties	TPWD	2000
Navasota River – Brazos & Grimes Counties	Hicks & Company	2000
Navasota River – Robertson & Leon Counties	Hicks & Company	2000
Neils Creek – Bosque County	TPWD	2000
Nolan River – Johnson & Hill Counties	Hicks & Company	2000
North Bosque River – McLennan County	Hicks & Company	2000
Paluxy River – Somervell, Hood, & Erath Counties	TPWD	2000
Steele Creek – Bosque County	TPWD	2000
Willis Creek – Williamson County	TPWD	2000
Double Mountain Fork Brazos River – from the confluence with Salt Fork Brazos River upstream to the Kent/Garza County Line	TPWD	2002
North Fork Double Mountain Brazos River – from the confluence with Double Mountain Fork Brazos River upstream to the Kent/Garza County Line	TPWD	2002
Salt Fork Brazos River – from Knox/Baylor County Line upstream to the Kent/Garza County Line	TPWD	2002
San Gabriel River – from the confluence with the Little River upstream to Granger Lake Dam	TPWD	2002

8.2 Recommendations Concerning Sites Uniquely Suited for Reservoirs

The Brazos G RWPG has chosen to identify the following three sites as uniquely suited for reservoir construction. Each of these sites is associated with a recommended water management strategy in the 2011 Plan, and local entities have requested these sites be identified as unique reservoir sites.

- Cedar Ridge Reservoir,
- Turkey Peak Reservoir,
- Millers Creek Reservoir Augmentation (downstream dam site), and
- Coryell County Off-Channel Reservoir.

8.3 Legislative and Policy Recommendations

The Brazos G RWPG 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. For the 2006 Plan, the Brazos G RWPG formulated recommendations for several legislative and water policy positions. For the 2011 Plan, these policy recommendations were revisited by the Water Policy Workgroup, and specific revised recommendations were offered to the full planning group for consideration.

The Brazos G RWPG offers the following specific recommendations concerning State water policy to the TWDB and the Texas Legislature. Issue number refers to a larger list of topics considered by the Brazos G RWPG for the 2006 Plan. Only those issues for which the Brazos G RWPG has formulated a recommendation are included here.

Issue #1: Interaction of State Agencies with Regional Water Planning Groups

"The Brazos G Regional Water Planning Group (Brazos G) recognizes that all State agencies involved in planning and/or permitting regional water projects need to act consistently with the current statewide water plan and to work cooperatively with Regional Water Planning Groups that are considering significant new regional water projects requiring State agency input and/or permits."

Issue #2: Coordination between Regional Water Planning Groups and Groundwater Conservation Districts

"The Brazos G Regional Water Planning Group (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 HB 1763, that GCDs are statutorily required to determine the amount of groundwater that is available for use in the Regional Water Plan. HB 1763, passed by the 79th Texas Legislature (2005) outlines a process by which all GCDs within the 16 Groundwater Management Areas (GMAs) work together to determine Desired Future Conditions (DFCs) for all aquifers within the GMA. DFCs are then researched by the TWDB and a Managed Available Groundwater (MAG) figures are supplied to the GMA and its member GCDs. MAG is the amount of water that GCDs may permit and expect to maintain/achieve their DFCs.

Regional water plans are required to use MAG as available groundwater if the GMA process is completed by January 2008. Some GMAs and their member GCDs may not finish the GMA planning process by January 2008 since the statutory deadline in HB 1763 is September of 2010. Brazos G has committed to use the MAGs in the current planning cycle provided that they are available before 10/1/2008. In those cases where the MAG is not available on 10/1/2008, Brazos G will use the draft MAG if the process is almost complete; use applicable TWDB Groundwater Availability Models (GAMs) for the Carrizo-Wilcox and Trinity Aquifers; and previous estimates from the 2006 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.

If there are differences between the Brazos G and a GCD that cannot be worked out, Brazos G may use the process outlined in HB 1763 to petition against the adoption of a disputed DFC. However, the coordination process outlined in HB 1763 is ongoing and continuing as GCDs work to set DFCs and work with the Regional Water Planning Groups, as they develop the Regional Plan."

Issue #3: System Operation of Water Facilities

"The Brazos G Regional Water Planning Group (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 #4: Interbasin Transfers of Surface Water

"The Brazos G Regional Water Planning Group recognizes that Interbasin Transfers have been a critical component of water management in Region G. The Texas Water Development Board projects that the State's population may double in the next 50 years. IBTs will be a necessary component of the water management strategies."

Issue #5: Rule of Capture

"While the Brazos G Regional Water Planning Group (Brazos G) recognizes that the Rule of Capture has a history of over 100 years in Texas, Brazos G also recognizes the advances in science and changes in water marketing that now face us.

Brazos G recognizes that the State groundwater supply is being threatened and, in many instances landowners risk loss due to depletion by unlimited pumping by their neighbors.

Local control through checks and balances can most effectively and fairly regulate usage. When the public chooses, Groundwater Conservation Districts are the appropriate mechanisms to provide local control of groundwater. The State should continue to develop policy and legislation to fairly protect both historic use and future sustainability."

Issue #7: Conjunctive Use of Groundwater and Surface Water

"The Brazos G Regional Water Planning Group (Brazos G) recognizes conjunctive use as an important management strategy. Conjunctive use is the systematic utilization of groundwater with 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 alternative conjunctive use projects, including aquifer storage and recovery operations, as needed."

Issue #8: Integrating Water Quality and Water Supply Considerations

"The Brazos G Regional Water Planning Group (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 #9: Reuse/Return Flow

"The Brazos G Regional Water Planning Group (Brazos G) recognizes that return flows should be managed by direct and indirect reuse where applicable. The reuse of return flows should also be coordinated with the appropriate agencies. Furthermore, Brazos G recommends considering the impact of reuse of return flows on instream flows."

Issue #10: Watershed Planning/Source Water Protection

"The Brazos G Regional Water Planning Group (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 #11: 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 the future water supply. The Brazos G Regional Water Planning Group (Brazos G) believes strongly that water education is important and supports public awareness programs such as the Texas Water Development Board's Water IQ: Know Your Water campaign."

Issue #13: Retail Customer Water Pricing

"The Brazos G Regional Water Planning Group (Brazos G) recognizes that water management strategy planning includes having the most positive effect on retail water customer pricing balanced with maintaining a long-term reliable plan. Optimizing retail water pricing with a long-term source may include an interbasin transfer when it is determined to be in the best interest of the ratepayers.

Brazos G encourages retail water providers to seriously consider implementing an inclining block rate structure that would be consistent with best management practices for conserving water. By using this methodology, a properly designed rate allows a consistent price signal to the ratepayer, without over earnings to the utility. This increasingly favored approach heightens the interest in water conservation to the end users."

Issue #15: Effects of the Federal Safe Drinking Water Act (SDWA) on Water Supply Systems

"The Brazos G Regional Water Planning Group (Brazos G) recognizes the difficulty in meeting the standards of the Federal Safe Drinking Water Act for some water supply systems. Accordingly, Brazos G encourages the regionalization of these systems, and/or education and proactive planning. This approach would prevent these systems from being a burden to the State."

Issue #19: Inter-Regional Cooperation/Inter-Regional Water Sharing

"The Brazos G Regional Water Planning Group (Brazos G) will be proactive in communication and interaction with neighboring regional water planning groups on water issues of mutual concern."

Issue #20: Plan Implementation / Funding

"The Brazos G Regional Water Planning Group (Brazos G) recognizes the need for a funding mechanism to implement the state water plan. Brazos G encourages legislative action to effect infrastructure funding."

Section 9
Report to the Legislature on
Water Infrastructure Funding Recommendations

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 2011 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 in the initially prepared regional plan with an associated capital cost were surveyed using the questionnaire provided by the TWDB (Exhibit 9-A). Individual municipalities and wholesale water providers were emailed a link to complete the survey online through the TWDB's 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 WIF-Deferred Program. The WIF-Deferred Program offers subsidized interest and deferral of principal and interest for up to 10 years for planning, design, and permitting costs.
- Acquisition and Construction: Costs were entered into this category if the entity wanted to participate in the WIF-Construction Program. The WIF-Construction Program offers subsidized interest for all construction costs, including planning, acquisition, design, and construction.

- Excess Capacity: Costs were entered into this category if the entity wanted to participate in the State Participation Program. State Participating 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.
- Rural: Costs were entered into this category if the entity wanted to participate in the Rural Areas Funding Program. Rural Areas funding offers grants and 0% interest loans for service areas which are not in a Metropolitan Statistical Area (MSA) and in which the population does not exceed 5,000. The service area must also meet EDAP eligibility criteria.
- Disadvantaged: Costs were entered into this category if the entity wanted to participate in the Economically Distressed Areas Program (EDAP). EDAP offers funding through grants and loans for service areas within a project which meet the EDAP eligibility criteria. Eligibility for the TWDB's EDAP requires that the median household income of the area to be served by the proposed project be less than 75% of the Texas median household income ($39,927), as shown in the 2000 Census. EDAP eligibility also requires adoption of Model Subdivision rules by the appropriate planning entities.

9.4 Survey Responses

The Brazos G RWPG sent links to 61 municipal water user groups and wholesale water providers and as of August 12, had received 23 responses, a 38 percent response rate. As shown in Table 9-1, the 23 responses represent about 82 percent of the estimated capital costs of water management strategies included in the Regional Water Plan. Of those responding, for which total capital costs are $2,073,130,098, the survey shows that approximately $216.9 million (10.5 percent of the total capital costs) would be financed through the WIF-Deferred Program, approximately $941.5 million (45.4 percent of the total capital costs) would be financed through the WIF-Construction Program, approximately $167.1 million (8.1 percent of the total capital costs) would be financed through the State Participation Program, approximately $10 million (0.5 percent of the total capital costs) would be financed through the Rural Areas Funding Program, and approximately $62.5 million (3.0 percent of the total capital costs) would be financed through the EDAP Program. It is unclear how the remaining 32.5 percent of capital costs for survey respondents would be paid, but those costs could possibly be covered through local cash reserves. It is also important to note that it is unclear how the remaining 18 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 included in the initially prepared plan. In response to public and agency comments regarding the initially prepared plan, several recommended water management strategies were either modified, replaced or removed from the plan. The reader is referred to the TWDB for survey results updated after August 12, 2010.

Table 9-1.
Summary of Responses to the Infrastructure Financing Survey*
(responses as of August 12, 2010)

Name of Political Subdivision	Recommended Project/Strategy	Capital Cost to be paid by Political Subdivision)	Planning, Design, and Permitting	Acquisition and Construction	Excess Capacity	Rural	Disadvantaged
Abilene	Cedar Ridge Reservoir	$ 285,214,000	$86,240,000	$198,974,000	$0	$0	$0
Abilene	Increase Treatment Capacity	$ 49,304,000	$14,188,000	$35,116,000	$0	$0	$0
Bistone MWSD	Limestone County Carrizo-Wilcox Aquifer Development	$ 12,277,000	$1,000,000	$11,277,000	$0	$0	$0
Brazos River Authority	Allens Creek Reservoir	$ 66,825,720	$0	$15,000,000	$15,000,000	$0	$0
Brazos River Authority	Belton to Stillhouse Pipeline	$ 36,038,000	$8,000,000	$25,000,000	$0	$0	$0
Brazos River Authority	Brazos Saltwater Barrier	$ 44,470,739	$0	$35,000,000	$0	$0	$0
Brazos River Authority	Coryell County Reservoir (BRA System)	$ 37,489,000	$10,000,000	$24,000,000	$0	$0	$0
Brazos River Authority	Freeport Desalination	$ 255,699,000	$0	$255,000,000	$0	$0	$0
Brazos River Authority	Groundwater/Surface Water Conjunctive Use (Lake Granger Augmentation)	$ 643,928,000	$0	$126,000,000	$142,000,000	$0	$0
Brazos River Authority	Stonewall, Kent, and Garza Chloride Control Project	$ 163,226,000	$40,000,000	$100,000,000	$0	$0	$0
Brazos River Authority	Storage Reallocation of Federal Reservoirs - Lake Aquilla	$ 11,447,000	$0	$0	$10,000,000	$0	$0
Bryan	Wastewater Reuse	$ 6,485,000	$1,500,000	$9,352,000	$0	$0	$0
Central Texas WSC	BRA Supply Through the EWCRWTS	$ 15,169,822	$450,000	$4,000,000	$100,000	$2,000,000	$1,000,000
Chisholm Trail SUD	Regional Surface Water Supply to Williamson County from Lake Travis	$ 13,264,000	$0	$0	$0	$0	$0
Cross Country WSC	Interconnection of City of Waco System with Neighboring Communities	$ 7,090,000	$0	$0	$0	$0	$0
Georgetown	Increase Treatment Capacity	$ 50,722,000	$1,000,000	$9,500,000	$0	$0	$0
Godley	BRA SWATS Expansion	$ 6,651,000	$0	$0	$0	$0	$0
Granbury	Increase Treatment Capacity	$ 31,314,000	$500,000	$15,000,000	$0	$0	$0
Groesbeck	City of Groesbeck Off-Channel Reservoir	$ 10,412,000	$2,412,000	$8,000,000	$0	$0	$0
Johnson County SUD	Purchase from Water Provider	$ 62,828,000	$6,507,590	$14,041,925	$0	$0	$0
Jonah Water SUD	BRA Supply Through the EWCRWTS	$ 5,053,238	$0	$0	$0	$0	$0
Kosse	Additional Carrizo Aquifer Development	$ 824,000	$0	$0	$0	$0	$824,000
Lorena	Wastewater Reuse	$ 5,649,170	$0	$0	$0	$0	$0
Marlin	Brushy Creek Reservoir	$ 39,690,000	$4,690,000	$35,000,000	$0	$0	$0
North Central Texas MWA	Millers Creek Augmentation	$ 46,948,000	$2,000,000	$222,000	$0	$8,000,000	$9,000,000
Palo Pinto MWD #1	New Water Treatment Plant	$ 35,822,000	$14,328,800	$0	$0	$0	$21,493,200
Palo Pinto MWD #1	Turkey Peak Reservoir	$ 50,227,000	$20,090,800	$0	$0	$0	$30,136,200
Southwest Milam WSC	Additional Carrizo Aquifer Development	$ 14,008,000	$0	$0	$0	$0	$0
Sweetwater	Expansion of Champion Well Field	$ 15,015,000	$0	$0	$0	$0	$0
Temple	Increase Treatment Capacity	$ 45,870,000	$4,000,000	$21,000,000	$0	$0	$0
Throckmorton	Midway Pipeline Project	$ 3,096,409	$0	$0	$0	$0	$0
Western Hills WS	Additional Trinity Aquifer Development	$ 1,073,000	$0	$0	$0	$0	$0
		$2,073,130,098	**$216,907,190**	**$941,482,925**	**$167,100,000**	**$10,000,000**	**$62,453,400**

*Note: The survey responses presented are related to water management strategies and capital costs included in the Initially Prepared 2011 Plan. As a result of public and agency comments on the Initially Prepared 2011 Plan, some strategies and capital costs have been modified in the final 2011 Plan, and those changes are not necessarily reflected here.

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Section 10
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 held three sub-regional meetings in January 2010 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 January 12, 2010 (Upper Subregion), in Waco on January 13, 2010 (Middle Subregion), and in College Station on January 14, 2010 (Lower Subregion).

In addition to the regular planning group meetings, committee meetings, and the three subregional meetings, the BGRWPG held several public hearings to obtain input concerning amendments to the 2006 Brazos G Regional Water Plan and for other items as required by regional water planning rules, such as during the development of the scope of work to develop the 2011 Plan.

10.2 Brazos G Regional Water Planning Group Website (www.brazosgwater.org)

The BGRWPG has directed its consultant and 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 planning documents are posted for public viewing and download. The website offers other features including member contact information, planning area maps, planning data, and audio transcripts of all meetings held since August 2004.

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. 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 2011 Initially Prepared Plan was provided to all county libraries and county clerks, 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. The Brazos G technical consultant presented results of the Brazos G water availability analysis, specifically focused on water available from the potential BRA System Operations Permit, to the Region H Water Planning Group on December 2, 2009.

10.5 Brazos G Regional Water Planning Group Meetings

The BGRWPG held 50 public meetings during the 2011 planning cycle, between January 1, 2006 and July 21, 2010, including regular meetings of the full planning group; periodic meetings of the Executive, Scope of Work, and Finance Committees; periodic meetings of the Groundwater Availability, Surface Water Availability, and Water Policy Workgroups; and public hearings to receive public comments concerning revisions to the 2006 Brazos G Regional Water Plan, development of the scope of work for developing the 2011 Brazos G Regional Water Plan, and the identification of potentially feasible water management strategies.

10.6 Public Hearing and BGRWPG Responses to Public Comments on Initially Prepared Plan

The BGRWPG held a public hearing on April 21, 2010 to receive comments concerning the Initially Prepared 2011 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, sixteen members of the public provided oral comments to the planning group concerning various aspects of the plan. Written comments were received from three of those individuals that mirror or expand upon their oral comments, including Representative Brown, Eric Swenson, and Joe Cunningham (Aquilla Water Supply District). In addition, written comments were received from the Guardians of the Navasota, an organization of which six of the speakers indicated they represented. Written and oral comments received from the same individual are responded to jointly.

Following the April 21, 2010 public hearing, written public comments were received by the planning group through June 25, 2010. 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. When comments are numbered, the number refers to comment numbers in the written comments received. Copies of written comments received and a transcript of the public hearing are included in Appendix O.

Commenter — State Representative Fred Brown (oral and written comments)

Requested that Millican Reservoir (Panther Creek site) not be a recommended water management strategy.

Millican Reservoir will not be a recommended water management strategy in the 2011 Brazos G Regional Water Plan.

Commenter — Joe Cunningham, Aquilla Water Supply District (oral and written comments)

Mr. Cunningham comments that the population projections for Hill County and the areas served by the District are too low, and requested sufficient notice when the 2016 Plan is prepared to object to the projections if the District believes them to be too low.

The 2011 Plan is considered to be an update to the 2006 Plan and utilizes essentially the same population projections as the 2006 Plan, with a few exceptions in which State Data Center estimates indicated growth in 2007 to be 5 percent or more greater than the TWDB projections. This was the case for four Hill County water user groups – Hillsboro, Hubbard, Itasca and Whitney. The TWDB increased the population projections for those cities and reduced the Hill County-Other population projections accordingly for a zero net change in the total Hill County population projections.

The 2010 Census data will be utilized to develop new population projections for the 2016 Brazos G Regional Water Plan. We anticipate that the TWDB will provide ample opportunity for review and revision of those projections before they are adopted by the TWDB.

Table 4A-7 on page 4A-16 shows no increases in demands for the District's customers.

The demands shown in Table 4A-7 are what the planning group's data indicate are the current contractual commitments between the District and its customers. The contractual commitments are not necessarily the demands of those customers. The demands shown for the District's customers that are water user groups (Brandon-Irene WSC, Files Valle WSC and Hillsboro) are shown in Table 2-5, which begins on page 2A-24. The demands for the rest of the District's customers are grouped together within the Hill County-Other demands.

The water supply projections for Lake Aquilla are not consistent with the conclusions of a 2006 Brazos River Authority sediment study.

The water supply estimates for Lake Aquilla reflect a long-term average sedimentation rate of 429 acre-feet per year. This rate was provided to the Brazos G technical consultant by the BRA via an email dated February 3, 2009. The BRA subsequently updated the sedimentation rate to be 127 acre-feet per year, based on a 2008 survey of the reservoir. However this smaller rate was not provided in time to be used in the preparation of the 2011 Plan. If the smaller sedimentation rate had been used, the estimated supplies from Lake Aquilla would have been greater than they are currently shown.

Commenter — Nancy Bufkin (oral comments)

Ms. Bufkin expressed opposition to South Bend Reservoir being included in the 2011 Plan.

The South Bend Reservoir was evaluated for possible inclusion in the 2011 Plan, but is not a recommended water management strategy in the 2011 Plan.

Ms. Bufkin desires to see better representation of agricultural interests from the area near Possum Kingdom Lake.

A variety of interests are represented on the planning group, but unfortunately, not every community or county will have a direct representative on the group.

Commenter — Tom Welfelt (oral Comments)

Mr. Welfelt expressed concern about the impact of Cedar Ridge Reservoir on water levels in Possum Kingdom Lake.

The effects of the proposed Cedar Ridge Reservoir on downstream reservoir levels were not addressed specifically in the evaluation. However, the evaluation was completed assuming that Cedar Ridge Reservoir would have to pass all inflows which the reservoir would not be entitled to impound in order to honor downstream senior water rights. In addition, it is the planning group's understanding that agreements written between the BRA and the City of Abilene compensate the BRA for any yield impact of Cedar Ridge.

Commenter — Randy Rogers (oral comments)

Mr. Rogers noted differences between numbers in the 2011 IPP and another report, e.g., "Abilene's study on Cedar Ridge".

The City of Abilene's studies regarding the Cedar Ridge Reservoir project will not necessarily match those found in the regional water plan. A local sponsor of a project may often utilize different basic assumptions when evaluating a project than are used for regional water planning. These include different hydrologic assumptions and costing methodologies, among others.

Mr. Rogers notes that the use of water from O.H. Ivie Reservoir could be increased by increasing treatment capacity.

The City of Abilene is not currently pursuing additional treatment capacity from O.H. Ivie Reservoir due to several factors, including brine disposal issues and uncertainty regarding the actual reliable supply available from that source.

Mr. Rogers notes that the quantity of water proposed to be used for a power plant planned by Tenaska in Nolan County will use substantially less water than the 20,000 acre-feet of steam-electric demand identified for Jones County that is planned for Abilene to meet.

The quantity of water planned to be used by Tenaska is, to the planning group's knowledge, less than the 20,000 acre-feet per year identified in the 2011 IPP. However, the Nolan County demand for water should not be identified specifically as a "Tenaska" demand, but should instead be considered as a regional water demand for steam-electric power generation. The demand identified for Nolan County by the University of Texas Bureau of Economic Geology (BEG) and the TWDB was originally 94,298 acre-feet per year. The planning group requested that the TWDB adopt a smaller, more realistic demand projection.

Mr. Rogers commented that a previous speaker had noted that West Texas Utilities has 14,300 acre-feet of water that it is willing to sell.

The planning group can only consider current supplies as they are currently contracted, and makes every effort to only recommend strategies that water user groups and wholesale water providers are planning to pursue. The City of Abilene has given the planning group no indication that it is pursuing acquisition of the water supply mentioned by Mr. Rogers. If and when the City of Abilene informs the planning group that it is pursuing this supply, future regional water plans can be modified to reflect the new course of action planned by the City.

Mr. Rogers noted concerns that the Cedar Ridge Reservoir would adversely impact water quality in Possum Kingdom Lake, specifically dissolved minerals.

Analysis of the impact of Cedar Ridge Reservoir on salinity levels in Possum Kingdom Reservoir is beyond the scope of work authorized by the TWDB for developing the 2011 Brazos G Regional Water Plan. However, during development of the 2016 Brazos G Regional Water Plan, additional treatment of salinity issues could be added to the scope of work if requested by the planning group and approved by the TWDB.

Commenter — Leon Denena (oral comments)

Mr. Denena expressed support for the comments made by Representative Brown regarding his opposition to Millican Reservoir.

Millican Reservoir will not be a recommended water management strategy in the 2011 Brazos G Regional Water Plan.

Mr. Denena expressed concern that actions of the planning group could endanger water rights currently authorized for irrigation to be used for municipal supplies.

The Brazos G Regional Water Planning Group has no authority to transfer water rights between users. The sole responsibility of the planning group is to develop a plan for meeting future water needs, which include irrigation needs. Agricultural interests are well-represented on the planning group.

Commenters — Mark Dudley, Marvin Karsten, Leonard Cox, Cathy Cox, Samuel (Fr. Cassian) Sibley, Brad Ayers, Robert Averette, Sammy Catalena (oral comments)

Each speaker expressed opposition to Millican Reservoir.

Millican Reservoir will not be a recommended water management strategy in the 2011 Brazos G Regional Water Plan.

Mr. Dudley, Mr. Karsten, Mr. Cox, Mrs. Cox, Mr. Ayers, and Mr. Averette represented themselves as affiliated with and speaking for the Guardians of the Navasota.

Mr. Dudley requested that the planning group "send a message" to Region H that Brazos G will no longer sell them water if Region H moves forward with Millican Reservoir.

The Brazos G Regional Water Planning Group has no authority or capability to buy or sell water. The ability to sell water is held by those entities (individuals, corporations and governmental entities) that hold water rights.

Mr. Karsten commented that Lake Limestone appears to not be operated correctly and is causing flooding.

Lake Limestone is owned and operated by the Brazos River Authority for water supply and not flood control. There is limited capability for the reservoir to control floods as it was not constructed for flood control purposes and has no dedicated flood control storage.

Mr. Cox noted an apparent discrepancy in the Initially Prepared Plan concerning the cost of Millican Reservoir shown on pages ES-17 and 4B.12-3.

The cost shown in the table on 4B.12-3 is a typographical error and will be corrected. The cost as shown on pages ES-17 and 4B.12-178 is correct.

Mr. and Mrs. Cox both requested that the planning group consider a portion of the Navasota River as a "unique ecological stream segment."

While the planning group understands and respects Mr. Cox's desire to designate the Navasota River as unique stream segment, the planning group has not opted to recommend that the Texas Legislature make such a designation. The planning group will consider recommending such designations in the next planning cycle.

Commenter — Janice Bezanson, Texas Conservation Alliance (oral comments)

Ms. Bezanson expressed opposition to Millican Reservoir.

Millican Reservoir will not be a recommended water management strategy in the 2011 Brazos G Regional Water Plan.

Ms. Bezanson expressed opposition to Cedar Ridge Reservoir, and stated that the steam-electric water demands in Nolan County that would be met by the City of Abilene are not correct now that Tenaska has agreed to utilize less water.

The quantity of water planned to be used by Tenaska is, to the planning group's knowledge, less than the 20,000 acre-feet per year identified in the 2011 IPP. However, the Nolan County demand for water should not be identified specifically as a "Tenaska" demand, but should instead be considered as a regional water demand for steam-electric power generation. The demand identified for Nolan County by the BEG and the TWDB was originally 94,298 acre-feet per year. The planning group requested that the TWDB adopt a smaller, more realistic demand projection.

Commenter — David Blackburn, City of Temple (written comments)

We therefore request that the City of Temple Treatment Capacity…should be 23,300 AF/Y.

As coordinated with City of Temple staff, the water supply available to Temple has been updated to 23,296 acft/yr to account for the membrane plant.

…we respectively submit that the City of Temple's rated capacity be adjusted…to 60% of capacity. This will change the figure in Table 4A-22 …from 23,300 AF/Y to 27,960 AF/Y.

The supply shown in Table 4A-22 and used throughout the 2011 Plan will utilize 27,955 acft/yr as the supply available to Temple.

…yet, BRA could not deliver all the water contracted for if called upon…

The BRA has strategies included in the 2011 Plan to increase supplies available in the Little River System to adequately meet its contractual commitments.

Commenter — Steve Carpenter, City of Harker Heights (written comments)

…Therefore, the City of Harker Heights requests revising the 2011 Brazos G Regional Water Plan to reflect surpluses for the years 2030 and 2060 based on the City's Water Master Plan.

Unfortunately, the 2011 Plan cannot be revised to match the City's 2006 Water Master Plan, for several reasons. First, water demands shown in the regional plan are established by the TWDB and cannot be modified to match the City's 2006 Water Master Plan, because the planning group is required to use the population and water demand projections adopted by the TWDB. Second, while the information obtained by the Brazos G technical consultant does indeed show a total contracted supply from BRA sources of 8,800 acft/yr, the BRA Little River System currently is not capable of supplying the total contractual commitments through a repeat of the drought of record, which is the basis for determining available supplies. Because the City's demands are less than the projected supplies available from the BRA Little River System (through the Bell County WCID No. 1), the Plan shows no shortage for Harker Heights and therefore no change in water supply is recommended. However, a surplus cannot be shown, as one does not exist in the

Little River System at this time. The BRA is pursuing strategies to increase supplies in the Little River System that will alleviate the drought-year shortages.

The following text will be added to Section 4C.1.8: "The contracted supplies of 8,800 acft/yr would result in a surplus of 3,000 acft/yr in 2030 and a surplus of 1,985 acft/yr in 2060."

Commenters — Stephanie Martin, Eastland County Water Supply District and Ron Holliday, City of Eastland (provided separate written comments)

Mr. Holliday noted that the City of Eastland is not in favor of the Eastland Water Supply District supplying water to the City of Strawn as shown in the 2011 IPP, and Ms. Martin noted that the Eastland Water Supply District has not considered this issue.

The concept for Eastland County WSD to supply the City of Strawn was obtained from *"West Central Brazos River Basin Regional Water Treatment and Distribution Facility Plan", August 2004*. A supply from Eastland County WSD to the City of Strawn is identified as one of the strategies in the "preferred alternative" in the report. As the supply from the District to Strawn appears technically and economically feasible, the Brazos G Regional Water Planning Group will continue to recommend this future water supply strategy for Strawn. This recommendation in no way obligates the District to supply the water to Strawn. It is simply a recommendation of the Brazos G Regional Water Planning Group. Financial requirements for this project would be entirely the responsibility of Strawn.

The following text will be added to Section 4C.27.3: "The Eastland County WSD has not agreed to this recommended water management strategy."

Commenter — Jayson E. Barfknecht, City of Bryan (written comments)

1. *The City's supply should be based on the total permitted well volume of 33,539.86 acft/yr.*

Water supplies in the regional water plan are based on current infrastructure capacities when known, not permitted amounts. The total rated capacity of the City of Bryan's wells was obtained from the water system data sheets maintained by the Texas Commission on Environmental Quality. These data were then adjusted to determine annual supplies to account for a 2.0 peaking factor and an assumed 5% per year maintenance downtime.

We are aware that you have recently obtained a tenth well that was formerly listed as a supply for the City of College Station. The 2011 Plan will be modified to reflect this additional supply of 2,124 acft/yr for the City of Bryan.

2. *…the City would like to have the projected water demands recalculated so these demands can be represented in the 2011 IPP.*

The TWDB has established the population and water demand projections to be used for this round of regional water planning and the planning group is unable to modify the projections.

3. *The City of Bryan is requesting that the 2011 IPP be modified to reflect the City of Bryan as a Wholesale Water Provider.*

The supplies and demands for the City of Bryan, Wellborn SUD and Brazos County-Other will be adjusted to account for the two supply contracts. We will adjust the water management strategy for Wickson Creek SUD to include supplies from Bryan as a recommended water management strategy.

Commenter — Jerry Atkinson, Bell County WCID No. 1 (written comments)

The actual contractual demands should be 62,509 acft/yr not 59,509 acft/yr as listed in Table 4A-8.

The District's contractual demands will be updated.

The recommended strategy of reallocation of supplies is not necessary and should be removed from the Plan.

The recommended strategy will be changed to "Firm up Existing BRA Supplies with Lake Granger Augmentation", as suggested.

Additionally, the District requests that several reuse strategies we are pursuing be included in the Plan.

The requested reuse strategies will be included in the 2011 Plan as requested.

Commenter — J. Calvin Hodge, Hodge Properties (written comments)

While somewhat illegible, Mr. Hodge's comments apparently question the need for the planning process.

The regional water planning process is designed to help ensure the orderly, reasoned development of water supplies to meet the future water needs of Texas.

Commenter — Sheril Smith, Private Citizen, Lexington (written comments)

Letter expresses concern that large surface water projects (dams, impoundments, and reservoirs) will have negative effects on surrounding productive land, communities, and the environment. Environmental concerns include reductions in stream flows to bays and estuaries, channel degradation, and impacts to fish and wildlife. Notes that reservoirs are subject to massive evaporation losses and sedimentation issues.

Expresses concern that groundwater is not considered "state water" and that Texas should establish a consistent set of laws to manage both surface and groundwater. Asks if the Brazos River receives water from Simsboro or Carrizo Aquifers, or aquifers further upstream.

Expresses concern over dwindling water resources and suggests the language in the Plan be changed from "Evaluate water management strategies and select strategies to meet water needs" to "Evaluate sustainable water supplies and select management strategies to provide adequate water supplies to maintain healthy people, communities and ecosystems while reducing demand."

Suggests that the Water Planning Group focus more on involving the region's general public upfront, before any water management strategies are considered. Quotes a report titled "The Deliberative Agency, Opportunities to Deepen Public Participation" and suggests that the planning group employ a variety of the tactics described within it. The report can be found at www.deliebrative-democracy.net/index.php?option=com_docman@Itemid=93

Thank you for your thoughtful comments concerning the following:

- Surface water projects,
- Groundwater projects,

- Demand versus supply planning, and
- Public involvement.

No changes to the 2011 Brazos G plan were incorporated as a result of these comments. The plan was developed within the guidelines established by the TWDB as mandated by the Texas Legislature.

Commenter — Stephen Dorman, KSA Engineers, on behalf of the City of Marlin (written comments)

Concurs with the 2011 IPP water shortage and concurs that the Brushy Creek Reservoir is the best supply option. Offers comments on the cost estimate and the water supply available from the proposed Brushy Creek Reservoir, as well as on population estimates for Falls County.

The cost estimate contained in section 4B.12.10 for the Brushy Creek reservoir has been updated with the information provided by the City of Marlin's engineer. The supply available from the project was estimated using the Brazos G modified WAM as described in Section 3.2. The Brazos G WAM contains assumptions not included in the TCEQ WAM Run 3, which explain the reason for the different supply estimates between the 2011 IPP and *TWDB Report 370 Reservoir Site Protection Study*. The TWDB provides each planning region with the population estimates that are to be used during the planning process. The population numbers contained in the plan will not be revised by the TWDB until after the 2010 census for inclusion into the 2016 round of regional planning.

Commenter — Larry Gilley, City of Abilene (written comments)

The City provided various editorial comments for the planning group to consider. The City of Abilene also submitted responses to comments received during the public hearing and the public comment period for the 2011 IPP.

Thank you for the editorial comments. These have been incorporated into the Plan. The City's responses to public comments received on the 2011 IPP have been recorded.

Commenter — R. Brent Locke, Bistone Municipal Water Supply District (written comments)

The District submitted information about costs required to bring the additional well capacity online, including the necessary system improvements. Requests that the necessary pipelines and treatment plant improvements also be added to the description of the water management strategy.

The cost estimate in Volume II was updated with the information provided by the District.

Commenter — John Daniel, Bethany Water Supply Corporation (written comments)

States that the capitol cost for a water management strategy to obtain supply from Johnson County SUD is overstated and should be updated to match the Bethany engineer's cost estimate (attached to letter).

The cost estimate in Volume II was updated with the information provided by Bethany WSC.

Commenter — Ben White, City of College Station (written comments)

Requests that the College Station future water deficit be met with surface water from the BRA System Operations Permit, not the Millican Reservoir (Panther Creek) project.

The Millican Reservoir (Panther Creek) had been removed from the plan. The water supply plan for College Station has been updated to show the City's future shortage being met with water from the BRA System Operation Permit.

Commenter — Judy Greer, (written comments)

Comment is addressed to Governor Perry and the board members and Executive Administrator of the TWDB. Requests documentation on potential projects investigated by the TWDB to provide for the future needs of the densely populated regions of the state. Also requests documentation describing how costs have been estimated for the projects, including the costs to the tax bases of all citizens.

As this is an information request to the Governor's Office and the TWDB, no changes to the 2011 Brazos G plan were incorporated as a result of these comments. The plan was developed within the guidelines established by the TWDB as mandated by the Texas Legislature.

Commenter — Rex Bland, Adobe Wells, Inc., (written comments)

Expresses concern that groundwater from the Seymour Aquifer in Jones County is being ignored for planning purposes and offers to sell his well water to the City of Abilene and the West Central Texas Municipal Water District. Offers an ASR alternative to the City of Abilene at the well field for sewer effluent from the Abilene wastewater treatment plant in conjunction with the Cedar Ridge Reservoir or the Tenaska Coal Plant.

County-wide, the estimated available groundwater in Jones County from the Seymour Aquifer is 8,000 acft/yr. Approximately 3,633 acft/yr of that available supply (45.4 percent) is being utilized in the Plan as a current supply. No water management strategies were evaluated or updated to investigate utilizing the remainder of the available supply. It is the intention of the planning group to conform the strategies in the plan to what is requested by specific WUGs and WWPs, when those entities request specific strategies be put into the plan for them. No WUG or WWP has asked that additional groundwater supply from the Seymour Aquifer be evaluated as a potential water management strategy. This option has been previously studied in 2001 for the BGRWPG and in 2005 for the City of Abilene. If a municipal WUG or WWP requests that this source be considered as a water management strategy, or if the planning group is informed that two parties (buyer and seller) have established a level of commitment through a contract or memorandum of understanding to pursue the supply, then a Seymour Aquifer project in Jones County would be considered as a water management strategy in the plan. This can occur during the 2016 planning process if the planning group is notified of such a commitment.

Commenter — Sam Chase, (written comments)

Expresses concern that groundwater from the Seymour Aquifer in Jones County that is available from the Rex Bland/Adobe Wells water field is not being considered in the 2011 Plan.

No WUG or WWP has requested that groundwater supply from the Seymour Aquifer be evaluated as a potential water management strategy.

Commenter — Billy Jacob, The Water Broker, LLC, (written comments)

Mr. Jacob states that he believes that the groundwater from the Seymour Aquifer in Jones County should be considered as a water supply by the City of Abilene, and indicates that a supply of 2,200 acft/year could be delivered to the vicinity of Fort Phantom Hill at an estimated cost of $850,000. An ASR alternative is also described.

No WUG or WWP has asked that groundwater supply from the Seymour Aquifer be evaluated as a potential water management strategy. The 8,000 acft of supply from the Seymour Aquifer in Jones County represents total supply and does not take into account existing demand on the aquifer.

Mr. Jacob states that the Plan does not specifically indicate that the Cedar Ridge Reservoir is a Wastewater Reclamation Project with the return flow being sewer effluent from the Abilene Wastewater Treatment Plant. He expresses concern that the Plan does not include any environmental issues concerning the effluent sewer capture in Cedar Ridge Reservoir or the use of Advanced Wastewater Treatment Methods or associated costs to approve a permit for the reuse of sewer water for municipal drinking water, or consider pharmaceuticals and their effect in the sewer effluent on the reservoir. Mr. Jacob also questions the computation of the shortages shown in Table 4C.38-11 for the City of Abilene. The commenter is directed to Table 4A-16 to review the computations of total supplies and total demands for the City of Abilene as a WWP.

Simply because Cedar Ridge Reservoir is located downstream of the City of Abilene's wastewater discharge location does not require that the Cedar Ridge Reservoir be categorized as a wastewater reclamation project. The Cedar Ridge Reservoir site is 69 river miles downstream from the City of Abilene's wastewater discharge location. Use of water from Cedar Ridge Reservoir will not require any additional authorization from the TCEQ other than a water right permit and TCEQ's approval of the drinking water treatment plant. Current State and Federal regulations would not require advanced treatment in order for Abilene to utilize its pending reuse permit to reclaim wastewater flowing into Cedar Ridge. However, the safe yield reported for Cedar Ridge Reservoir of 23,380 acft/yr does not include any return flows as inflows into Cedar Ridge Reservoir.

There are no math errors related to Abilene's portion of the plan, as reported by the commenter. The Region G Planning Group and the TWDB have approved the use of a 2-year safe yield for supply purposes for the City of Abilene and the WCTMWD. The supplies and demand calculations described in the letter are inconsistent with the methodology required by the TWDB for regional water planning.

Commenter — Eric Swenson, White River MWD (oral comments supplemented with handout)

Mr. Swenson provided several comments concerning the necessity and viability of Cedar Ridge Reservoir as a recommended water management strategy for the City of Abilene.

- The Region G Planning Group and the TWDB have approved the use of a 2-year safe yield for supply purposes for the City of Abilene and the WCTMWD to deal with the uncertainty of providing critical water supply to a drought prone region of Texas.
- No WUG, WWP, or "willing buyer" requested that groundwater supply from the Seymour Aquifer be evaluated as a potential water management strategy. This option has been previously studied in 2001 for the BGRWPG and in 2005 for the City of Abilene.

- To increase supply from O.H. Ivie would require an expansion of the Hargesheimer WTP. Approximately 15% of the Ivie supply is lost to the brine reject stream. The City of Abilene has reported that accommodating additional brine discharge is problematic.
- The City has an extensive reuse system in place and currently has a permit pending with the TCEQ to more effectively use its effluent in the overall supply scenario.
- The current state of the water right and water contract held by Eagle Construction is shown correctly in the Plan. The plan will be updated to indicate that the current owner is Eagle Construction Environmental Service, L.P.
- The Possum Kingdom supply to Abilene is listed as an alternative water management strategy for the City of Abilene. The costs from the City of Abilene November 2009 report are different from the costs represented in the 2011 Brazos G Plan because of the different assumptions used for the two independent studies.
- The needs of the residents in high-growth areas of the region, specifically Bell, Johnson, Coryell, McLennan, Williamson, Washington, Brazos, Bosque, Burleson, Hill and Robertson Counties have been addressed successfully by their own respective water supply plans as detailed in Section 4C.

Commenter — Scott A. Jones, Galveston Bay Foundation (written comments)

Mr. Jones' comments were addressed to Region H. The letter states that the Region H Water Plan should take freshwater inflow targets from the freshwater inflows standards to be developed by the TCEQ as mandated by Senate Bill 3. Mr. Jones suggests that water conservation goals and implementation be greatly increased in Region H, particularly in the Houston and Dallas metropolitan areas. Mr. Jones expresses concern that reservoir construction will cause destruction to the fragile riparian habitat and that interbasin transfers harm donor basin environmental flows. Mr. Jones suggests identifying additional appropriate ecologically significant stream and stream segments to the Region H Water Plan.

Thank you for your comment and we appreciate you copying Brazos G on your correspondence with Region H. We will defer to Region H to respond, as your comments were specifically addressed to that group.

Commenter — Glen Roe (written comments)

Mr. Roe expresses concern about building the Bedias Reservoir, as it will affect the surrounding land and communities who love that land.

Thank you for your comments and we appreciate you copying Brazos G on your correspondence with Region H regarding the proposed Bedias Reservoir. We will defer to Region H to respond to comments that specifically address strategies in the Region H Plan.

Multiple Commenters — see list below (written comments)

The following individuals and organizations provided written comments expressing opposition to the Millican Reservoir project as a recommended water management strategy. This reservoir was also recommended as a water management strategy and as a site uniquely suited for reservoir construction by the Region H Water Planning Group in the 2011 Initially Prepared Region H Water Plan. Several of those commenting originally directed their comments toward *the Region H Plan, but also provided copies of their comments to Brazos G. Several others provided written comments to the TWDB, which are included in Appendix O, along with correspondence from the TWDB in reply. As this set of comments all expressed clear opposition to inclusion of the proposed Millican Reservoir in either the Brazos G or Region H Plans, the comments are responded to as a single group.*

Steven L. Hanson, three letters to the TWDB
Tom and Paula Moore, letter to the TWDB
T. Barret Lyn, PhD, two letters to the TWDB
Robert and Elaine Sheffield, letter to Region H
Randy Sims, Brazos County Judge, letter to Region H and resolutions from the Brazos County Commissioners Court opposing Millican Reservoir in the Brazos G and Region H Plans
Paul Brannon, letter to Region H
John Cruse Knotts, letter to the TWDB
Grimes County Commissioner's Court, resolution opposing Millican Reservoir in the Region H Plan
Elaine Sheffield, Iola Cemetery Association, letter to Region H
Grimes County Sub-Regional Planning Commission, letter to the TWDB announcing resolution opposing Millican Reservoir in the Region H Plan
Chris Loup, letter to the TWDB
Blair Fannin, letter addressed to both Region H and the TWDB
Alec Pointer, several emails in correspondence with Brazos G
Mark Dudley, Guardians of the Navasota River, letter to Brazos G accompanied with a petition containing in excess of 1,600 signatures
Cheryl Wells, letter to Brazos G
Catherine Payne, letter to the TWDB
C. Leon Williamson, letter to Brazos G

Millican Reservoir will not be a recommended water management strategy in the 2011 Brazos G Regional Water Plan.

Commenter — Brazos River Authority (written comments)

The BRA provided two attachments containing their comments. Some of their comments are noted as having been addressed in an earlier draft of the plan prior to publication of the IPP. Many of the comments are editorial corrections noting minor typographical errors. These have been corrected in the final plan. The remainder of the comments are responded to below.

Table 4C.1-5, Bell County Steam-Electric. Temple recently purchased 2,500 acft from BRA for steam electric and is part of the 30,453 acft contract total shown on previous pg.

The database provided by BRA of its contracts lists the Temple 2,500 acft/yr as municipal supply. Correcting the Steam-Electric supplies for Bell County will not change the plan, as Temple is committed to providing up to 10 MGD of reuse supply to meet the Bell County Steam-Electric need. A change to the plan at this time is unwarranted.

Paragraph 4C.7.3.1. In the Description of Supply 2nd bullet it states that the supply is limited by treatment plant capacity but there is no strategy to expand the treatment plant capacity.

The estimated reliable supply from the BRA contract (5,000 acft/yr) equals the treatment plant capacity.

Paragraphs 4C.7.3.3 (Gatesville) and 4C.7.5.2 (County-Other). Should explain cost for new Coryell Co reservoir as simply being BRA's current system rate. "FYI" Current rate is $60/acft.

The cost is not based on BRA's current system rate, but is based on the 2008 rate. As per earlier discussions with BRA staff regarding how to appropriately address costs for water management strategies identified as BRA projects, the unit cost of the actual project, not BRA's system rate, was utilized.

Section 4C.10.2. City of Marlin plan. Also, it is the BRA's understanding that the existing Brazos mainstem intake and raw water line are in need of repair. Should they also be included, so that they are eligible for TWDB funding?

The City of Marlin's engineer has not indicated that the City would like those facilities included in the plan for the City of Marlin.

Section 4C.15.2.3. Need clarification on cost, it's misleading to assume that a pool rise won't cost our customers anything. If you leave cost at zero add footnote with explanation.

A footnote has been added stating that future increases in BRA System Rate would account for costs for BRA to augment existing supplies.

4C.18.5.1. need to reference BRA contract (1,820 acft).

The contract is referenced in Section 4C.38.17 in the plan for Stamford as a WWP.

4C.24.13. McGregor. Please confirm that McGregor has access to run-of-river supplies as stated.

The text has been corrected to remove the reference to run-of-river rights.

4C.24.1. Woodway. They may receive some water from Lake Belton through Bluebonnet WSC.

The Bluebonnet WSC supply is not referenced.

4C.25.8. Milan County Steam-Electric. Clarify - does the supply number for the shortage calculation include both the ALCOA Little River water right and BRA contract for 5,000 acft?

The shortage calculation includes only the ALCOA Little River water right. The BRA contract for 5,000 acft/yr is assigned to Milam County Manufacturing supply.

4C.30.4. Somervell County Steam-Electric. Confirm that the shortage calculation of 35K acft can be reconciled with Luminant's 2006 Brazos G Plan Amendment numbers since shortage is much less than what Luminant is requesting to purchase from BRA.

The steam-electric demands used in the regional water plans are consumptive demands and often require contractual commitments that are greater than the demands shown in the plan.

4C.33.13.1. Abilene. Add BRA supply (50 acft contract).

This contract for supply from Possum Kingdom Reservoir is part of a priority calls agreement to compensate BRA for loss of yield. The supply made available to Abilene from this contract is much greater than 50 acft/yr and is accounted for by including priority calls (subordination) agreements in the water supply modeling.

4C.36.13. Jonah Water SUD. Treatment infrastructure is not currently in place to use the Stillhouse Hollow supply (Clarify that there shouldn't be a WMS for infrastructure). Jonah is currently getting water from the EWCRWTS and it doesn't appear to be reflected in the number in the Table. Contract is for "needs-met" quantity.

The text and available supplies has been modified to account for this.

Table 4A-6. Why do Existing Contracts (Region K) under Little River System increase through time?

The increasing demands in Region K are due to how the BRA contractual supplies were proportioned between Region K and Brazos G. The Region K supplies shown are for entities with demands in both Region K and Brazos G. The Region K supplies increase over time as the Brazos G supplies decrease over time. The sum of the two equal 250,970 acft/yr in each decade. This adjustment was done in coordination with Region K so that the Region K demands (which are relatively small) could be shown as being fully met, and any shortages from BRA contracts would be located solely in Brazos G. This was done so that water management strategies would not have to be implemented in the Region K plan.

Table 4A.6. New Demands (Region H) under Main Stem/Lower Basin appear inconsistent with Region H Plan. Region H allocates WMS supply from both Allens Creek and BRA Sys Ops beginning in 2020.

The Region H demands from the BRA Main Stem/Lower Basin System were coordinated with the Region H consultant and are consistent.

Can BRA obtain the Little River System projected reservoir yields from 2010 - 2060 by individual reservoir?

Individual yields for the BRA reservoirs are presented in Table 3.3-2 for years 2000 and 2060. Yields for intervening decades were linearly interpolated between these values.

Table 4A-7. Clarify whether "...purchased 3,889 acft…" and "Total sales…were 4,844 acft." in Description represent contract totals or actual amounts used. Also document/explain whether the Projected Demand numbers are contract amounts or actual projected use. This comment applies to all following WWP Projected Demand sections.

The contract amounts in the tables for all wholesale water providers are full contract amounts. Needs met contracts will not be shown as static and will change over time. The uses discussed in the descriptions are the actual use (water delivered). It is an indication of how much water is being used from the contracted supplies.

Table 4A.8. Description at top references 62,509 acft/yr BRA contracts while Supply section below shows 53,428 acft/yr. Is this difference a result of the Little River System contract reductions made by HDR for modeling?

Yes.

Table 4A-9. Recommend deleting "…however the firm supply of those contracts is 7,037 acft/yr." from Description. Also, clarify whether the "943 acft" and "2,848 acft" numbers in Description are contract amounts or actual water use. The Projected Demands increase through time and look like actual water use projections as opposed to contract amounts. Is this consistent with the way demands are shown for other WWPs such as BRA, Aquilla WSD, Bell Co. WCID#1, and Central Texas WSC?

The text should remain to clarify that the full contractual amounts are not firm supplies. See previous comment and response. The contracts shown in the table are “needs met” contracts and will change over time to match the demands of the WUGs that are supplied by the contracts.

Table 4A.16. Check Total Raw Water Supply numbers in bottom of Supplies Table. Shouldn't OH Ivie component of this number be approximately 15,000 AF instead of 6,720?

The full raw water supply from O.H. Ivie cannot be used without advanced treatment resulting in 15 percent reject brine. Therefore the full contract amount from O.H. Ivie cannot be considered the raw supply.

Table 4C.38-1. Do BRA shortages include shortages shown for BRA customers in the table that are also WWPs (i.e. Round Rock, Aquilla WSD, etc.)? If so, probably need to footnote table so numbers are not accidentally "double counted" by readers.

The BRA shortages are contractual shortages (including water management strategies), and need to match those shortages shown in the Section 4A tables. A footnote has been added to the table.

Section 4C.38.2.2. Note that Lake Granger Augmentation project isn't solely dependent on Sys Ops interruptible supply. Existing System Order provisions allow diversions from Lake Granger in excess of its priority amount. Suggest rewording.

Additional text has been added to clarify.

Section 4C.38. Comparing water contract amounts (as opposed to actual projected water use under those contracts) to yield creates unrealistic shortages in early decades, which in turn results in strategies being shown much sooner than they are really needed. BRA does not have a real shortage of 31,802 acft/yr in 2010 as shown in Table 4C.38-3. The text and tables are misleading and need to be modified somehow to reflect this.

Contractual demands are necessarily shown at their full amounts, even if the customer demands are much less than what they have contracted for. Text has been added in bold type on page 4C.38-1 to clarify that shortages shown are likely accelerated.

Section 4C.38.3. What is the math for calculating these shortages (107,223 in 2030 and 302,926 in 2060)?

The math for calculating the shortages is shown in the Wholesale Water Provider summary tables in Section 4A.

Section 4C.38.3. Stonewall, Kent, and Garza County Chloride Control Project. BRA is not actively involved in pursing this chloride control strategy. BRA recognizes downstream benefits from upper basin chloride control and is not opposed to the project; however, BRA's long-range financial planning does not currently contemplate large financial participation in 2020 as currently shown for this strategy.

The BRA is identified as the project sponsor because the BRA is a major regional entity in the Brazos River Basin. BRA is identified in the plan for several water management strategies when a clear sponsor for a major project has not been identified. Also, it is the technical consultant’s understanding that BRA has participated in the project in the past.

Section 4C.38.3. What is the math for calculating these shortages? Region H Plan shows no BRA shortage in 2010, 83,062 acft/yr of recommended strategies in 2020, increasing to approximately 246,000 acft/yr in 2060. Millican Reservoir is not recommended until 2040 in Region H Plan.

The math for calculating the shortages is shown in the Wholesale Water Provider summary tables in Section 4A.

Table 4C.38-4. Also need to correct footnote 2. It doesn't apply to Millican Reservoir or Chloride Control as shown in the table, and the footnote itself looks like it is from the 2006 plan in that it references a Region H Sys Ops allocation of 120,000 acft/yr.

The footnote in the IPP is correct and only references the Sys Ops strategy, not Chloride Control or Millican Reservoir.

Page 4C.38-10. Eliminate or reword first and second to last sentence. BRA will honor its full contract. Add the following text to the end of the sentence: "...and potentially make additional water available for contracting."

Corrected.

Table 4C.38-5. What causes the 117 acft/yr shortage in 2010, 2020, and 2030 decades? Based on updated sedimentation rates, reservoir yield should exceed total of all Lake Aquilla contracts in 2010 and potentially in 2020 and 2030 as well. Also need to address cost that is shown as $0. This is misleading without additional context.

Aquilla WSD has contracted to supply its customers 6,070 acft/yr. The supply allocated to Aquilla WSD from Lake Aquilla is 5,953 acft/yr. The difference is the shortage. A footnote has been added regarding the zero additional cost.

Table 4C.38-18. How can there be a 7,000 acft/yr surplus of treated water and an 8,154 acft/yr shortage of raw water in 2010?

Please review Table 4A.-16, which presents the math. The City has sufficient supplies and treatment capacity to meet its treated water demands, but insufficient raw water supplies to meet some of the additional raw water needs for which the City of Abilene supplies are identified as recommended water management strategies.

Page 4B.6-1. "Water demands in Johnson County are increasing at a very significant rate, while the existing supply from the Surface Water and Treatment System (SWATS) water treatment plant at Lake Granbury is at or near capacity," (Verify this statement is correct)

This statement is correct. The IPP actually reads "…is near operational capacity."

Section 4B.8.1. Brazos G WAM subordinates PK to Salt Fork and Lake Davis - would like to know what impacts this consideration has to the yield and if it impacts PK yield. And check to see if BRA should be compensated for any loss of yield.

The impacts to PK yield were not defined during this evaluation, and is stated as such in the last paragraph of Section 4B.8.1.4. This project is not a recommended water management strategy in the plan.

Table 4B.7-2. System Rate should be updated (The System Rate is has not been updated through out the plan)

Costs are based on September 2008 prices. The BRA System Rate in 2008 was $54.50/acft, which is the value used throughout the plan.

New Reservoirs and Off-Channel Reservoirs. It appears that the subordination of water rights to the BRA has been accommodated inconsistently throughout the variety of strategies. For some, we have agreed to subordination in our Sys Ops settlements or interlocal agreements, but not in others.

Correct. Subordination was only considered when it corresponded with an existing agreement, or when it was necessary to make water available to a project.

Section 4B.14.2. Fails to acknowledge current efforts by Stephens Regional SUD to construct their own advanced treatment facility. They have already piloted the technology and acquired a site (and may even be under construction). Having an existing plant within the area would certainly seem to effect implementation of the strategy.

Text has been added to the implementation issues addressing this development.

Section 4B.5.2.2. Verify yield numbers for Lake Granger. The yields seem high compared to the 2060 reservoir capacity.

The year 2060 yield for Lake Granger is correct.

Table 4B.5.2.4-2. Need to clarify under the Total Capital Cost that land acquisition is included. Write-up states that land is included, but not clear where in the estimate.

The cost for land acquisition and surveying for 37 acres is shown in the cost summary table.

Page 4B.5-4. Add this sentence to the end of the second paragraph…

The sentence has been added to 4B.5-6.

Page 4B.5-4. Add to the last sentence of the 4th paragraph…

The last sentence of the first paragraph on page 4B.5-8 has been modified to clarify.

Section 4B.12.2.2. Expand on how PK was modeled…

Additional explanation has been added.

Section 4B.12.4.2. Explain why the Brazos Mini-WAM was not used for the yield estimates.

The Brazos Mini-WAM includes only the Clear Fork of the Brazos River down to its confluence with the main stem of the Brazos River, then the main stem downstream through Possum Kingdom Reservoir.

Section 4B.18.2.2. Footnote that the 2060 estimated storage does not account for the updated TWDB volumetric survey (2008).

Footnote added.

Section 4B.4.1. Why is 698,440 acft/yr of BRA commitments shown here different from 669,821…

We cannot locate the reference to 669,821 acft/yr. The number as referenced in Section 4B.4.1 is what was included in the modeling.

Table 4B.4-1. Suggest further clarification of footnote 2…

Further clarification has been added.

Section 4B.4.6. Range of unit costs shown in paragraph 2 is different…

No unit costs are shown in paragraph 2. This comment must be concerning an earlier draft of the report section.

Section 4B.17.2.10. Should this strategy for Cleburne be associated with Lake Whitney instead of Lake Granbury?

The strategy for taking water from Lake Granbury has been removed as a recommended water management strategy for Cleburne. The strategy description will remain as a Lake Granbury supply, but will not be recommended.

Table 4B.18.2.1. Suggest footnote to table explaining SUPER yield versus BWAM3 yield.

Footnote has been added.

Section 4B.18.2.2. Suggest examining 2060 yield value for Lake Aquilla.

The yield values are correct and consistent with the value used in the water supply analyses (Section 3).

Page 1-22, Table 1-7. Not clear how LCRA contracts totaling 49,400 acre/yr are determined.

The contracts included in that total are taken from page 4B.11-6 and include the HB 1763 supply.

Page 1-52. Any updates to groundwater conservation district membership?

That information will be checked and updated as necessary for the final plan.

Table 3.5-1. No mention of HB 1437 water.

That will be added.

Section 4C.1.1. The text is not clear that 439 WSC also has a supply allocation from Bell County WCID No. 1.

That fact is now noted.

Chisholm Trail SUD has no plans to utilize the 3,472 acft balance of HB 1437 water.

Needs (shortages) for the SUD do not appear until 2050, and the SUD has not indicated any plans to meet the future shortages that are projected. The strategy is included as a recommendation of the planning group.

Section 4B.6.2.2. What water at Lake Granbury is uncommitted and available for sale?

The sentence has been deleted.

Page 4B.11-9. The 25% surcharge is subject to adjustment by the LCRA.

A note has been added to the plan.

Commenter — Ross Melinchuk, Texas Parks and Wildlife Department (written comments)

…7 of the 13 Mollusks listed as Species of Concern in Table 4B.12.8-3 are now listed as threatened by the State of Texas.

Table 4B.12.8-3 will be updated to reflect the revised listing status of the threatened species.

Comment questions steam-electric demands to be supplied by the City of Abilene, including a current contractual commitment and steam-electric demands in Nolan County.

The existing contract between the City of Abilene and West Texas Utilities (now Eagle Construction) is a commitment by the City of Abilene to provide water and must be recognized in the regional water plan as such until such time as the contract ceases to exist.

The quantity of water planned to be used by Tenaska is, to the planning group's knowledge, less than the 20,000 acre-feet per year identified in the 2011 IPP. However, the Nolan County demand for water should not be identified specifically as a "Tenaska" demand, but should instead be considered as a regional water demand for steam-electric power generation. The demand identified for Nolan County by the BEG and the TWDB was originally 94,298 acre-feet per year. The planning group requested that the TWDB adopt a smaller, more realistic demand projection.

…concentrations of dissolved salts and minerals in Possum Kingdom...to increase.

Analysis of the impact of Cedar Ridge Reservoir on salinity levels in Possum Kingdom Reservoir is beyond the scope of work authorized by the TWDB for developing the 2011 Brazos G Regional Water Plan. However, during development of the 2016 Brazos G Regional Water Plan, additional treatment of salinity issues could be added to the scope of work if requested by the planning group and approved by the TWDB.

…Possum Kingdom will experience greater fluctuations.

Possum Kingdom Reservoir will experience greater fluctuations in the future as greater demands are placed on the reservoir. An agreement exists between the City of Abilene and the BRA to compensate the BRA for impacts of Cedar Ridge on Possum Kingdom. This agreement provides for a reduced demand on Possum Kingdom in response to reduced inflows due to Cedar Ridge.

Environmental Water Needs Impacts of Miller's Creek Augmentation (new dam and reservoir option) are described as "moderate impact" even though Miller's Creek is predicted to be dry approximately 85% of the time with the project compared to less than 20% of the time without the project.

The increase in percent time dry from 85% to 20% does appear to be significant. However, the stream is dry approximately 15% of the time. Streamflow statistics indicate that the 7Q2, and 25th percentile naturalized flow are both zero, and the median streamflow is greater than zero in 7 out of 12 months. An increase in the percent of time dry of a stream that already experiences considerable periods of zero flow would appear to be a "moderate" impact. Also, remember that the streamflow statistics reflect not only construction of the reservoir, but also a priority calls (subordination) agreement whereby Millers' Creek Reservoir does not have to pass inflows to Possum Kingdom Reservoir. That priority calls agreement is not reflected in the "without project scenario", e.g., the "without project" scenario includes flows passed to downstream.

TPWD has concerns regarding environmental flow impacts that could result from increased interbasin transfers from the Colorado River Basin to the Brazos River Basin and recommends an analysis of these potential impacts be undertaken.

The water supply associated with the interbasin transfer from the Colorado River Basin the Brazos River Basin is from an existing, perpetual water right, and would not be a new appropriation of water. Therefore, no impacts on streamflows would occur beyond those assumed by full utilization of existing water rights.

Alterations in hydrologic and water quality conditions…may disrupt the dynamics of the unique ecosystem and render habitat unsuitable for species adapted to prairie streams…

Detailed analysis of any downstream impacts of water management strategies is beyond the scope and funding limitations of the regional water planning process, and should be considered during Environmental Impact Analyses that occur during the permitting processes associated with water rights appropriations and Corps of Engineers 404 permits.

TPWD encourages Brazos G to make water conservation a priority early in the next planning cycle.

Advanced water conservation was considered first by the Brazos G Regional Water Planning Group for any water user group with a projected shortage. Advanced water conservation was recommended as a water management strategy for 35 of the 76 municipal water user groups with shortages. Brazos G has made and will continue to make water conservation an important part of the regional water plan.

The Brazos G IPP does not recommend nomination of any stream segments as ecologically unique. No explanation is provided for the lack of recommendations. TPWD…encourages the planning group to consider this creek [Salado Creek], and other rivers and streams, in the next planning cycle.

The Brazos G Regional Water Planning Group deliberated at length regarding the subject of recommending stream segments having unique ecological value during both the 2006 and the 2011 planning cycles. Ultimately, the planning group members were unsure of the future legal ramifications of such a designation and elected to not recommend any stream segments as having unique ecological value. The planning group will reconsider this issue during the next planning cycle.

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

Chapter 1

1. *Please confirm that plan will not impact any relevant, designated unique stream segments. [3] TAC §357.8(c)]*

   There are no designated unique stream segments in the Brazos G Area. Therefore, no water management strategies identified in the 2011 Brazos G Plan will impact any designated unique stream segments in the Brazos G Area. Additionally, no water management strategies recommended in the 2011 Brazos G Plan are located in Regions E and H, the only regions with current, unique stream segment designations.

2. *Page 1-48; Chapter 4B; Volume II, Sections 4B.l through 4B.20: Quantitative reporting of impacts to agricultural resources are provided regarding cropland/rangeland/grassland acreage impacts of reservoirs but not for other water management strategies. Please provide*

numerical basis for quantitative impact discussion on page 1-48 and include similar quantitative reporting of impacts for all potentially feasible water management strategies evaluated. [Title 3 Texas Administrative Code (TAC) 357.7(a)(8)(A)(iii)]

Section 1 of the report is a description of the region as it exists currently. Page 1-48 begins a section on threats to agricultural and natural resources, not the impacts of water management strategies on those resources. Section 1 is not the appropriate place in which to place information regarding potential impacts of the regional water plan. The Brazos G Regional Water Planning Group declines to include information regarding quantitative impacts of water management strategies in this report section.

The impacts of reservoir projects that will inundate large acreages are well documented in Volume II of the regional water plan. The remaining water management strategies involve relatively insignificant acreages and will have no significant impact on the State's agricultural resources. That piece of information will be included in Section 4B.1.2.

3. *Pages 1-54 andl-55, Table 1-11.1.9.2: Please update the approval dates for Groundwater District Management Plans. Please update Table 1-11 with the following dates:*
    - *Clearwater Underground Water Conservation District, approved 3/6/2006*
    - *Middle Trinity Groundwater Conservation District, approved 5/5/2009*
    - *Saratoga Underground Water Conservation District, approved 11/30/2009*
    - *Wes-Tex Groundwater Conservation District, approved 4/7/2010*

    The approval dates will be updated as requested.

Chapter 3

4. *Pages 3-28 and 3-30, Table 3.2.2: Plan includes water supply estimates using the 75/75 basis as availability for irrigation. Developing a strategy for agricultural needs must reflect availability under drought of record conditions. Please modify analysis based on firm yield or firm diversion and revise table results to reflect drought of record conditions (e.g. firm yield). Please update plan regarding any resulting changes to water needs, if applicable. [31 TAC §357.7(a,)(5); Contract Exhibit "D" Section 3.0]*

    The Brazos G Regional Water Planning Group respectfully declines to make this change to the plan. The 75/75 convention for determining availability of supply for surface water irrigation rights was utilized in both the 2001 and 2006 Brazos G Regional Water Plans with the knowledge and approval of the TWDB, under the same or similar TAC requirements. Use of the 75/75 convention was articulated clearly at regional water planning group meetings during the development of the 2011 IPP (see Agenda item 6.7, February 18, 2009 meeting). TWDB representatives present at those meetings gave no indication that Brazos G was to discontinue use of the 75/75 convention for irrigation rights. The 2011 Plan is to be an update to the 2006 Plan, and should follow similar conventions. Modification of this convention at this late date would modify a large portion of the regional water plan, and would necessitate adding a number of additional water management strategies to supply increased irrigation needs. When the scope of work was developed for the 2011 Plan, this potential situation was never considered and potentially feasible water management strategies were never identified to meet irrigation needs that would be substantially greater than those in the 2001 and 2006 Plans. This would be a significant modification of the basic assumptions of the plan and would require a new public hearing and public comment period, because potentially new water management strategies to meet new irrigation needs would have to be identified, evaluated and incorporated into the regional water plan.

5. *Page 3-45, Table 3.4-2: The availability value for the Edwards Balcones Fault Zone Aquifer-Northern Segment in Williamson County (3,462 acft/yr) does not match the managed available groundwater value from groundwater availability model Run 08-10 (3,452 acft/yr). Please revise as appropriate throughout the plan.*

   The value will be updated throughout the plan.

6. *Pages 3-45 thru 3-48, Table 3.4-2: Please update the "Source" column in all instances where table states "Pending final TWDB determination" for the Trinity Aquifer to reflect the appropriate groundwater availability model (GAM) run. TWDB's March 31, 2009 letter provides the managed available groundwater estimates in GAM Run 08-04 based on desired future conditions adopted by the groundwater districts in GMA 8.*

   The reference has been changed to indicate it is a preliminary determination. The groundwater availability estimates from the Trinity Aquifer are based on the preliminary results available from GMA8 GAM Run 08-06, as referenced. The GMA8 did not provide Desired Future Conditions (DFC's) for the Trinity Aquifer to the TWDB until after the January 1, 2008 deadline. The DFCs for the Trinity Aquifer were provided to the TWDB in a letter dated October 6, 2008. The Brazos G RWPG elected to utilize final MAG determinations when the DFC deadline was not met if the resulting MAG for an aquifer was determined prior to October 1, 2008. Because the resulting MAG determination was not made prior to October 1, 2008, Brazos G elected to utilize a preliminary estimate for the Trinity Aquifer as the best available estimate. This resulting MAG differs slightly from the final MAG and Table 3.4-2 should correctly note that it is not the "final" MAG determination.

7. *Pages 3-47 and 48, Tables 3.4-2 and 3.4-3: The 'Western Area' total for Other (Local) aquifer (located in Shackelford County only) of 2,250 acft/yr shown in Table 3.4-3 is not included in the Shackelford County availability of 806 acre-feet in Table 3.4-2. Please revise as appropriate throughout the plan.*

   Table 3.4-3 has been corrected.

8. *Page 3-48, Table 3.4-3: Table 3.4-3 Other (Local) Aquifer total of 2,915 acft does not equal the Table 3.4-2 Other (Local) Aquifer total of 3,059 acft. Please reconcile Other (Local) Aquifer totals between Table 3.4-2 and 3.4-3, and, as appropriate, throughout plan.*

   Table 3.4-3 has been corrected.

Chapter 4B

9. *Page 4B-8, second paragraph: "...drought management recommendations have not been made by the Brazos G RWPG as a water management strategy for specific WUG needs". Please explain whether drought management strategies were considered for each water user group (WUG) to which Texas Water Code §11.1272 applies in a manner consistent with Texas Water Code §11.1272. [31 TAC §357.7(a)(7)(B)]*

   As explained in the paragraph, drought management as a water management strategy was considered but not utilized to meet WUG needs for the reasons stated.

Chapter 4C

10. *The plan does not present categories of water use delineated by counties and river basins. Please present water user group water demands by county and river basin. [31 TAC §357.7(a)(5)A)(iv)]*

    A table will be added as an appendix showing this information.

11. *Please indicate whether conservation water management strategies were considered for every water user group with an identified water need and if none were recommended, please explain why in each instance (e.g. Milam County Mining). [31 TAC §357.7(a)(7)(A)]*

    Appropriate text will be added to each instance where conservation was not recommended as a water management strategy to meet a water user group's projected needs.

12. *Page 4C.12-2 and 3, Section 4C.12.4.3: The references to "cost source" for items "c" and "d" currently show, "4B.17.2.7", which should be "4B.17.3.7." Please revise.*

    The text will be corrected.

13. *Page 4C.30-4 through 4C.30-6: Regarding Somervell County Steam-Electric water needs plan states that "Conservation was not applied to this plan because... (it) is not applicable." Please clarify why conservation was not considered as an applicable strategy where the shortage results from construction of new facilities.*

    The text has been revised to: "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."

14. *Page 4C.39-4: The water management strategy shown as Groundwater Development" appears to be included in the online planning database as "Additional Carrizo Aquifer Development (includes overdrafting)". Please revise to consistently name water management strategies in both the plan document and online planning database. [Contract Exhibit 'D" Section 3.0]*

    The addition of "(includes overdrafting)" to the description of this water management strategy in the online planning database has been objected to strenuously by at least one wholesale water provider, when that description was observed as they were completing the Water Infrastructure Financing survey. The description "(includes overdrafting)" connotes a negative situation where the recommended strategy would "overdraft" the aquifer, when in fact it does not result in an over allocation of the resource in that county. The Brazos G Regional Water Planning Group respectfully requests that the text "(includes overdrafting)" be removed from the online planning database because of the negative connotation it places on recommended water management strategies that do not result in over allocation of the Carrizo-Wilcox Aquifer.

Chapter 6

15. *Please include a summary of information regarding water loss audits specific to water users located in Region G. [31 TAC §357.7(a)(1)(M)]*

    Section 1.12 has been added to Section 1 to summarize the water loss audit information for Brazos G entities.

Appendix C

16. *It appears that total county 'balance' surpluses/shortages were calculated incorrectly throughout Appendix C Tables by subtracting Tota1 Demand' from Tota1 Supply'. Please revise to reflect total subcategory and county-wide water needs as the sum of the individual needs of each water user group in the county; needs that are calculated based on each water user group's own demands and supplies. [31 TAC §357.7(a)(4)(B)]*

    The Brazos G Regional Water Planning Group respectfully declines to make the suggested change. The tables are prepared this way intentionally to illustrate the overall county water balance. Even though some water users have "needs", supplies in the county may still exceed demands. For the municipal demands and supply comparisons shown in the county tables (odd-numbered tables), this effectively illustrates the difference between total demand and total supply for all municipal users in the county, in contrast to the itemized individual needs documented in the municipal water user group tables for each county. Summations of individual water "needs" are effectively itemized in other places in the report.

    A footnote will be added to the tables explaining this.

17. *Please include a footnote explaining how 'contractual demand' (e.g. Table C-I) is accounted for in calculating net supplies available for each water user group so that current supply numbers can be replicated.*

    A footnote will be added.

Volume II

18. *Chapter 4B: contains two consecutive report sections "4B.17.3", without section 4B.17.2. Please revise the first of these sections to "4B.17.2" if appropriate.*

    The text has been corrected.

19. *(Attachment B) Comments on the online planning database (i.e. DB12) are herein being provided in spreadsheet format. These Level 1 comments are based on a direct comparison of the online planning database against the Initially Prepared Regional Water Plan document as submitted. The table only includes numbers that do not reconcile between the plan (left side of spreadsheet) and online database (right side of spreadsheet). An electronic version of this spreadsheet will be provided upon request.*

    The spreadsheets have been reviewed and database and plan numbers have been corrected to remove inconsistencies, or the inconsistencies have been explained.

20. *(Attachment C) Based on the information provided to date by the regional water planning groups, TWDB has also attached a summary, in spreadsheet format, of potential interregional conflicts, apparent water source over allocations, and apparent unmet water needs that were identified during the review of the online planning database and initially Prepared Regional Water Plan. [Additional TWDB comments regarding the general conformance of the online planning database (DB12) format and content to the Guidelines for Regional Water Planning Data Deliverables (Contract Exhibit D) are being provided by TWDB staff under separate cover as 'Exception Reports']*

    Potentially over allocated sources – the Brazos G and Region L technical consultants have coordinated and the supply available to the GBRA Simsboro Project from Lee County in the Region L Plan has been reduced to remove the potential over allocation.

    Water user groups with unmet needs – Municipal water user groups Abilene, Cedar Park and Round Rock do not have unmet needs. The database issue has been resolved. Each of the irrigation water user groups do, indeed, have unmet needs. No economically feasible water management strategies exist to meet those irrigation needs. The mining demand in Williamson County is associated primarily with dewatering of quarry operations, for which pumping exceeds the available groundwater supply estimated for the county. Steam electric water demands in Nolan and Somervell County do not have unmet needs. The database issue has been resolved.

10.7.2 Level 2 TWDB Comments

General Comments

1. *Please consider eliminating one version of section 4B-1 which is duplicated in both Volume I and Volume II.*

    Section 4B.1 will be removed from Volume I.

2. *Table of Contents, Page vi. 4B.1.8: Indicates "stage agencies". Please consider correcting to state agencies.*

    That section is no longer referenced in the Volume I Table of Contents.

<u>Chapter 4</u>

3. *Fig 4B.12-l, page 4B.12-2: the legend indicates black dots as representing "off-channel reservoir sites". It appears that these are sites for proposes on-*channel reservoirs. *Please consider correcting the figures legend.*

   The legend has been corrected.

4. *Page 4C.36-21 and 22: There appears to be a mislabeled subsection as there are two sections labeled as "c". Please consider revising as appropriate throughout the plan.*

   Corrected.

<u>Chapter 5</u>

5. *The chapter includes brief discussion of impacts of voluntary redistributions of water and moving water from rural and agricultural areas; however, it does not provide the economic basis for the conclusion regarding increased pumping costs to agricultural and rural areas. Please consider providing additional information on which this conclusion is based.*

   The text is self-explanatory. Lowering of water levels increases pumping costs because water has to be lifted higher, using more energy. There is no need to further elaborate.

<u>Appendix B</u>

6. *Page B-27, 3rd paragraph: Please consider replacing "GAM-7" with "GMA-8".*

   The application Groundwater Management Area for the Edwards Trinity Plateau Aquifer is GMA-7. "GAM-7" has been corrected to "GMA-7".

7. *Page B-32, 1st paragraph: Please consider replacing "GAM-8" with "GMA-8".*

   Corrected.

8. *Page B-39, 3rd paragraph: Groundwater Management Area 8 established desired future conditions for the Hickory Aquifer in Lampasas and Williamson Counties on May 19, 2008. Please consider revising paragraph to reflect this status.*

   Clarifying language has been added to the paragraph.

9. *Page B-32: The plan states "The preliminary groundwater availability estimates by GAM-8 for the Ellenburger-San Saba Aquifer in Lampasas County is 2,341 acft/yr." The managed available groundwater numbers were officially released by TWDB on December 9, 2009 as 2,593 acft/yr. Please consider revising to reflect this volume.*

   As the official number will not be used in the 2011 Plan, it is best to only cite the preliminary value in the 2011 Plan.

10. *Page B-41, 5th paragraph: Please consider replacing "GAM-8" with "GMA-8".*

Corrected.

10.8 Final Plan Adoption

On July 21, 2010, the BGRWPG reviewed and adopted responses to the oral and written comments received. The final plan was adopted by unanimous vote of the members present pending completion of the changes noted in response to comments received.

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