**Adopted**

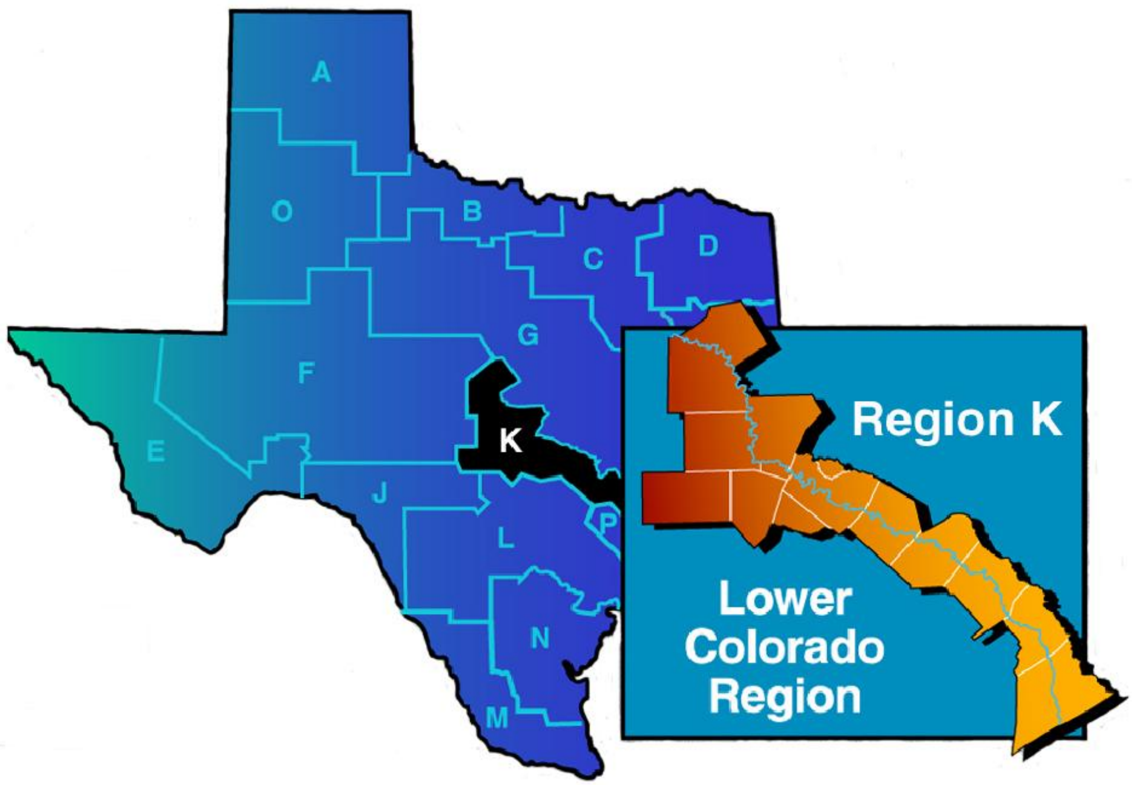
# 2011 Region K Water Plan

for the

Lower Colorado Regional Water Planning Group

## Volume I

**(Chapters 1 – 4)**




*prepared by*

**Lower Colorado Regional Water Planning Group**
**with funding assistance from the Texas Water Development Board**

*prepared for*

**Texas Water Development Board**

*with assistance from*

**AECOM USA Group, Inc.**
**TBPE Reg. No. F-3082**

**July 2010**

# Adopted
# 2011 Region K Water Plan
# for the
# Lower Colorado Regional Water Planning Group

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# FOREWORD

The development of a reconnaissance level water plan such as the one that follows this forward serves several purposes. First and foremost, it applies the best available information to determine the water demands that will have to be met, and the available supplies to meet those demands. The difference between available supplies and demand for each water user group, or WUG, is either a surplus or a need. Needs are estimated for each decade so planners and city officials know when additional water is needed. Once the needs are determined, a listing of potential alternative strategies to meet those needs is assembled. These strategies are reviewed to determine how long it takes to implement them, what they will cost, to the extent that they are currently known or predicted, what will be the environmental impacts, etc. With that information, the planning groups make decisions about relative merits of different alternative strategies and combinations of strategies to try and come up with a plan that has strategies that can be built in time to meet the need, and which appear to have the most reasonable cost and the fewest environmental impacts. Again, much of the information that is used comes from existing studies, which are often in progress with only preliminary results available.

It is also important to distinguish what this regional plan is not. The level of detail in this plan is not sufficient for supporting any permitting decision before the Texas Commission on Environmental Quality. None of the alternatives proposed for inclusion in the plan have complete studies, fully known environmental impacts, and other features. Few alternatives, if any, have determined actual pipeline routings, placements for major plant facilities, locations of discharges, etc. In fact, few of the projects have the required local sponsors, financing, or any of a myriad of other requirements. All of that remains to be done during the permitting processes, during preliminary and final design, and during the financing and construction phases. These processes require a far greater level of detail and analysis and require the expenditure of far greater sums to achieve the level of accuracy needed to support a permitting action plan review or financing action. The purpose of this portion of the process is to try not to overlook something that might become a viable strategy. Further, the plan develops reconnaissance level costs with similar levels of accuracy so that projects that are obviously too costly or which have serious negative effects on the environment can be screened out and the serious permitting and design monies spent on projects with a greater likelihood of implementation.

For you, the reader, please be assured that the Lower Colorado Regional Water Planning Group, or LCRWPG, has many remaining concerns about the management strategies that are listed in this plan. The LCRWPG will continue to collect and review the results of additional studies, refine the analyses done with that information, seek to eliminate those strategies which cannot be implemented without significant detriment to the environment, and evaluate new strategies. Your participation and comments on this process are an integral part of ensuring that needs are met and environments are protected.

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# ES. EXECUTIVE SUMMARY

## ES.1 OVERVIEW

Following the guidelines provided by the Texas Water Development Board (TWDB), the Lower Colorado Regional Water Planning Group (LCRWPG) prepared this *Adopted Regional Water Plan* for the Lower Colorado Regional Water Planning Area (LCRWPA) (Region K) covering the 2010 to 2060 time period (2011 Plan). This plan has been submitted to the Texas Water Development Board (TWDB) for review and integration into a statewide water plan.

The Plan includes a description of the region, population and water demand projections, water supply analyses, water management strategies for ensuring supplies during drought-of-record (DOR) conditions, water conservation and drought management plans, consistency with the state's long-term resource protection goals, policy recommendations related to improving water management and preserving the environment, and public involvement activities.

It should be noted that local plans that are consistent with the regional water supply plan are also eligible to apply for TWDB financial assistance even though they have not been specifically recommended in this plan. The plan is comprised of the following ten chapters:

Chapter 1: Introduction and Description of the Lower Colorado Regional Water Planning Area

Chapter 2: Population Projections and Water Demand Projections

Chapter 3: Identification of Currently Available Water Supplies

Chapter 4: Identification, Evaluation, and Selection of Water Management Strategies Based on Need

Chapter 5: Impacts of Water Management Strategies on Key parameters of Water Quality and Impacts of Moving Water From Rural and Agricultural Areas

Chapter 6: Water Conservation and Drought Management Plans

Chapter 7: Regional Plan Consistency with State's Long-Term Resource Protection Goals

Chapter 8: Additional Recommendations (Including Unique Ecological Stream Segments and Reservoir Sites, Legislative Issues, and Regional Policy Issues)

Chapter 9: Water Infrastructure Financing Recommendations

Chapter 10: Public Involvement Activities

The LCRWPG, representing the 11 TWDB-required interest groups and two additional regional interest groups (*Table ES.1*), was responsible for the development of the Lower Colorado Regional Water Plan.

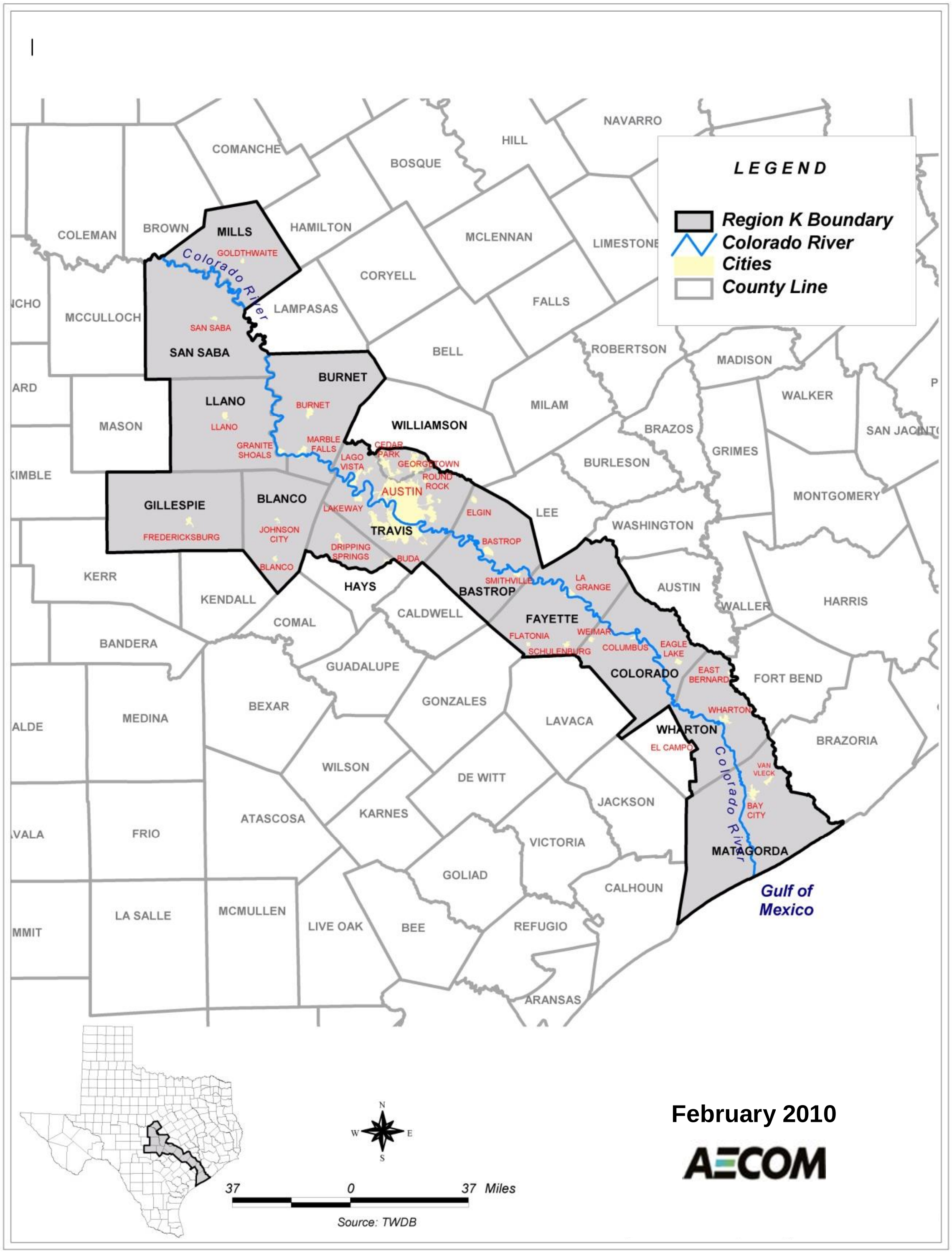
**Table ES.1 The Lower Colorado Regional Water Planning Group Voting Board Members**

| Interest | Name | Entity | County |
|---|---|---|---|
| **Public** | Laura Marbury | League of Women Voters | Travis |
| **Counties** | Bill Neve | Burnet County Commissioners Court | Burnet |
| | Billy Roeder | Gillespie County. Commissioners Court | Gillespie |
| | James Sultemeier | Blanco County Commissioners Court | Blanco |
| **Municipalities** | Finley de Graffenreid | City of Llano | Llano |
| | Teresa Lutes | City of Austin | Williamson |
| **Industries** | Barbara Johnson | Austin Area Research Organization, Inc. | Travis |
| **Agricultural** | Bill Miller | Rancher | Llano |
| | Haskell Simon | Rice Industry Rep. and Farmer | Matagorda |
| **Environmental** | Jim Barho | Protect Lakes Inks, Buchanan | Burnet |
| | Jennifer Walker | Sierra Club, Lone Star Chapter | Travis |
| **Small Businesses** | Ronald Gertson | | Wharton |
| | Rob Ruggiero | | Travis |
| **Electric. Generating Utilities** | Sandra Dannhardt | STP Nuclear Operating Company | Matagorda |
| **River Authorities** | James Kowis | LCRA | Travis |
| **Water Districts** | Paul Tybor | Hill Country UWCD | Gillespie |
| | Ron Fieseler | Blanco-Pedernales GCD | Hays |
| | David Van Dresar | Fayette County GCD | Fayette |
| **Water Utilities** | John Burke | Aqua WSC | Bastrop |
| **Other(s)** | Roy Varley | | Mills |
| | Bob Pickens | | Colorado |
| **Recreation** | Doug Powell | Emerald Point Marina | Travis |

## ES.2 INTRODUCTION AND BACKGROUND

The Lower Colorado Region—designated by the TWDB as Region K—consists of all or parts of 14 counties roughly consistent with the Lower Colorado River Basin (see *Figure ES.1*).

**Figure ES.1: Lower Colorado Regional Water Planning Area (Region K)**



This area relies primarily on the Colorado River; the Gulf Coast, Carrizo-Wilcox, Edwards, Trinity, and Edwards-Trinity (Plateau) aquifers; and several minor aquifers for its water supply. Small portions of the Brazos, Guadalupe, and Lavaca River Basins also lie within the region. In total, about 28 percent of dependable yield water supplies during DOR conditions come from groundwater, while the remaining 72 percent are provided by surface water throughout the planning period.

The region stretches from arid and rocky Hill Country counties that receive an average of 24 inches of rainfall annually to the humid Coastal Plain, which receives an average of 44 inches of rain per year. Average annual stormwater runoff ranges from about 350 acre-feet per square mile (ac-ft/sq mi) near the mouth of the Colorado River to less than 50 ac-ft/sq mi in the western portion of the region. During the 1950s drought, used as the DOR for calculation purposes in Region K's Plan, both of these average annual runoff values declined by about 75 percent.

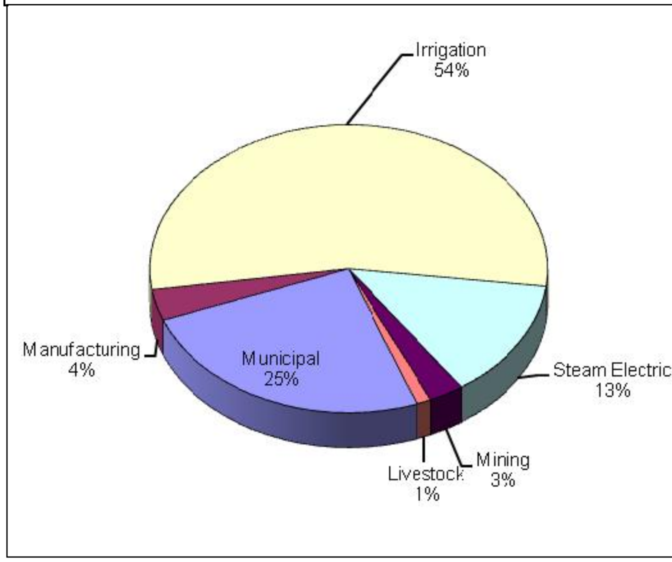
The system of Highland Lakes administered by the Lower Colorado River Authority (LCRA) is a major hydrologic feature of the region that provides flood control, power generation, water supply, and recreational benefits.

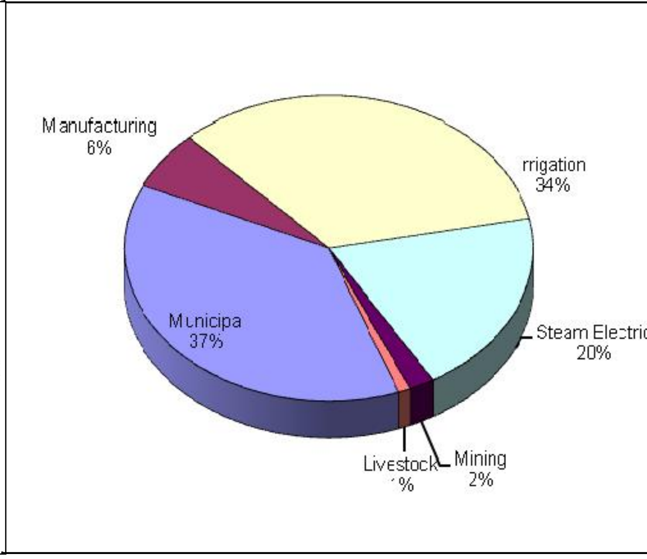
## ES.3 POPULATION AND WATER DEMANDS

About 78 percent of the region's population of approximately 1.4 million is currently concentrated in the rapidly growing Austin metropolitan area, which includes Travis and parts of Williamson and Hays Counties. By 2060, the population of the region as a whole is projected to more than double (2.8 million). Each of the 14 counties in the region are projected to grow significantly over the planning period, with Travis County continuing to account for nearly 68 percent of the total population for the region. The vast majority of the population growth is expected in the geographic "middle" counties (i.e., Blanco, Burnet, Hays, Travis, Williamson, Bastrop, and Fayette Counties).

The region's population now consumes about 1.1 million ac-ft of water each year, with 55 percent used for agricultural and livestock purposes, 25 percent put to municipal use, 6 percent devoted to mining and manufacturing, and the remaining percentage to electric power generation (see *Figure ES.2*). As *Figure ES.2* shows, this pattern of use is expected to change over the planning period, such that the volume of irrigation use will decrease slightly, and the proportion of total use it represents will decline significantly. The total regional water demand is projected to increase to approximately 1.4 million ac-ft/yr by the year 2060. Chapter 2 includes details concerning the population and water demands projections and how they were developed. One issue of concern for the LCRWPG is that the original population projections that the LCRWPG developed for the plan were not accepted by the TWDB staff. The LCRWPG was requested by the TWDB staff to revise the projections so that the overall totals would be lower. The LCRWPG reluctantly agreed with the request in order to proceed with the planning process, but did adopt a Resolution regarding the issue on June 10, 2009.

**Figure ES.2: LCRWPA Water Demands (ac-ft/yr) – Year 2010 and Year 2060**

| Year 2010<br>1.1 million ac-ft/yr | Year 2060<br>1.4 million ac-ft/yr |
|---|---|



## ES.4 WATER SUPPLIES

Water supplies in the LCRWPA are available from 11 aquifer systems and alluvial groundwater and 6 river and coastal basins. The Colorado River Basin makes up the single largest source of surface water for the region with large volumes of water available from both run-of-river (ROR) diversion rights and water stored in reservoirs. Water available in the LCRWPA was found to total nearly 1.3 million ac-ft/yr, of which over 72 percent is from surface water sources, over the planning period.

Surface water supplies for DOR conditions for the Colorado River Basin were determined using a modified version of the Texas Commission on Environmental Quality (TCEQ) WAM (Water Availability Model) Run 3 that was developed in this round of planning by the Region K Planning Group and is referred to as the Region K Cutoff Model. This conservative model predicts water availability under DOR conditions and assumes maximum surface water diversions with no return flows to streams, and also includes in the 2011 plan a planning assumption whereby upstream water to meet downstream priority rights would not be released until some portion of the upstream needs were satisfied. This "No Call" assumption does not have legal standing and does not impact the seniority of owner's rights. This is a planning level assumption only that was agreed to by the LCRWPG solely to avoid a potential conflict with Region F. Information from WAM Run 3 runs were used when available for determining firm supplies in other basins of the LCRWPA. Local supplies (stock ponds, etc.) were assumed to be consistent with numbers previously evaluated in the 2001 Plan.

Groundwater supplies were developed from the best information available from Groundwater Management Areas (GMAs), Groundwater Availability Models (GAMs), local information from Groundwater Conservation Districts (GCDs), or information from the previous LCRWPA Plan (2006). The GMA program is still in its formative stages: most of the GMAs in the LCRWP have not yet adopted their Desired Future Conditions (DFC), thereby determining the Managed Available Groundwater (MAG) values for their aquifers. The result is that some aquifers in some counties have MAGs, some have availabilities established by a GCD, and the rest have the availability established in the 2006 Region K Plan. The sources of groundwater availability data in this plan, in descending order of priority, are:

1. Managed Available Groundwater (MAG) values
2. Preferred availability reported to the LCRWPA by a Groundwater Conservation District (GCD). Even where a GCD has a water management plan, they may have been in the process of establishing a new availability, and were given the opportunity to have that availability included in this plan;
3. GCD availabilities adopted in a groundwater management plan, and;
4. In absence of any of the above, the availabilities established in the 2006 Region K Plan.

In the LCRWPA there are five major aquifers and six minor aquifers that provide usable groundwater supplies. Both surface water and groundwater availability for the LCRWPA are shown in *Table ES.2*.

**Table ES.2 Groundwater and Surface Water Supplies Available to the LCRWPA**

| | | | |
|---|---|---|---|
| Gulf Coast Aquifer | 198,425 | 198,425 | 198,425 |
| Carrizo-Wilcox Aquifer | 28,400 | 28,400 | 28,400 |
| Edwards Aquifer (Balcones Fault Zone) | 9,496 | 9,496 | 9,496 |
| Trinity Aquifer | 17,600 | 17,598 | 17,311 |
| Edwards-Trinity (Plateau) Aquifer | 1,500 | 1,500 | 1,500 |
| Hickory Aquifer | 24,153 | 24,153 | 24,153 |
| Queen City Aquifer | 3,991 | 3,991 | 3,991 |
| Sparta Aquifer | 9,889 | 9,889 | 9,889 |
| Ellenburger-San Saba Aquifer | 26,451 | 26,451 | 26,451 |
| Marble Falls Aquifer | 14,658 | 14,658 | 14,658 |
| Yegua-Jackson Aquifer | 20,000 | 20,000 | 20,000 |
| Other Aquifer [1] | 15,562 | 15,601 | 15,622 |
| **Groundwater Subtotal** | **370,125** | **370,162** | **369,896** |
| | | | |
| **Surface Water [2]** | | | |
| Run of River | 485,587 | 470,347 | 470,360 |
| Reservoir | 402,768 | 384,597 | 367,064 |
| Local Supply | 70,099 | 73,631 | 78,491 |
| **Surface Water Subtotal** | **958,454** | **928,575** | **915,915** |
| | | | |
| **Sources Outside the Region [3]** | **3,136** | **3,327** | **3,642** |
| | | | |
| **TOTAL LCRWPA Water Availability** | **1,331,715** | **1,302,064** | **1,289,453** |

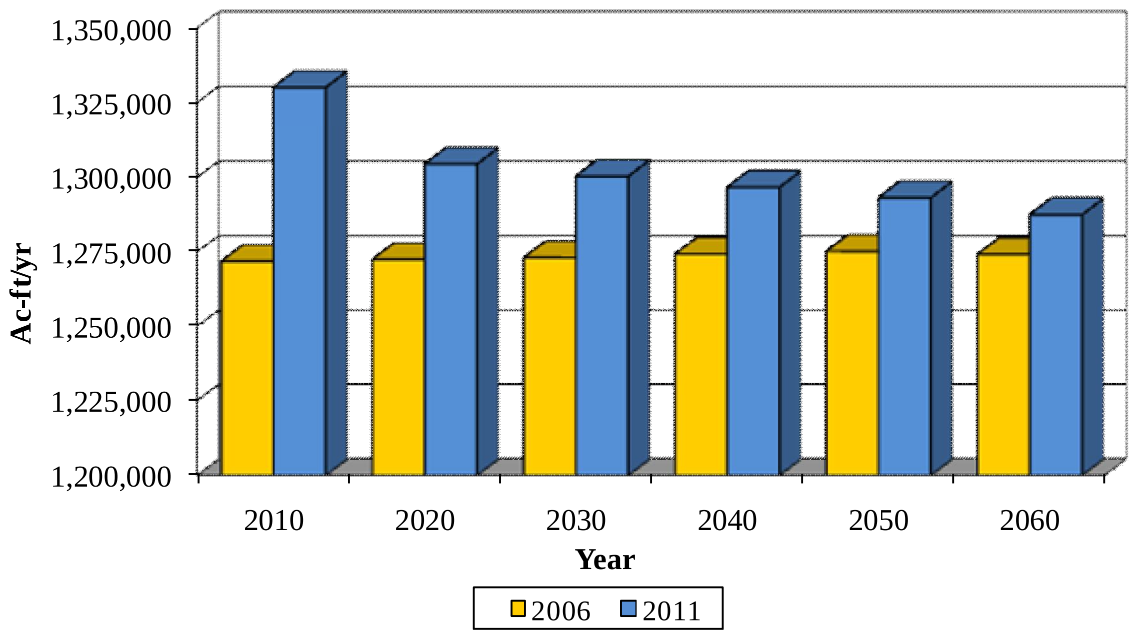
[1] Other Aquifer refers to alluvial aquifer water supplies.

[2] Includes local supplies determined from 2001 Plan.

[3] Includes Lake Brownwood, Brazos River Authority System, Edwards-BFZ Aquifer, and Canyon Lake Reservoir

In comparison to water availability in each decade described in the 2006 Plan, total water availability for every decade in this Plan (2011) is higher. *Figure ES.3* shows a comparison of the water availability used in developing the 2006 Plan to the water availability for the 2011 Plan (supplies from other regions were not included in this comparison).

**Figure ES.3: LCRWPA Water Availability – 2006 vs 2011**




The total amount of water supply for the water user groups (WUGs) in Region K is less than the total available water to the region presented in *Table ES.2*. This condition exists because WUGs generally balance current needs with cost of water and provide additional supplies as they are needed throughout the planning period. As an example, a WUG on groundwater with a current need of 1 million gallons per day (mgd) will not drill wells to provide 10 mgd to meet its future needs. The water may still be available in the aquifer, but the WUG only has the capability to serve its current needs plus some adequate factor of safety. In general, water supplies for the WUGs are responsive to current needs, location relative to the source, and infrastructure limitations. There is water available in Region K that is not currently being used by WUGs because they do not have the needs right now, or they do not have the means to utilize the source at this time.

## ES.5 IDENTIFIED SHORTAGES

The water supplies (Chapter 3) and projected demands (Chapter 2) for each WUG were compared to determine where shortages, or "needs," are expected to occur. The comparison identified 73 WUGs that would have projected water deficits by the year 2030 under DOR conditions. An additional 19 WUGs are shown with projected water deficits arising between 2030 and 2060.

The estimated water need under DOR conditions for all of Region K is approximately 297,000 ac-ft/yr in 2030 and 370,000 ac-ft/yr in 2060. This identified shortage is based on conservative water availability estimates, which assume (1) only water that is available during a repeat of the historical drought of record (DOR), (2) that all water rights are being fully and simultaneously utilized, and (3) excludes both water available from the Lower Colorado River Authority (LCRA) on an interruptible basis and water projected to be available as a result of municipal return flows to the Colorado River. Based upon these assumptions, water needs have been identified in all of the six water use categories, as shown in *Figure ES.4*, which illustrates the distribution of the number of WUGs with identified water needs in the years 2030 and 2060. *Figure ES.5* shows the magnitude of the identified needs by water use category for the years 2030 and 2060.

Note in *Figures ES.6* and *ES.7* that the category with the largest number of user groups with potentially unmet needs is in the category of municipal users. Irrigation shortages, which are expected to be the largest shortage in 2030, are reduced in 2060.

**Figure ES.4: Number of LCRWPA Water User Groups With Needs**

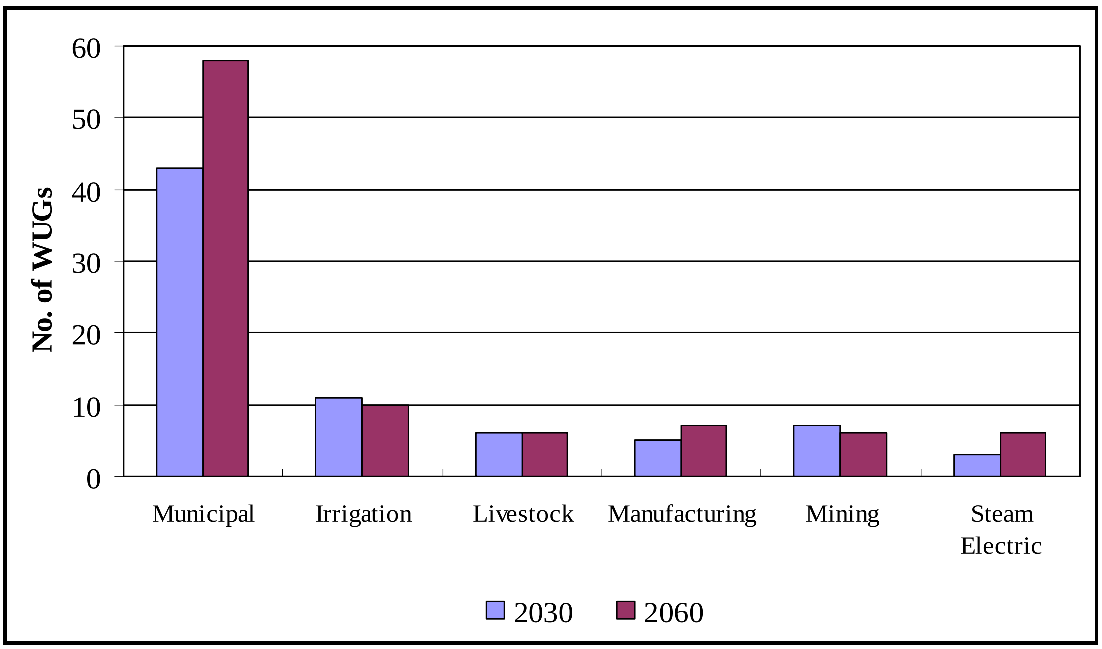
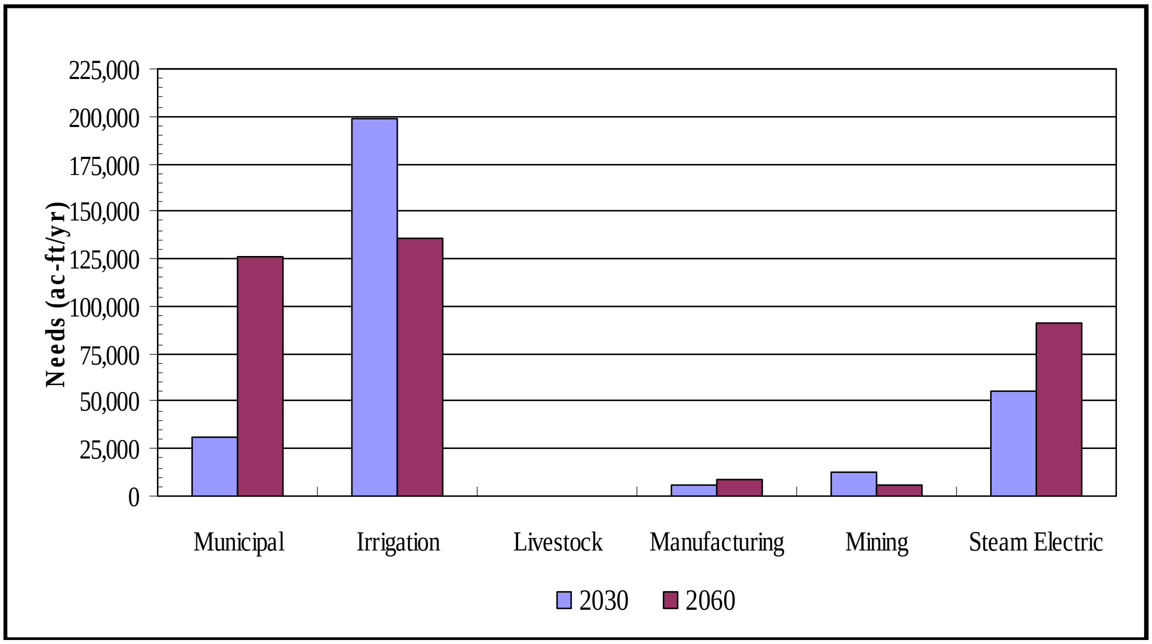


**Figure ES.5: LCRWPA Identified Water Needs by Category of Use**




## ES.6 MANAGEMENT STRATEGIES AND IMPACTS

Several management strategies were assembled to provide for the unmet water needs identified above. Many of the shortages were met with the extension of existing contracts, new contracts, or allocation of existing supplies. Other strategies are more extensive and will require the implementation of conservation measures, drought management, or the construction of additional infrastructure.

### ES.6.1 Utilization of Return Flows

Approximately 60 percent of all municipal diversions by the City of Austin (COA) and others are currently returned to the Colorado River as effluent discharges. Unless otherwise authorized by permit, once discharged to the river, this water is subject to diversion under existing water rights' permits. Further, state law currently allows a water right holder to directly reuse all of its effluent unless its permit restricts such use. The City of Austin does reuse a portion of its return flows, with the remainder being available for downstream use. The Region K Cutoff Model for the Colorado River that was used for this round of planning excludes all sources of return flows in the model when determining water availability.

This exclusion of return flows in the model leads to identification of water shortages for entities that currently use and rely upon the return flows. For purposes of this plan, the strategies considered projected return flows discharged by the COA, the City of Pflugerville, and Aqua Water Supply Corporation. Strategies related to COA's reuse of treated effluent are described in Chapter 4. This plan assumed projected levels of effluent to be discharged by the City of Pflugerville and Aqua Water Supply Corporation of 60 percent of the total projected demand for raw water in 2060, or about 12,500 ac-ft/yr. Effluent not being reused by Austin and these other projected levels of effluent were made available to water rights according to the prior appropriation doctrine. *Table ES.3* shows the estimated amount of return flows that would be released to the river after any direct reuse occurs.

**Table ES.3 Estimated Return Flows (ac-ft/yr)**

| Return Flows | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected COA Effluent minus reuse | 98,638 | 99,792 | 105,750 | 116,775 | 124,632 | 132,660 |
| Projected Pflugerville and Aqua WSC Effluent | | | 1,250 | 5,000 | 9,375 | 12,500 |

### ES.6.2 Wholesale Water Provider (WWP) Management Strategies

LCRA and COA provide water to a large portion of the LCRWPA. Management strategies implemented at the WWP level are capable of alleviating the majority of the shortages within the LCRWPA. *Table ES.4* shows the strategies associated with each of these WWPs and the amounts of water made available to meet the needs of WUGs with shortages.

**Table ES.4 WWP Water Management Strategies**

| WWP | Strategy | Supply From WMS (acre-feet per year) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| LCRA [2] | Irrigation Water Right Amendments [1] | 43,000 | 47,000 | 55,000 | 65,000 | 65,000 | 106,600 |
| | Available Interruptible Water for Irrigation | 255,493 | 196,568 | 137,643 | 78,718 | 19,793 | 0 |
| | New Contracts | 300 | 35,864 | 37,082 | 59,722 | 60,477 | 70,210 |
| | Contract Amendments | 2,862 | 4,340 | 5,176 | 7,488 | 9,965 | 11,953 |
| | LCRA-SAWS Water Project | | 201,950 | 201,950 | 201,950 | 201,950 | 201,950 |
| | Unappropriated Flows and Off-Channel Storage | | | | | | 47,000 |
| | Enhanced Municipal and Industrial Conservation | | | 2,000 | 10,000 | 20,000 | 20,000 |
| | Aquifer Storage and Recovery | | | | 10,000 | 10,000 | 10,000 |
| | Reuse by Highland Lakes Communities | | 500 | 2,000 | 5,000 | 5,000 | 5,000 |
| | Commitment Reductions [3] | 0 | (15,000) | (17,000) | 0 | 0 | 0 |
| City of Austin | Conservation | 11,030 | 18,795 | 24,036 | 25,385 | 30,401 | 36,370 |
| | Direct Reuse (Municipal & Manufacturing) | 5,143 | 13,620 | 22,077 | 30,268 | 36,218 | 40,468 |
| | Direct Reuse (Steam Electric) Travis | 2,315 | 3,315 | 7,315 | 8,315 | 12,315 | 13,315 |
| | Purchase Water from LCRA (Steam Electric) | 0 | 0 | 0 | 20,975 | 20,975 | 26,895 |

[1] These amendments are proposed to meet increased municipal and industrial demand within the lower Colorado River Basin and are also a necessary component of the LSWP.

[2] LCRA's irrigation strategies are discussed in Section ES.6.5.

[3] Reduction in LCRA commitments due to improved efficiency in Ferguson and COA reuse. The use of this strategy is based on calculated surpluses shown in the 2011 Region K Plan only and does not assume that any legal changes to existing commitments would occur as a result of this strategy.

#### *ES.6.2.1 LCRA Management Strategies*

LCRA proposes the use of portions of its Garwood, Pierce Ranch, Lakeside, and Gulf Coast Irrigation Operations' irrigation rights as well as the Highland Lakes as a system for meeting municipal and industrial needs throughout the basin. These amendments to the existing water rights would be made possible through conservation and other programs to reduce overall irrigation demands in the lower basin as part of the Lower Colorado River Authority-San Antonio Water System (LCRA-SAWS) Water

Project[1] (LSWP). These ROR rights could be reallocated by incorporating them into a system operation yield through the use of off-channel reservoirs to capture unused firm yield water as well as some peak flows. An amount of the additional yield created by the LSWP, totaling up to 150,000 ac-ft/yr, is intended for use by Region L in meeting their needs on a temporary basis until up to 2090. In addition, the LCRA is seeking a permit for the remaining unappropriated flows in the Colorado River Basin to help meet future water needs in this basin and in San Antonio.

A portion of this water would be available to expand existing contracts within the basin and provide water to new customers. The Plan also recommends new contracts and the amendment of existing contracts to better allocate supplies to needs in the LCRWPA. Additional water supply options include enhanced municipal/industrial conservation, aquifer storage and recovery (ASR), and reuse by communities around the Highland Lakes.

#### *ES.6.2.2 COA Management Strategies*

The COA plans to meet its future needs with a combination of conservation, municipal effluent reuse, and purchasing additional water from LCRA for steam-electric demands. The COA conservation program has been successful at making significant impact upon peak and average water demands, and this strategy aims to further reduce demands placed on the city's supplies by continuing these efforts. Reclaimed water will be used, to provide for municipal, manufacturing, and steam electric demands, and this resource will be used in a continuously greater capacity through the decades of the planning period. These supplies will allow COA to meet its own demands and the needs of its wholesale customers.

### ES.6.3 Regional Water Management Strategies

For municipal WUGs with shortages, water conservation was considered before these regional strategies. Amounts of water produced from conservation strategies are shown in *Table ES.10*.

The strategies selected to provide for unmet needs on a regional basis include expansion of current groundwater supplies, development of new groundwater supplies, the transfer or allocation of water from WUGs that have an anticipated surplus through 2060, and drought management. The expansion of current groundwater supplies involves the pumpage of additional water from groundwater sources by WUGs already served by groundwater. WUGs that are recommended to develop new groundwater supplies will need to construct new well fields to obtain the additional supplies. The transfer and allocation of water is intended to utilize water that is in excess of a WUG's anticipated demands through the 2060 decade. Temporary drought period use of aquifers was recommended for a few WUGs in the LCRWPA, to be carried out only when maximum demands corresponded with minimum anticipated supplies. Drought management was recommended for a few WUGs that are either already incorporating drought management through existing regulations, or for WUGs that have limited options for additional supply. In the future, the planning group may decide to recommend drought management on a more region-wide basis, as conservation is.

*Table ES.5* lists aquifers recommended for expansion of current groundwater supplies and the amount of additional water supplies obtained from each. This strategy will provide supplies to WUGs in Bastrop, Burnet, Colorado, Fayette, Hays, Llano, Matagorda, Mills, Travis, and Wharton Counties.

[1] This project is the subject of litigation. For a description of the status of the project *see* p. 4-35.

**Table ES.5 Expansion of Current Groundwater Supplies**

| Aquifer | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Carrizo-Wilcox | 4,350 | 5,815 | 8,476 | 9,779 | 12,950 | 12,920 |
| Ellenburger-San Saba | 681 | 756 | 788 | 1,229 | 1,633 | 2,076 |
| Gulf Coast | 4,486 | 4,261 | 3,659 | 2,573 | 1,185 | 1,409 |
| Hickory | 62 | 62 | 62 | 62 | 62 | 62 |
| Queen City | 98 | 40 | 40 | 31 | 24 | 17 |
| Sparta | 188 | 208 | 129 | 129 | 129 | 129 |
| Trinity | 428 | 431 | 988 | 937 | 1,147 | 1,124 |
| Yegua-Jackson | 0 | 0 | 0 | 0 | 0 | 9 |
| Other Aquifer | 0 | 416 | 777 | 1,366 | 2,017 | 2,814 |
| **TOTAL** | **10,293** | **11,989** | **14,919** | **16,106** | **19,147** | **20,560** |

The strategy to develop new groundwater supplies will require the construction of new well fields to deliver groundwater to WUGs in Bastrop, Colorado, Fayette, Hays, and Llano Counties. The development of new groundwater supplies from the Edwards-BFZ would involve a new well field over the Saline Zone of the Edwards-BFZ Aquifer in eastern Travis County that would pump saline groundwater. Desalination of the water would occur on-site prior to connecting to an existing distribution system that would distribute the water to customers in southern Travis and northern Hays County. The new supplies from this strategy are shown in *Table ES.6*.

**Table ES.6 Development of New Groundwater Supplies**

| Aquifer | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Carrizo-Wilcox | 0 | 1,687 | 1,687 | 1,687 | 2,662 | 2,933 |
| Edwards-BFZ* | 0 | 250 | 2,750 | 2,850 | 5,500 | 7,100 |
| Ellenburger-San Saba | 478 | 478 | 478 | 478 | 519 | 542 |
| Hickory | 512 | 488 | 406 | 331 | 261 | 196 |
| Queen City | 0 | 0 | 0 | 0 | 0 | 580 |
| Trinity | 0 | 0 | 75 | 200 | 301 | 400 |
| Other Aquifer | 4,291 | 4,291 | 4,370 | 4,582 | 4,839 | 5,180 |
| **TOTAL** | **5,281** | **7,194** | **9,766** | **10,128** | **14,082** | **16,931** |

* This strategy uses brackish groundwater from the Saline Zone of the Edwards-BFZ Aquifer

The transfer strategy was utilized for WUGs with shortages that are located in multiple counties or basins. This strategy moves the surplus from the county/basin with the surplus to the one with the shortage. The WUG receiving the transferred supplies is shown in *Table ES.7*.

**Table ES.7 Transfer Water Strategy**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Goforth WSC | Travis | Colorado | 11 | 21 | 30 | 37 | 43 | 48 |
| **TOTAL** | | | **11** | **21** | **30** | **37** | **43** | **48** |

The allocate water strategy typically moves water from a County-Other WUG to various WUGs with shortages in the same county. The supplies that are being reallocated were estimated in the 2001 Plan. The water demands have changed and the number of WUGs included in County-Other has changed since the last plan; therefore, this strategy involves adjusting the 2001 supply allocation estimates to better represent the current plan conditions. The WUGs receiving the allocated supplies from this strategy are shown in *Table ES.8*.

**Table ES.8 Allocate Water Strategy**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Cimarron Park Water Company | Hays | Colorado | 17 | 110 | 0 | 0 | 0 | 0 |
| Irrigation | Mills | Colorado | 50 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | | | **67** | **110** | **0** | **0** | **0** | **0** |

Temporary drought period use of aquifers was found to be the most cost-effective strategy for two WUGs in the LCRWPG. During some severe drought periods, these WUGs would use groundwater in excess of the sustainable yield of the aquifer temporarily to meet their needs. This strategy would only be required to meet drought shortages and would not pose a long-term impact on the aquifer. *Table ES.9* lists the WUGs that this strategy has been recommended for and the supplies expected to be pumped in excess of the groundwater sustainable yield.

**Table ES.9 Temporary Drought Period Use of Aquifers**

| WUG Name | County | River Basin | Aquifer | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Irrigation | Bastrop | Brazos | Queen City | 21 | 10 | 0 | 0 | 0 | 0 |
| Manufacturing | Matagorda | Colorado | Gulf Coast | 0 | 0 | 0 | 0 | 0 | 47 |
| **TOTAL** | | | | **21** | **10** | **0** | **0** | **0** | **47** |

Drought management was found to be a cost-effective strategy for some WUGs that have limited options for new supplies or that already reduce their water use significantly during times of critical drought. This strategy involves using public outreach and potentially enforcement to encourage communities to reduce their water use during times of drought by restricting outdoor watering. *Table ES.10* lists the WUGs that this strategy has been recommended for and the water savings expected.

**Table ES.10 Drought Management**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Aqua WSC | Bastrop | Colorado | | | | | | 898 |
| Elgin | Bastrop | Colorado | | | | | | 265 |
| Smithville | Bastrop | Colorado | | | | | | 288 |
| Cimarron Park Water Company | Hays | Colorado | 109 | 109 | 109 | 109 | 109 | 109 |
| Mountain City | Hays | Colorado | 39 | 39 | 39 | 39 | 39 | 39 |
| Manufacturing | Hays | Colorado | 257 | 257 | 257 | 257 | 257 | 257 |
| Goldthwaite | Mills | Colorado | 56 | 56 | 56 | 56 | 56 | 56 |
| **TOTAL** | | | 461 | 461 | 461 | 461 | 461 | 1,912 |

### ES.6.4 Municipal Water Management Strategies

Various municipal water management strategies were selected in addition to the regional management strategies recommended above. Water conservation was a general strategy and was applied to a number of WUGs throughout the LCRWPA, while other strategies were intended for individual WUGs or groups of WUGs.

Conservation was recommended as the first strategy for all municipal WUGs within the LCRWPA that were expected to have a shortage and had a per capita demand in excess of 140 gallons per capita per day (gpcd). The LCRWPG recommends a 1 percent reduction in per capita use annually for all municipal WUGs with shortages and per capita usage above 140 gpcd. *Table ES.11* shows the total reduction in water demand in each WUG by decade and county.

**Table ES.11 Municipal Water Conservation by County**

| County | Water Savings from Municipal Conservation (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Bastrop | 262 | 475 | 795 | 1,224 | 1,438 | 1,728 |
| Burnet | 298 | 758 | 1,351 | 2,043 | 2,685 | 3,408 |
| Fayette | 43 | 104 | 157 | 159 | 167 | 184 |
| Hays | 107 | 294 | 483 | 558 | 666 | 755 |
| Llano | 1,108 | 1,645 | 2,127 | 2,492 | 2,858 | 3,225 |
| Mills | 47 | 100 | 147 | 187 | 223 | 259 |
| San Saba | 13 | 22 | 19 | 15 | 14 | 15 |
| Travis [1] | 12,579 | 21,830 | 28,583 | 31,383 | 37,790 | 45,172 |
| Wharton | 41 | 29 | 18 | 8 | 4 | 4 |
| **TOTAL** | **14,498** | **25,257** | **33,680** | **38,069** | **45,845** | **54,750** |

[1] The amount of savings from Conservation for the City of Austin was provided by City of Austin and is included in this table as well as in *Table ES.4*

Other strategies to reduce needs for specific WUGs can be categorized into two types of strategies:

- Water transmission strategies
- Reservoir strategies

*Table ES.12* lists each strategy and WUG with its associated supply of water it would receive from the strategy.

**Table ES.12 Municipal Water Management Strategies**

| Strategy | WUGs | Supply From WMS (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Water Transmission** | | | | | | | |
| Purchase SW From COA | Hays County-Other | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 |
| HB 1437 | Round Rock | 126 | 246 | 349 | 426 | 536 | 645 |
| **Reservoir Strategies** | | | | | | | |
| Goldthwaite Channel Dam | Goldthwaite | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | | **1,226** | **1,346** | **1,449** | **1,526** | **1,636** | **1,745** |

### ES.6.5 Irrigation Water Management Strategies

Rice irrigators in Colorado, Wharton, and Matagorda Counties have the greatest anticipated needs and would be expected to experience a shortage in every decade if the DOR were repeated. For this reason, irrigation management strategies were selected with the interests of these growers in mind. *Table ES.13* shows each recommended water management strategy (WMS) for rice irrigation and the anticipated yield of each strategy.

**Table ES.13 Rice Irrigation Water Management Strategies**

| Rice Irrigation Strategies | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Continued Use of Austin Return Flows | 18,665 | 19,687 | 22,900 | 27,781 | 30,382 | 33,838 |
| Continued Use of Downstream Return Flows [1] | 0 | 0 | 213 | 850 | 1,594 | 2,125 |
| Water Management Plan-Interruptible Water Supply | 255,493 | 196,568 | 137,643 | 78,718 | 19,793 | 0 |
| | | | | | | |
| On-Farm Conservation | | 34,150 | 34,150 | 34,150 | 34,150 | 34,150 |
| Irrigation District Conveyance Improvements | | 65,000 | 65,000 | 65,000 | 65,000 | 65,000 |
| Conjunctive Use of Groundwater | | 62,000 | 62,000 | 62,000 | 62,000 | 62,000 |
| Development of New Rice Varieties | | 40,800 | 40,800 | 40,800 | 40,800 | 40,800 |
| ***LSWP Subtotal*** | | *201,950* | *201,950* | *201,950* | *201,950* | *201,950* |
| | | | | | | |
| Firm up ROR With Off-Channel Reservoir | | | | | | 47,000 |
| | | | | | | |
| HB 1437 | 4,000 | 4,000 | 4,000 | 4,000 | 14,800 | 25,000 |
| | | | | | | |
| Supply Reduction due to LSWP | | | | | | (71,381) |
| Amendment to Irrigation Rights for Municipal and Industrial Needs | (25,365) | (42,769) | (50,769) | (57,769) | (67,769) | (90,487) |
| **TOTAL** | **252,793** | **379,436** | **315,937** | **255,530** | **200,750** | **148,045** |

[1] The downstream return flows are from Pflugerville and Aqua WSC.

For Irrigation WUGs with shortages outside of Colorado, Matagorda, and Wharton Counties, the following regional WMSs were selected:

- Expansion of current groundwater supplies
- Transfer/Allocate water from WUGs with surplus

- Temporary drought period use of aquifer

### ES.6.6 Livestock, Manufacturing, and Mining Water Management Strategies

The expansion of current groundwater supplies and the development of new groundwater supplies were selected to meet the minor shortages expected for mining and livestock uses. For manufacturing shortages, strategies such as the expansion of current groundwater supplies, transfer/allocate water from WUGs with surplus, and temporary drought period use were recommended. *Table ES.14* shows the supplies for each category that were used to meet these shortages. These strategies were also discussed in the regional strategy section.

**Table ES.14 Livestock, Manufacturing, and Mining Water Management Strategies**

| Category | Supply to Meet Shortages (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Livestock | 188 | 188 | 188 | 188 | 188 | 188 |
| Manufacturing | 310 | 344 | 454 | 612 | 741 | 934 |
| Mining | 13,550 | 13,146 | 12,366 | 6,972 | 5,574 | 5,794 |
| **TOTAL** | **14,048** | **13,678** | **13,008** | **7,772** | **6,503** | **6,916** |

### ES.6.7 Steam Electric Water Management Strategies

Several strategies were selected to meet shortages in steam electric power demands including the regional strategy of expanding current groundwater supplies. Additional strategies were recommended that would be carried out by LCRA, COA, STP Nuclear Operating Company (STPNOC), and other existing or future steam-electric power facilities.

LCRA has selected the use of water taken from the current Garwood water right to provide for steam electric demands at the Fayette Power Project. Both the Fayette facility and the Garwood Irrigation Operation are operated by LCRA. The reallocation of this supply is described above in Section ES.6.2 and explained in detail in Chapter 4.

COA expects to meet the needs of steam electric facilities in Fayette and Travis Counties through the City's ROR rights, LCRA firm water supplies, and effluent reuse. These strategies are shown below in *Table ES.15* with the anticipated supplies from each.

**Table ES.15 COA Steam Electric Supplies and Water Management Strategies**

| COA Strategies | Supply to Meet Shortages (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| *Supplies* | | | | | | |
| COA Run-of-River | 8,420 | 8,420 | 8,420 | 8,420 | 8,420 | 8,420 |
| LCRA Contracts | 18,674 | 18,674 | 18,674 | 18,674 | 18,674 | 18,674 |
| *Strategies* | | | | | | |
| Purchase from LCRA | | | | 20,975 | 20,975 | 26,885 |
| Direct Reuse | 2,315 | 3,315 | 7,315 | 8,315 | 12,315 | 13,315 |
| Reduction in LCRA Commitment [1] | | (3,000) | (5,000) | | | |
| **TOTAL** | **29,409** | **27,409** | **29,409** | **56,384** | **60,384** | **67,294** |

[1] The use of this strategy is based on calculated surpluses shown in the 2011 Region K Plan only and does not assume that any legal changes to existing commitments would occur as a result of this strategy.

STPNOC will continue to meet its demands with a variety of supplies from ROR rights, existing off-channel reservoirs, and groundwater. Several strategies have also been included to meet deficits that cannot be met with these current supplies. These strategies include, but are not limited to:

- A water right permit amendment
- Blending brackish surface water in their existing reservoir
- Rainwater harvesting

### ES.6.8 Alternative Water Management Strategies

The viability of the future LSWP[2] water management strategy and its use to meet various needs in Region K is currently unclear. As such, the LCRWPG desired to identify alternative strategies that would meet the various needs if the LSWP strategy was no longer an option. In addition, the LCRA is looking at several options to help meet future needs in the decades to come, and would like to include some of the potential strategies as alternative strategies while the evaluation process continues. Mills County is also looking at a potential alternative to meet the needs in their county.

Rice irrigation in the Lower Basin is one water user that has a significant portion of its needs met by the LSWP strategy through agricultural conservation and groundwater development. The recommended group of alternative strategies to meet these specific needs is shown below in *Table ES.16*.

**Table ES.16 Rice Irrigation Alternative Water Management Strategies (ac-ft/yr)**

| Water Management Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Expansion of Gulf Coast Aquifer | 0 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Off-Channel Storage in Reservoirs | 0 | | 30,000 | 40,000 | 40,000 | 40,000 |
| On-Farm Conservation | 0 | 20,000 | 20,000 | 35,000 | 35,000 | 35,000 |
| Irrigation District Delivery System Improvements | 0 | 20,000 | 25,000 | 40,000 | 48,000 | 48,000 |
| Conjunctive Use of Groundwater Resources | 0 | 0 | 0 | 0 | 15,000 | 15,000 |
| Enhanced Recharge of Groundwater | 0 | 0 | 0 | 0 | 17,200 | 17,200 |
| **Total** | **0** | **50,000** | **85,000** | **125,000** | **165,200** | **165,200** |

Alternative new water supply options for LCRA were also developed using their Water Supply Resource Plan. This water would provide additional firm yield to LCRA as a wholesale water provider and could be used to meet various needs throughout Region K, including irrigation needs. *Table ES.17* shows these alternative strategies and the amounts of water they could provide.

[2] This project is the subject of litigation. For a description of the status of the project *see* p. 4-35.

**Table ES.17 LCRA Wholesale Water Supply Alternative Water Management Strategies (ac-ft/yr)**

| Water Management Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Groundwater Importation | 0 | 0 | 0 | 35,000 | 35,000 | 35,000 |
| Brackish Desalination of the Gulf Coast Aquifer | 0 | 0 | 0 | 22,400 | 22,400 | 22,400 |
| **Total** | **0** | **0** | **0** | **57,400** | **57,400** | **57,400** |

Mills County, in coordination with Fox Crossing Water District, has shown interest in a strategy involving the desalination of brackish groundwater from the Ellenburger-San Saba Aquifer. Due to the implementation cost of the strategy, it is not necessarily the most viable strategy at this time, but placing it in the Plan as an alternative strategy allows the county to keep their options open and allow for future growth. Chapter 4 provides more detail on this strategy. *Table ES.18* lists the amount of water available from the strategy.

**Table ES.18 Desalination of Brackish Groundwater from the Ellenburger-San Saba Aquifer (Alternative Strategy)**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| County-Other | Mills | Colorado | 0 | 0 | 384 | 384 | 384 | 384 |

## ES.7 MANAGEMENT STRATEGY IMPACTS

The impacts associated with water management strategies were considered throughout the selection process, and strategies that imposed minimal impacts on the environment existing resources were weighted more favorably than less desirable strategies. The LCRWPG considered impacts to a number of resources, including:

- Water quality
- Existing water rights
- Instream flows
- Bay and estuary freshwater inflows
- Sustainable aquifer yield
- Agricultural water resources
- Threatened and endangered species
- Wildlife habitat
- Public lands

While reuse is projected to increase, municipal return flows are also projected to increase over the planning period. When available, downstream water rights can continue to divert, in seniority order, these return flows. Because the exact amount of reuse and downstream diversion cannot be determined, the amount of return flow available for environmental purposes is uncertain.

The construction of a channel dam on the Colorado River at Goldthwaite would have minor impacts on instream flows but would not affect downstream water rights, as the right for this reservoir would be junior to all existing permits.

The transfer of water anticipated under HB 1437 would constitute an inter-basin transfer to the Brazos River Basin. With this distinction comes the potential for environmental impacts from the introduction of invasive species and issues resulting from mixing water supplies from multiple sources. The greatest potential impacts on the Colorado River Basin would result from the reduced streamflow resulting from the transfer. LCRA will continue to meet the environmental flow requirements as specified in its Water Management Plan (WMP).

The 2002 State Water Plan included a proposal to temporarily transfer up to 150,000 ac-ft/yr of water from the Lower Colorado River Basin to the Region L water planning area. The objective of this proposal was and is to satisfy long-term water shortages in both Region K and Region L. In 2001, the Region K planning group also considered and passed a nine-point policy to be considered by the regional planning group in evaluating the proposed inter-basin transfer of this water to Region L (refer to Chapter 8 Section 8.2.1).

In 2004, LCRA entered into an agreement with SAWS[3] to effectuate this proposal. Prior to finalizing the agreement with SAWS, specific legislation was enacted that imposes several restrictions and requirements on the LSWP (Texas Water Code § 222.030). Specifically, the LCRA Board must find that the contract:

1. Protects and benefit the Lower Colorado River watershed and the authority's water service area, including municipal, industrial, agricultural, recreational, and environmental interests
2. Is consistent with regional water plans filed with the Texas Water Development Board on or before January 5, 2001
3. Ensures that the beneficial inflows remaining after any water diversions will be adequate to maintain the ecological health and productivity of the Matagorda Bay system
4. Provides for instream flows no less protective than those included in the authority's WMP for the Lower Colorado River Basin, as approved by the commission
5. Ensures that, before any water is delivered under the contract, the municipality has prepared a drought contingency plan and has developed and implemented a water conservation plan that will result in the highest practicable levels of water conservation and efficiency achievable within the jurisdiction of the municipality
6. Provides for a broad public and scientific review process designed to ensure that all information that can be practicably developed is considered in establishing beneficial inflow and instream flow provisions
7. Benefits stored water levels in the authority's existing reservoirs

These and additional requirements contained in the legislation and final agreement between LCRA and SAWS mirror many of those contained in the nine-point policy of the 2001 Plan.

[3] This project is the subject of litigation. For a description of the status of the project *see* p. 4-35.

Regional strategies such as conservation, expanded use of groundwater, and development of new groundwater resources are thought to have minimal effects on the environment and natural resources. Preserving a sustainable level of groundwater resources and specifically spring flows is important in maintaining endangered species habitat. Information concerning the impacts of specific strategies can be found in Chapter 4. Chapter 5 discusses the impacts of strategies on water quality and rural areas. Finally, Chapter 7 includes information about the overall impacts of the Plan on water, agricultural, and natural resources of the State.

## ES.8 WATER CONSERVATION AND DROUGHT MANAGEMENT

Water conservation is recommended for all water user groups, although it is calculated and applied in the tables only for WUGs with shortages. Drought management plans are required for all WUGs to address brief periods of water shortage, but are not recommended as long-term management strategies. Drought management plans typically force conservation over a limited period of time. To achieve a sustained reduction in demand, water conservation strategies must be implemented, so that water users do not perceive the required changes as being temporary. Chapter 6 provides information on what types of conservation measures are currently being implemented.

## ES.9 POLICY RECOMMENDATIONS

The regional water planning process provides for RWPGs to make any recommendations they see as desirable regarding regulatory, administrative, or legislative changes to foster wise water planning and water use. Planning Group members deliberated at length about such changes and adopted a series of resolutions reflecting the recommendations outlined below.

### ES.9.1 Management of Surface Water Resources

The LCRWPG recognizes the growing need for use of surface water resources from regions with more plentiful supplies to meet the demands of regions with insufficient water supplies through inter-basin transfer (IBT). However, as this need grows, there is also a growing need for implementing policies that are aimed at protecting the state's surface water supplies. The LCRWPG proposed four major points of policy on protection of surface water resources in order to meet this challenge.

The LCRWPG previously devised and adopted a nine point policy for transporting water outside the Colorado River Basin in the 2001 planning round. These points have been revised and are, again, adopted for this Plan. These guidelines directly impact the proposed water transfers to the South Central Texas RWPG but would also apply to other potential customers for surface water supplies from the LCRWPA.

The LCRWPG also recommended the development of models that will be capable of estimating the interaction between groundwater and surface water. Studying the linkage between these two resources will provide a better understanding of how the complete system behaves when impacted by significant events such as droughts or flooding and would be especially important in areas with close groundwater and surface water interaction. Estimates of the impacts of pumpage on aquifers were in some cases determined by maintaining a percentage of spring flow contributing to a surface resource, so the LCRWPG is already moving in this area.

The conjunctive use of groundwater and surface water was also recommended by the LCRWPG. The combined use of these two resources would be conducted in a way which would minimize the use of groundwater when surface water was available and manage aquifers for sustainable yield.

New electrical generation facilities should provide reasonable assurance that surface and groundwater are available, can be developed, or can be obtained during the facility planning and permitting process.

### ES.9.2 Environmental Flows

Maintaining streamflows to lower reaches and, ultimately, bay and estuary systems is recognized as a major goal for the regional water planning process. Many authorized water diversions were issued prior to the addition of restrictions to protect environmental flows. The LCRWPG recommends legislative changes to protect instream flows by issuing permits with thorough mitigation plans that would assure the maintenance of appropriate environmental flows, and that existing water rights be converted to environmental uses through a voluntary sale or lease of underutilized water rights. In places where unpermitted water is available, the State should set aside water in order to assure critical flows and include provisions in all new permits that would further protect these flows.

### ES.9.3 Environmental-Sustainable Growth

The LCRWPG recognizes the complexities and the seemingly insurmountable political obstacles that prevent the adoption of growth management plans. Therefore, it is the LCRWPG's recommendation that the issue of sustainable growth be addressed primarily through educational efforts. The LCRWPG strongly supports the proposed state-wide Water IQ public education campaign and encourages that this campaign be saturated with information regarding the finite nature of water resources and the inescapable trade-offs that inevitably must occur when water use in a given geographic area or economic sector increases. Care must be taken in such a program to highlight the need for a balance to be sought among competing water uses that would ensure the maintenance of:

- Healthy riparian, riverine, estuarine, and hardwood bottomland ecosystems
- Historic cultural resources
- Regional economic opportunities
- Agricultural development
- Preservation of rural communities

### ES.9.4 Groundwater

Groundwater is an important resource throughout the state of Texas for many communities with no reasonable means of alternative water sources. The role of protecting these supplies has been given to GCDs which are able to manage groundwater with an insight into local needs and concerns. The LCRWPG supports the power of the GCDs to modify the Rule of Capture in order to preserve groundwater quality and quantity but recognizes the authority of the Rule of Capture in locations where no GCD exists. The LCRWPG also supports the creation of a GCD within the LCRWPA if the need arises for such an entity at the local level.

Region K supports GMA-wide cooperation in management of groundwater resources, while also recommending certain improvements to the process provided by HB 1763 of the 79th Legislature. Region K recommends that GCDs be required to manage the resource as necessary for meeting the DFCs set forth in their management plans and ratified through the GMA MAG process rather than using the MAG as a cap on groundwater permitting. Region K supports the use of GMA-wide average DFCs in conjunction with GMA-established pumping patterns as a means of expediting the establishment of MAG numbers. However Region K also understands that an aquifer can vary within a GMA and may require different DFCs to effectively manage the aquifer.

As noted above, the LCRWPA supports the management of groundwater resources at the sustainable level wherever possible. Sustainability is defined as balancing groundwater withdrawals with natural recharge and replenishment to maintain long-term stability in regional or local groundwater supplies. GCDs should incorporate the best available information to assure that this is done.

LCRWPG recommends establishing coordination between water marketing proposals with local GCDs and RWPGs and requiring state agencies to comply with all local GCD rules and state-certified groundwater management plans and all state and regional water plans. LCRWPG also recommends requiring all groundwater export or water marketing projects to coordinate with local GCDs and RWPGs.

LCRWPG supports the funding needs of the TWDB in order to continue maintaining state-wide groundwater databases.

### ES.9.5 Protection of Agricultural and Rural Water Resources

The view of the LCRWPG is that agricultural industries and rural areas are vital to the State. Accordingly, water transfers to serve unmet needs in more urbanized areas should be based on more factors than simply market-driven conditions. Water resources in these areas should be protected through strengthening of GCDs, encouraging the interaction of agricultural and rural users to those in the water market and planning arenas, and protecting IBT source basins.

### ES.9.6 Agricultural Water Conservation

The LCRWPG supports further efforts to promote agricultural conservation practices. The large magnitude of agricultural demands indicates a strong potential for making a major reduction in overall demand through conservation. In particular, the LCRWPG supports increased funding of programs such as the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and future cooperation between municipalities and farmers as in the LSWP.

### ES.9.7 Municipal/ Industrial Conservation

The LCRWPG supports efforts to promote municipal and industrial conservation practices. The LCRWPG supports the development of a consistent methodology for calculating gallons per capita per day (GPCD), by the Texas Water Conservation Advisory Council (TWCAC). Consistent water savings metrics, additional financial assistance to reduce water loss, conservation coordinators, conservation messaging coordination, property owners' associations' outdoor water use policies, dedicated conservation funding are conservation practices that the LCRWPG supports. More information on these water conservation practices can be found in Chapter 8.

### ES.9.8 Reuse

The LCRWPG supports reuse as a water management strategy but acknowledges that the practice has many complex issues that may have long-term impacts. The LCRWPG looks to continue monitoring of legislative activity involving reuse and supports further review of planned reuse projects.

### ES.9.9 Brush Control

The LCRWPG has chosen to adopt a policy to recommend and promote voluntary brush control in the LCRWPA and recommend that state and federal funds be made available to support this effort.

### ES.9.10 Recommended Improvements to Regional Planning Process

Six recommendations were made by the LCRWPG to improve and strengthen continued regional water planning efforts. These include the following points:

- The State should work to coordinate water quantity planning along with water quality planning in the form of the Texas Clean Rivers Program.
- The State should continue funding for data collection that is essential for decisions made in the water planning process.
- The State should continue to provide assistance to the RWPGs in the form of public information materials and administrative support.
- The State should continue the commitment to diversity set forth by the State by improved representation by women and minorities.
- The State should structure the planning process to include and plan for environmental needs.
- The State should provide adequate and timely funding for the regional water planning process to aid in developing effective and environmentally responsible strategies to meet future water needs.

### ES.9.11 Other Policy Recommendations

The LCRWPG also made the following recommendation:

- The State should provide sufficient funding to aid rural communities in treating radionuclides in the Hickory and Marble Falls aquifers and disposing of radioactive wastes generated by the process.

## ES.10 ECOLOGICALLY UNIQUE STREAM SEGMENTS AND RESERVOIR SITES

No sites are recommended for designation for this planning cycle.

## ES.11 ECONOMIC IMPACT OF UNMET NEEDS AND INFRASTRUCTURE FUNDING

This section was not complete at the time of submittal, but will be included in the Final 2011 Regional Water Plan for the LCRWPA.

## ES.12 PUBLIC PARTICIPATION

Regional Planning Group members reached out to interest groups, civic leaders, small water utilities, and the public-at-large. The LCRWPG will have held more than 20 open regular meetings in locations throughout the LCRWPA by March 2010. Two public meetings in Burnet and Bay City and one public hearing in Austin will be held to receive public comments on the Initially Prepared Plan.

Members of the LCRWPG made presentations to civic and special-interest groups throughout the area at various times through the planning process. The LCRWPG also maintained a web page and provided fact sheets about the process and proposed solutions. In this way, the LCRWPG succeeded in providing important information to thousands of regional stakeholders.

The LCRWPG also formed several committees to develop portions of and to help guide and oversee the development of the regional water plan. These committees include the following:

- Population and Water Demand Committee
- SH 130/45 and Northern Hays Committee

All of these efforts made information and updates on the regional water planning process available to thousands of people throughout the entire region. Additional information concerning public involvement can be found in Chapter 10.

## ES.13 REMAINING ISSUES AND CONCERNS

Some of the strategies in this plan are predicated upon identified water needs or possible water supply scenarios which are affected by the outcomes of pending or future permitting processes at the Texas Commission on Environmental Quality (TCEQ). The planning group recognizes that the plan is typically updated on an every five-year cycle, providing regular opportunities to update future plans to reflect the resolution of such processes. This plan includes various alternative strategies, which may be needed depending on the outcome of pending or future litigation or permitting processes (see *Section 4.15 Alternative Water Management Strategies* for a discussion of alternative strategies included in the plan).

The LCRWPG has met with the TWDB staff and Region L to resolve the potential interregional conflict regarding the over-allocation of the Carrizo-Wilcox Aquifer in Bastrop County. During this planning round, the LCRWPG worked diligently to avoid over-allocation of this water source within Region K. In fact, there is not sufficient availability of the Carrizo-Wilcox Aquifer supplies to meet all of the projected demands for those WUGS which currently rely on this aquifer for their municipal supplies; consequently, additional water management strategies in addition to expansion and development of groundwater supplies have been recommended during the latter decades of the plan to meet those needs. Bastrop County is an area of Region K that is growing very rapidly with growth rates exceeding previous projections. As a result, the 2011 Region K Water Plan includes significantly revised population and water demand numbers for this round of planning which reflect that projected high growth rate. Many of the municipal WUGs in Bastrop County currently rely on the Carrizo-Wilcox Aquifer as their sole or primary water source. In addition, these WUGs already have existing groundwater permits that currently meet or exceed the annual amount of water identified as needed for their future system demands within the fifty-year planning period of the 2011 Region K Water Plan. Unfortunately, the amount of Carrizo-Wilcox Aquifer water currently permitted to WUGs in Bastrop County by the Lost Pines GCD is 43,486 ac-ft/yr, which is already greater than the 28,000 ac-ft/yr that is currently estimated to be the maximum availability of this source. Because these WUGs in Bastrop County already have existing permits that meet or exceed the quantities of water shown as water management strategies in the 2011 Region K Water Plan, and because Region K itself has not over-allocated the Carrizo-Wilcox Aquifer in Bastrop County, it does not appear reasonable to propose plans for these WUGs to develop new water management strategies in order to accommodate export of the groundwater supplies to another County and planning region of the state.

## ES.14 FOR MORE INFORMATION

For information regarding opportunities to obtain additional information about the Region K planning process and how you can participate, please refer to the Region K website or the LCRA web page at: www.regionk.org; www.lcra.org or navigate directly to http://www.lcra.org/water/lcrwpg.html

Full text of the 16 RWPG Adopted Plans will be available on the TWDB web page at: www.twdb.state.tx.us/.

Copies of this Executive Summary and other information materials may also be obtained by calling John Burke, Chairman, Lower Colorado Regional Water Planning Group, 512-303-3943.

Please refer to the body of the Plan for detailed information regarding methodology, projections, and issue discussions.

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## APPENDICES

# CHAPTER 1.0: INTRODUCTION AND DESCRIPTION OF THE LOWER COLORADO REGIONAL WATER PLANNING AREA

## 1.1 INTRODUCTION TO THE PLANNING PROCESS

Sections 16.051 and 16.055 of the Texas Water Code direct the Executive Administrator of the Texas Water Development Board (TWDB) to prepare and maintain a comprehensive State Water Plan. The overall goal of the State Water Plan is to address water supply needs at the local level with the consideration of balancing affordable water supply availability and conserving the State's natural resources and serves as a flexible guide for the development and management of all water resources in Texas.

In February 1998, the TWDB adopted rules establishing 16 regional water planning areas. Each planning area is responsible for preparing a consensus-based Regional Water Plan that will provide for the water needs of its region for the next 50 years. The TWDB incorporates the resulting Regional Water Plans into the State Water Plan, which is updated in 5-year cycles. The first round of Regional Water Plans were completed in January 2001 and incorporated into the 2002 State Water Plan. The second round of regional water planning started in spring 2002. These Regional Water Plans were adopted in January 2006 and incorporated into the 2007 State Water Plan. The third round of regional planning began in summer 2007. It is anticipated that the third round of Regional Water Plans will be finalized and adopted by September 1, 2010. Subsequently, by January 5, 2012, the TWDB will prepare a new State Water Plan..

The Lower Colorado Regional Water Planning Area, initially designated by the TWDB as "Region K," encompasses all or part of 14 counties mostly within the Lower Colorado River Basin from the Hill Country to the Gulf of Mexico (*Figure 1.2*). The Lower Colorado Regional Water Planning Group (LCRWPG), representing the 11 TWDB-required interest groups and two additional regional interest groups, is responsible for the development of the Lower Colorado Regional Water Plan (*Table 1.1*). The TWDB's guidelines require the LCRWPG's Regional Water Plan to complete the following tasks:

- Description of the region (Chapter 1)
- Population and water demand projections (Chapter 2)
- Estimates of currently available water supplies (Chapter 3)
- Identification, evaluation, and selection of water management strategies (Chapter 4)
- Impacts of selected water management strategies on key parameters of water quality and impacts of moving water from rural and agricultural areas (Chapter 5)
- Water conservation and drought management strategy development (Chapter 6)
- Regional plan consistency with State's long term protection goals (Chapter 7)
- Unique stream segments/reservoir sites and Legislative recommendations (Chapter 8)
- Report to Legislature on water infrastructure funding (Chapter 9)
- Public participation and education/input (Chapter 10)

**Figure 1.1 : TWDB Designated Regional Water Planning Areas**

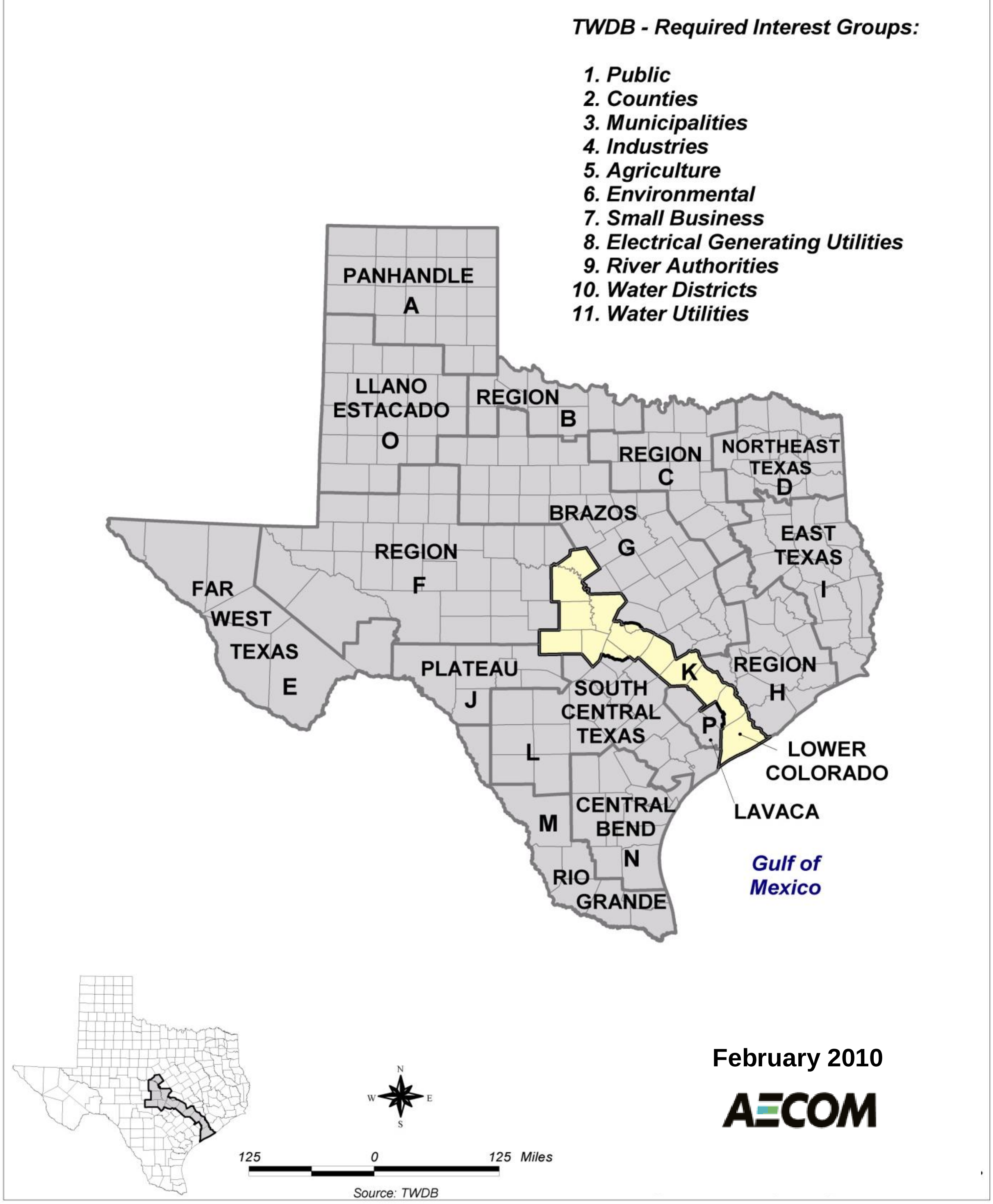


**Figure 1.2 : Lower Colorado Regional Water Planning Area (Region K)**

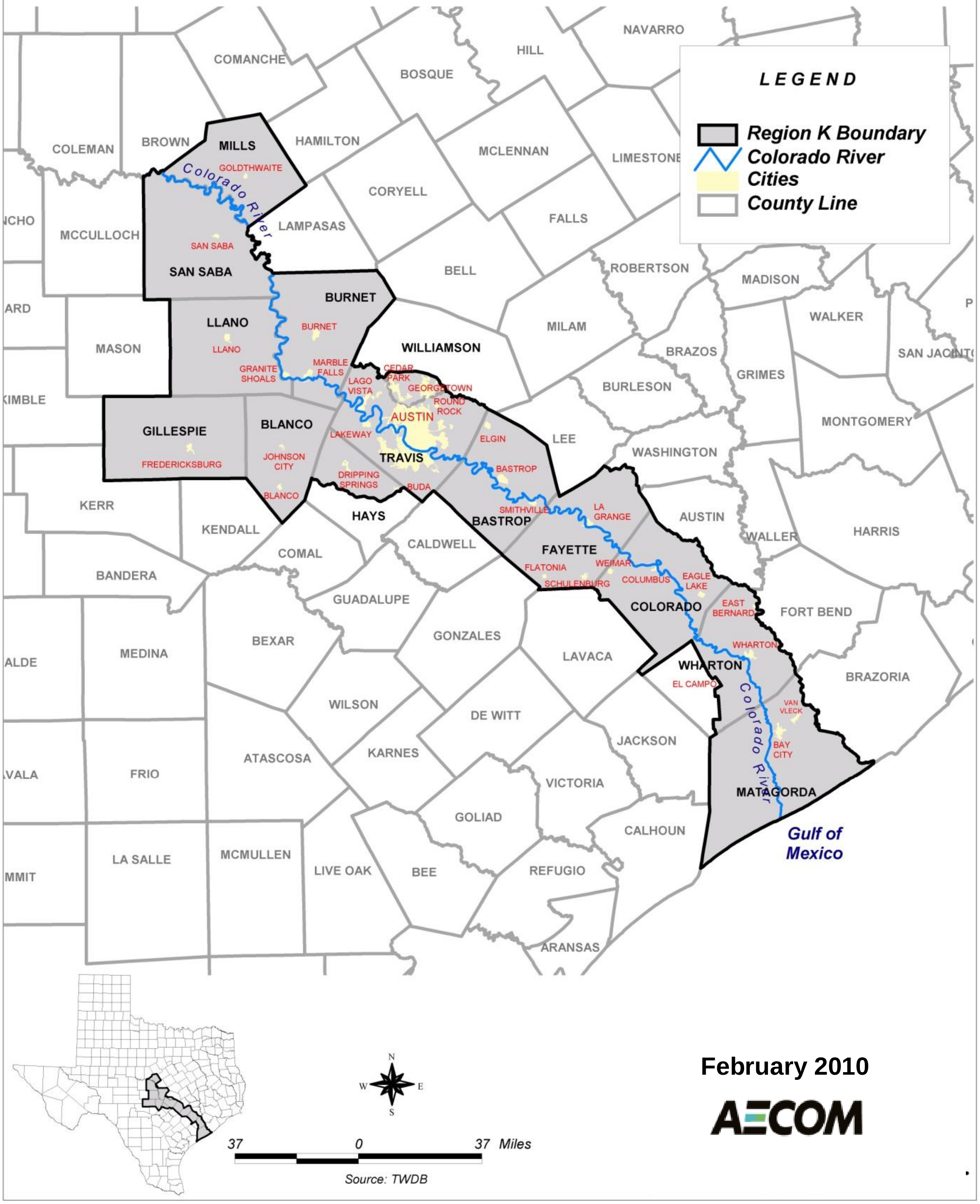


**Table 1.1a The Lower Colorado Regional Water Planning Group Voting Board Members**

| Interest | Name | Entity | County (Location of Interest) |
|---|---|---|---|
| **Public** | Laura Marbury | League of Women Voters | Travis |
| **Counties** | Bill Neve | Burnet County Commissioners Court | Burnet |
| | Billy Roeder | Gillespie County Commissioners Court | Gillespie |
| | James Sultemeier | Blanco County Commissioners Court | Blanco |
| **Municipalities** | Finley deGraffenreid | City of Llano | Llano |
| | Teresa Lutes | City of Austin | Williamson |
| **Industries** | Barbara Johnson | Austin Area Research Organization, Inc. | Travis |
| **Agricultural** | Bill Miller | Rancher | Llano |
| | Haskell Simon | Rice Industry Rep. and Farmer | Matagorda |
| **Environmental** | Jim Barho | Protect Lakes Inks, Buchanan | Burnet |
| | Jennifer Walker | Sierra Club, Lone Star Chapter | Travis |
| **Small Businesses** | Ronald Gertson | | Wharton |
| | Rob Ruggiero | | Travis |
| **Electric Generating Utilities** | Sandra Dannhardt | STP Nuclear Operating Company | Matagorda |
| **River Authorities** | James Kowis | LCRA | Travis |
| **Water Districts** | Ron Fieseler | Blanco-Pedernales GCD | Hays |
| | Paul Tybor | Hill Country UWCD | Gillespie |
| | David Van Dresar | | Fayette |
| **Water Utilities** | John Burke | Aqua WSC | Bastrop |
| **Other(s)** | Roy Varley | | Mills |
| | Bob Pickens | | Colorado |
| **Recreation** | Doug Powell | Emerald Point Marina | Travis |

**Table 1.1b The Lower Colorado Regional Water Planning Group Nonvoting Members**

| | |
|---|---|
| David Bradsby | Texas Parks & Wildlife Department |
| Richard Eyster | Texas Department of Agriculture |
| David Meesey | Texas Water Development Board |

**Table 1.1c The Lower Colorado Regional Water Planning Group Alternate Members**

| | | |
|---|---|---|
| Cynthia Braendle | Terry Bray | Neil Hudgins |
| Terry Fischer | Karen Haschke | Billy Mann |
| Mark Jordan | Harold Sohner | Steve Balas |
| Calvin Ransleben | Bill Stewart | Rick Gangluff |
| Ronny Hibler | Floyd Cooley | Chris Lippe |
| Tyson Broad | John Dupnik | Richard Bowers |

Texas is an extremely diverse state both in climate and economics. This diversity requires the use of a variety of water management strategies, the combination of which will be unique for each of the 16 regions. The types of strategies that may be considered include:

- expected/advanced water conservation
- water reuse
- expanded use of existing supplies
- reallocation of reservoir storage
- water marketing and inter-basin transfers
- subordination of water rights
- yield enhancement measures
- chloride control measures
- new supply development

Water availability, economics, environmental concerns, and public acceptance were considered during the process of developing water management strategies within each region. The final Regional Water Plan must comply with all existing state and federal regulations regarding existing water rights, instream flows, bay/estuary freshwater inflows, water quality, threatened/endangered species, critical habitats, and sites of historical importance.

The overall goal of the State Water Plan is to address water supply needs at the local level with the consideration of balancing affordable water supply availability and conserving the State's natural resources.

## 1.2 DESCRIPTION OF THE LOWER COLORADO REGIONAL WATER PLANNING AREA

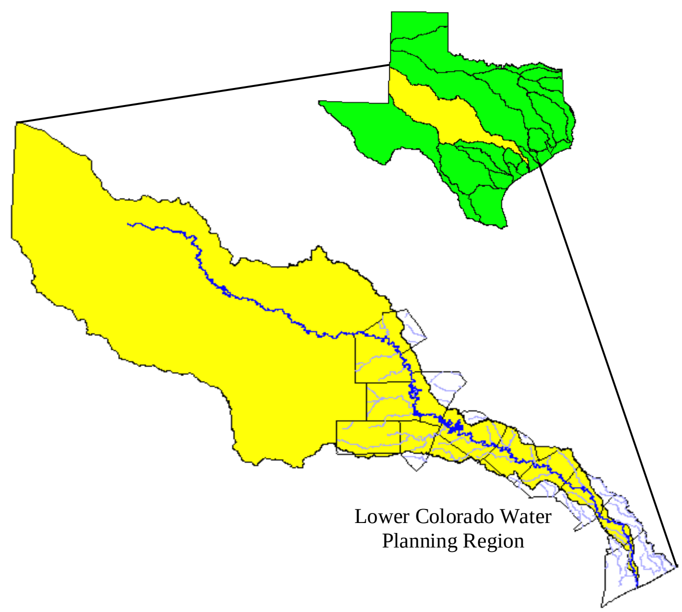
The Lower Colorado Regional Water Planning Area (Region K) encompasses all or part of the following counties:

- Bastrop
- Blanco
- Burnet
- Colorado
- Fayette
- Gillespie
- Hays (partial)
- Llano
- Matagorda
- Mills
- San Saba
- Travis
- Wharton (partial)
- Williamson (partial)

Most of the Lower Colorado Region (Region K) lies within the Colorado River Basin and crosses the Great Plains and the Coastal Plains physiographic provinces. The following sections provide a general description of the area's physical and socioeconomic characteristics, as well as water quality and natural resource issues of importance to the region.

### 1.2.1 Physical Characteristics of the Lower Colorado Regional Water Planning Area[1]

**Figure 1.3: The Colorado River Basin**



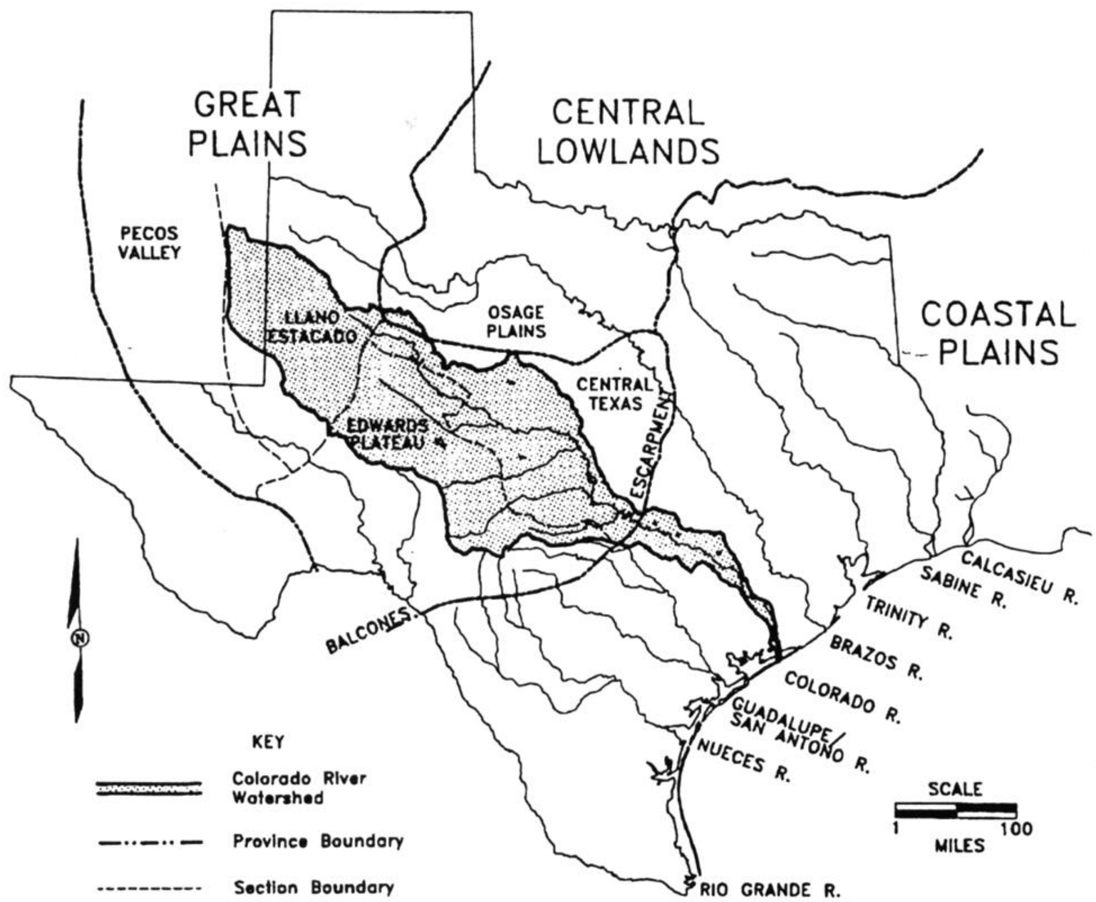

The Colorado River Basin extends well beyond the boundaries of Region K northwest into eastern New Mexico (*Figure 1.3*). From these headwaters, the river travels 900 miles to the Gulf of Mexico. The Colorado River Basin is bordered by the Brazos River Basin to the north and east, and by the Guadalupe River and Lavaca River Basins to the south and west. The total drainage area of the Colorado River is 42,318 sq mi, 11,403 sq mi of which is considered non-contributory to the river's water supply. There are six major tributaries with drainage areas greater than 1,000 sq mi that contribute to the Colorado River: Beall's Creek and the Concho River, above the Region K boundary; and the San Saba, Llano, and Pedernales Rivers as well as Pecan Bayou. All of these major tributaries and approximately 90 percent of the entire contributing drainage for the river occur upstream of Mansfield Dam near Austin. This dam is the primary regulator of water flow from its location south to the Gulf of Mexico. Downstream of Austin, there are only two tributaries with drainage areas greater than 300 sq mi, Onion Creek in Travis County and Cummins Creek in Colorado County.

#### *1.2.1.1 Geology of the Lower Colorado River Basin*[2, 3]

The northernmost boundary of Region K lies in the Central Texas section of the Great Plains physiographic province (*Figure 1.4*). It is here that the Colorado River intersects the broad, low structural zone exposing early Paleozoic and Precambrian igneous and metamorphic formations, called the Llano Uplift. In the northwestern portion of the region, the major southern tributaries and the Colorado River drain the Edwards Plateau section of the Great Plains province, which is characterized by Cretaceous-

[1] Lower Colorado River Authority (LCRA), June 1992. *Instream Flows for the Lower Colorado River*, Final Report.
[2] LCRA, Op. Cit., June 1992.
[3] Texas Water Development Board (TWDB), May 1977. *Continuing Water Resource Planning and Development for Texas, Volume II.*

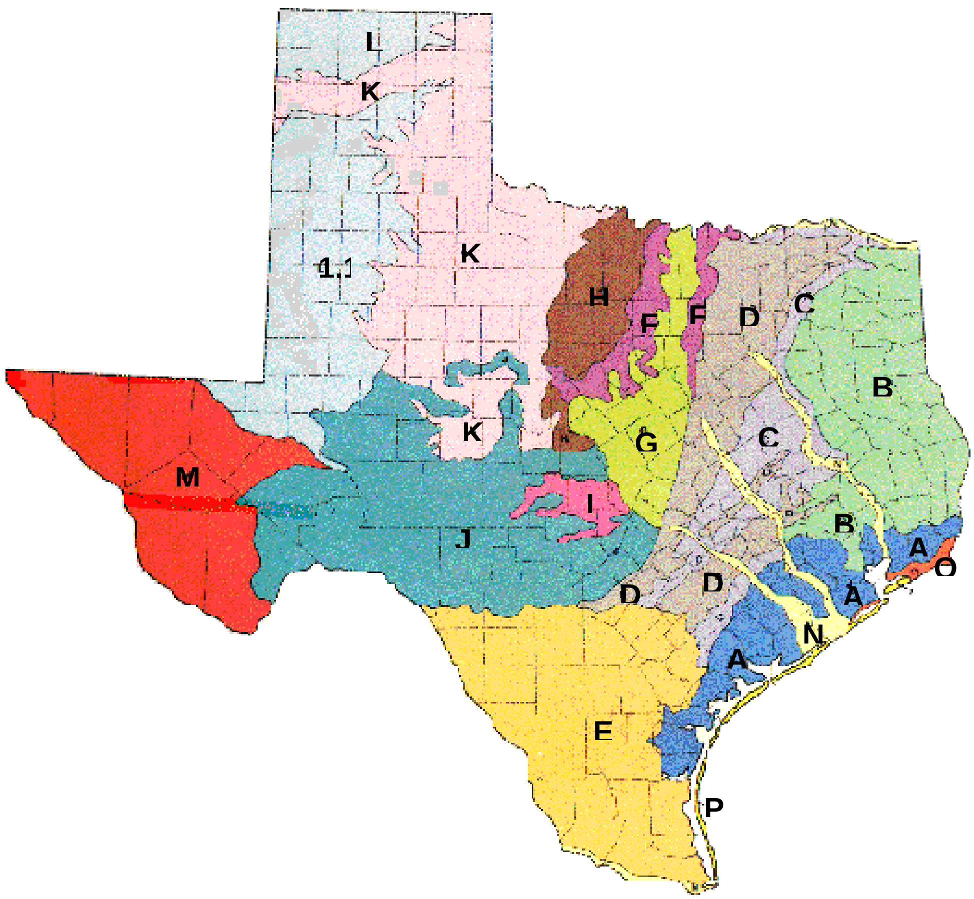
**Figure 1.4: Physiographic Provinces and Major Drainage Basins of the Western Gulf Slope**
(Modified from Conner and Suttkus, 1977)




aged limestone formations overlain by Tertiary-aged sediments. The Colorado River meanders through these limestone deposits in relatively steep narrow canyons in this area; however, there are also flat-topped remnants of the once more extensive Edwards Plateau. At the eastern edge of the Edwards Plateau, the Edwards aquifer outcrops at several locations along the Balcones Fault Zone (shown as the Balcones Escarpment on Figure 1.4), creating aquifer recharge zones and associated natural discharge points or springs, such as Barton Springs in Travis County. Typical soils (*Figure 1.5*) of the Llano Uplift are reddish-brown to brown, neutral to slightly acidic, calcareous, sandy loams. Soils mapped on the Edwards Plateau section typically consist of dark, deep to shallow, stony, calcareous clays.

The Western Gulf Coast section of the Coastal Plains province contains the remaining 300 miles of the Colorado River south of the Balcones Fault Zone in Travis County to the Gulf of Mexico. The Western Gulf Coast section is characterized as an elevated sea bottom with low topographic relief ranging from low hills in the west to coastal flats. Surface geologic units mapped along the next portion of the Colorado River include a relatively narrow band of Upper Cretaceous formations just southeast of the Balcones Fault Zone, followed by a belt of Tertiary deposits that outcrop from Bastrop County southeast

**Figure 1.5: Soils of Texas**
(Source: Bureau of Economic Geology, 1977)




**A** Dark-colored, neutral to slightly acid clay loams & clays; some lighter colored sandy loams; acid soils mostly east of Trinity River.

**B** Light-colored, acid sandy loams, clay loams, & sands; some red soils & clays.

**C** Light-brown to dark-gray, acid sandy loams, clay loams, & clays.

**D** Dark-colored calcareous clays; some grayish-brown, acid sandy loams & clay loams along eastern edge of the major prairie & interspersed in minor prairies.

**E** Dark calcareous to neutral clays & clay loams; reddish-brown, neutral to slightly acid sandy loams; grayish-brown, neutral sandy loams & clay loams; some saline soils near coast.

**F** Light-colored, acid loamy sands & sandy loams.

**G** Dark-colored, deep to shallow clay loams, clays, & stony calcareous clays over limestone.

**H** Reddish-brown to grayish-brown, neutral to slightly acid sandy loams & clay loams; some stony soils.

**I** Reddish-brown to brown, neutral to slightly acid, gravelly & stony sandy loams.

**J** Dark, calcareous stony clays & clay loams.

**K** Dark-brown to reddish-brown, neutral to slightly calcareous sandy loams, clay loams, & clays.

**L** Dark-brown to reddish-brown neutral sands, sandy loams, & clay loams; some very shallow calcareous clay loams.

**M** Light reddish-brown to brown sands; clay loams & clays (mostly calcareous, some saline) & rough stony lands.

**N** Light-brown to reddish-brown, acid sandy loams; acid & calcareous clay loams & clays.

**O** Light- & dark-colored, acid sands, sandy loams, & clays.

**P** Tan, loose sand & shell material.

to Colorado County. The remaining geologic units, from Colorado County to the Gulf of Mexico, are mapped as Quaternary-aged deposits. Sediments in the Western Gulf Coast section are composed primarily of marine deposits such as limestones, marls, and shales; however, the river valley also contains significant fluvial (river) terrace deposits of granitic assemblage, quartz and quartzite, chert, limestone, sandstone, siltstone, hornblende schist, silicified wood, and rip-up clasts. Colorado Basin soils in the Western Gulf Coast section are typically dark, neutral to slightly acidic, clay loams, and clays. Near the coast, soils become light, acidic sands, and darker, loamy to clayey soils.

### *1.2.1.2 Climate*[4, 5, 6]

The climate across the State of Texas varies considerably; however, there are no natural boundaries, and changes occur gradually from east to west. In general, average temperatures, rainfall, and the length of the growing season decrease from the east to the north and west. The upper atmospheric winds, or jetstreams, affect the large-scale weather patterns in the state. The polar jetstream affects the movement of cold arctic air masses from December through February. The moist warm air masses are brought to Texas from the Pacific Ocean by the subtropical jetstream, whose influence is most prevalent during the spring and fall.

Region K lies entirely within the warm-temperate/subtropical zone. The constant flow of warm tropical maritime air from the Gulf of Mexico produces a humid subtropical climate with hot summers across the lower third of the region. This maritime air combines with cooler and drier continental air further inland, which results in a subtropical climate with dry winters and humid summers in the remainder of the region. Winters in Region K typically are mild with frequent, short duration surges of colder continental air masses and strong northerly winds. Average annual net evaporation in Region K varies from 20 to 24 inches at the coast to approximately 44 inches in the uppermost portion of the region (*Figure 1.6*).

The amount of rainfall varies across the Lower Colorado Planning Region from an average of 48 inches at the coast to 24 inches in the northwestern portion of the region (*Figure 1.7*). The rainfall distribution pattern in this region has two peaks: spring is typically the wettest season with a peak in May, and a second peak usually occurs in September and October, coinciding with the tropical cyclone season in the late summer/early fall. The spring rains are typified by convective thunderstorms that produce high intensity, short duration precipitation events with rapid runoff. These thunderstorms are generally caused by successive frontal systems that move through the state. These weak cold air masses are overrun by warm Gulf moisture, and the line of instability that develops where the two air masses come in contact produces thunderstorms. The fall seasonal rains are primarily governed by tropical storms and hurricanes that originate in the Caribbean Sea or the Gulf of Mexico and make landfall on the coast from Louisiana to Mexico. As the storm moves inland, the coverage area for a single tropical cyclone event can be quite large and the storm severe, with wind and flood damage common. Fall cold fronts can also bring widespread, heavy rain events.

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[4] TWDB, Op. Cit., May 1977.
[5] Hatch, S. L., et al. July 1990. *Checklist of the Vascular Plants of Texas.* Texas Agricultural Experiment Station, College Station, Texas.
[6] Jones, B. D., 1990. *Texas Floods and Droughts. In National Water Summary 1988–1989*. U.S. Geological Survey, pp. 513–520.

**Figure 1.6 : Lower Colorado Regional Water Planning Area (Region K) Average Annual Net Evaporation**

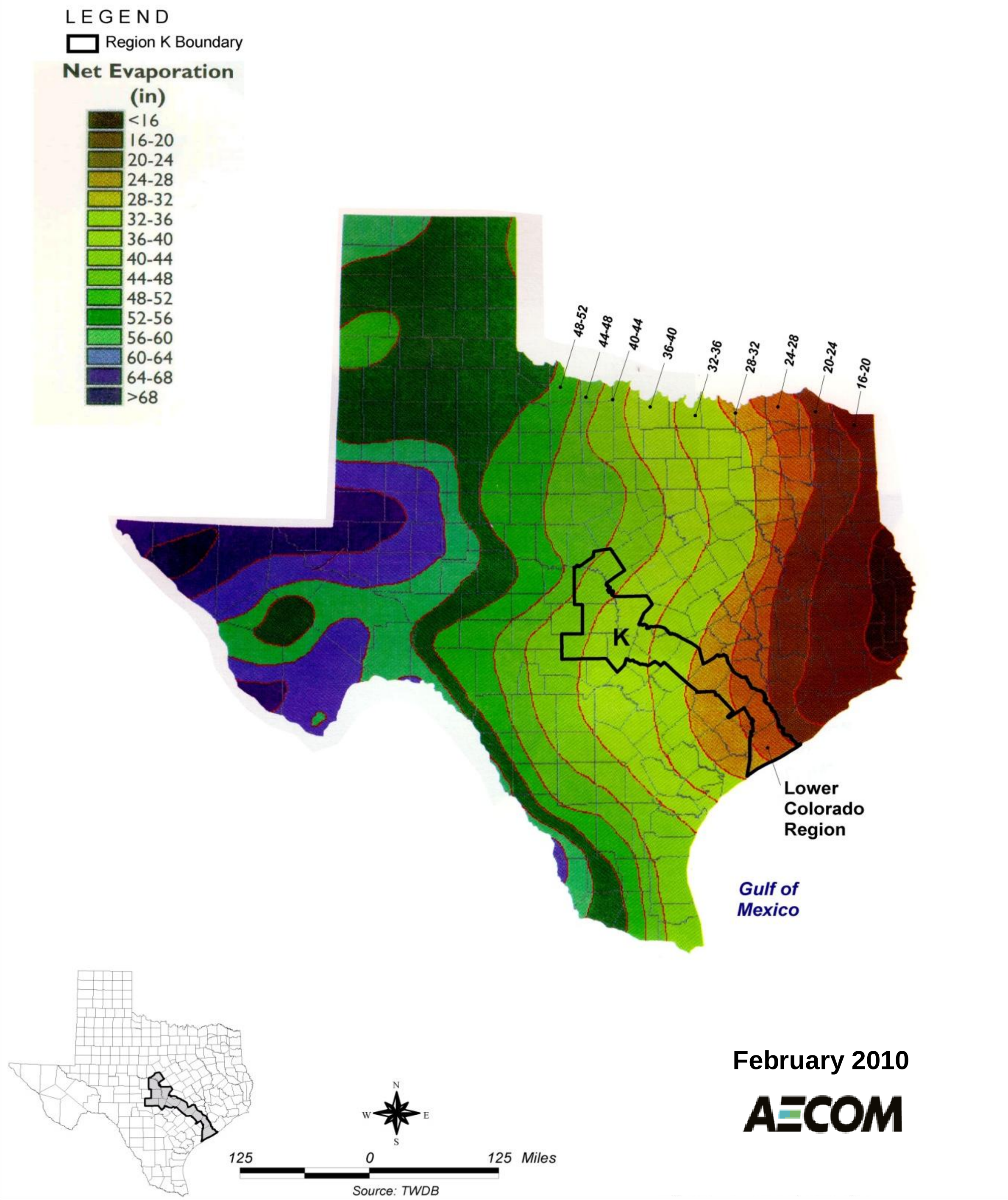
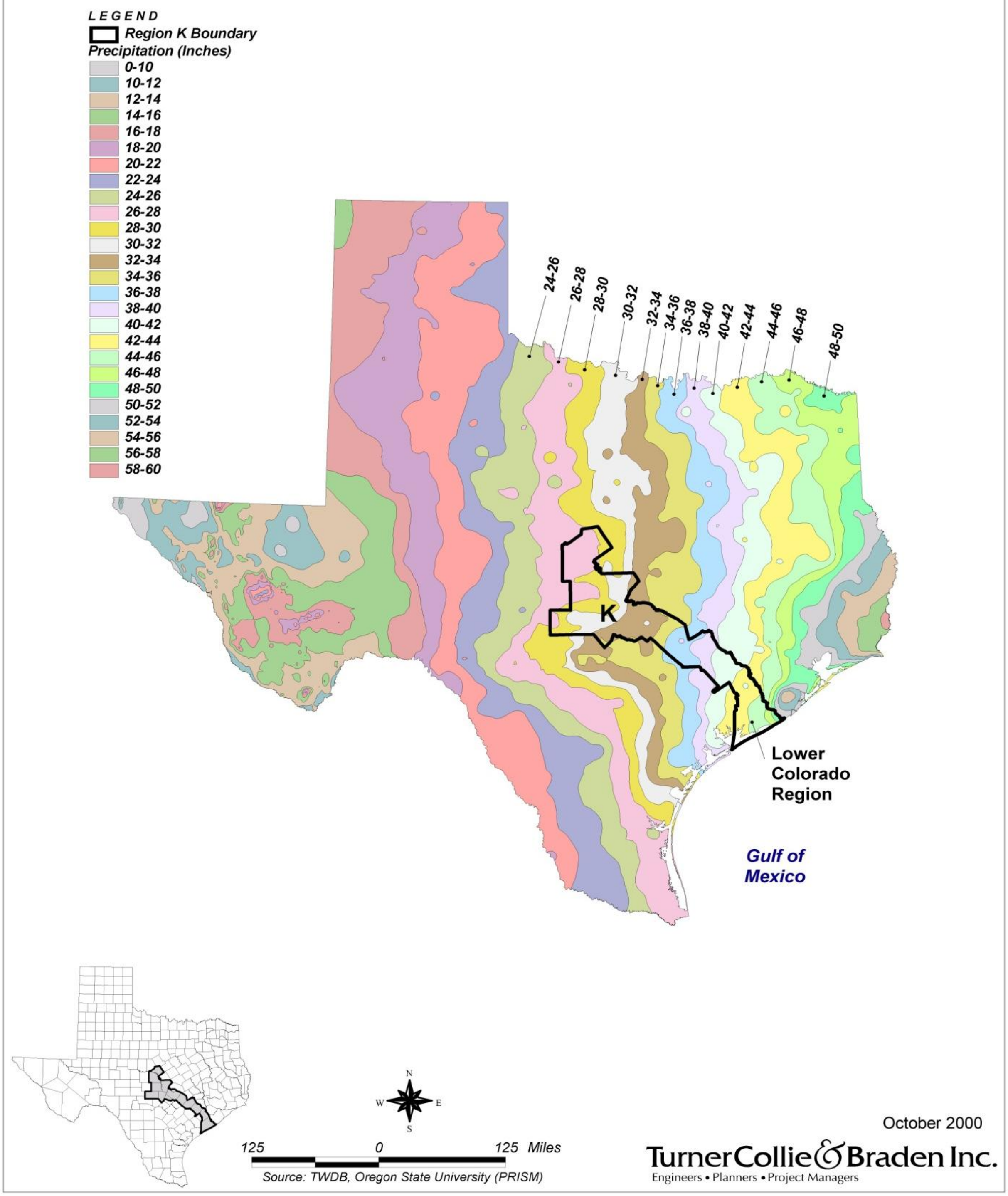


**Figure 1.7 : Lower Colorado Regional Water Planning Area (Region K) Average Annual Precipitation**



The hydrologic characteristics of the Colorado River are closely linked to the precipitation patterns that occur in the river basin, especially the cycles of floods and droughts, which are common in Texas. Major flood and drought events are those with statistical recurrence intervals greater than 25 years and 10 years, respectively. Streamflow gaging data collection began in the early 1900s, and the data show that there has been a major drought in almost every decade of this century. Droughts in Texas are primarily the result of the presence of a strong subtropical high-pressure cell, called a Bermuda High, which becomes stationary over the state and prevents low-pressure fronts from passing through the state. Major droughts can cause stock ponds and small reservoirs to go dry and large reservoirs, such as Lake Travis, can drop their storage levels to less than one-third their capacity. The average annual runoff during the period from 1941 to 1970 ranged from 350 ac-ft/sq mi near the mouth of the Colorado River to less than 50 ac-ft/sq mi in the westernmost portion of the basin's contributing zone, which translates to an overall basin average of 81 ac-ft/sq mi. During this 30-year time period there were three major statewide droughts: 1947 to 1948, 1950 to 1957, and 1960 to 1967. These periods of drought saw average annual runoff values decrease 72 to 80 percent, to 16 to 23 ac-ft/sq mi, which resulted in record low flows in the Colorado River. The most severe of these droughts occurred from 1950 to 1957, in which 94 percent of the counties in the state were declared disaster areas. The drought of record for Region K is the period 1947 to 1957, and these drought-of-record conditions were used in this regional water planning effort.

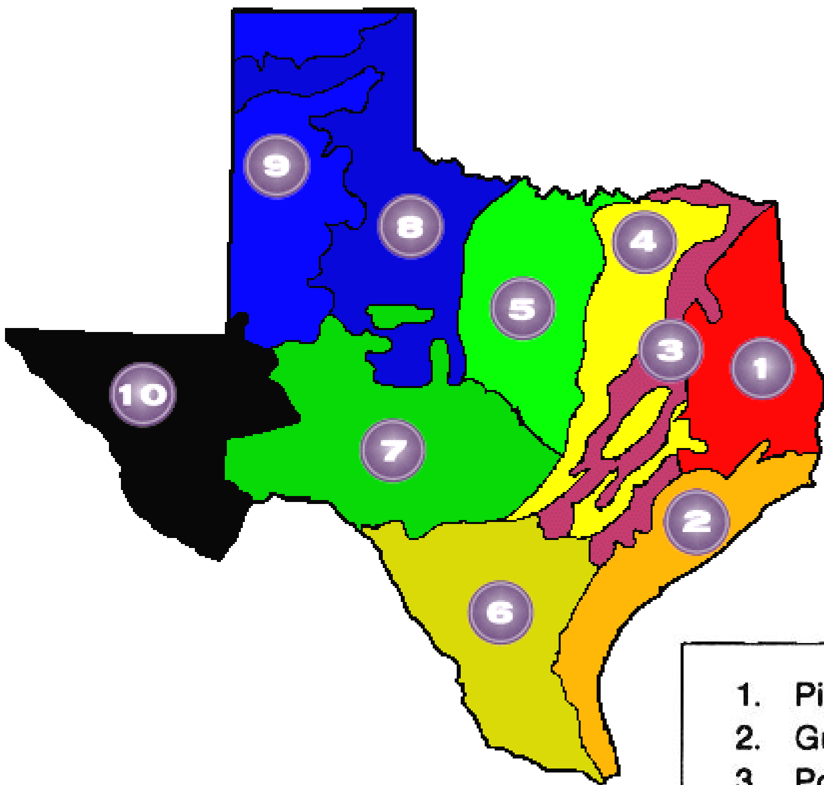
The end of a drought cycle is often marked by one or more flooding events, allowing aquifers and man-made water storage facilities to recharge. The floodplains of the upper Colorado River and its tributaries are typically steep, narrow channels with rocky soils and sparse vegetative cover. During intense rain events this allows for rapid runoff, resulting in sharp-crested floods with high peak discharges and velocities. Downstream, the floodplains become wider with denser vegetation, which decreases these streamflow velocities; however, the massive volumes of water moving down the river basin can still cause a great deal of flood damage. Areas expected to be most prone to flood damage in the Lower Colorado Planning Region are along Lake Travis and Lake Austin, and the Cities of Austin, La Grange, Columbus, Wharton, and Matagorda. Historically, the coastal portion of the river basin is affected by hurricanes two of every five years. The Hill Country in Central Texas has experienced more severe flood events than any other region of the country. In fact, the continental United States record for the most intense 18-hour rainfall occurred in Williamson County in the Brazos River Basin in 1921, with 36 inches of rain. From 1843 to 1938, there were 22 major floods along the Colorado River. The most intense localized flash flood in the Lower Colorado Planning Region in recent history occurred 24 May 1981 in Austin. This storm produced a flood with a recurrence level greater than 100 years, caused $40 million in damages, and was responsible for 13 deaths. Another intense event occurred on 27 June, 2007 in Marble Falls. This storm produced a flood with a recurrence level of greater than 500 years.

### *1.2.1.3 Vegetational Areas*[7]

Natural regions, or vegetation areas, are based on the interaction of geology, soils, physiography, and climate. There are ten vegetational areas that cross the State of Texas and five of these intersect Region K (*Figure 1.8*). These are the Cross Timbers and Prairies, the Edwards Plateau, the Blackland Prairies, the Post Oak Savannah, and the Gulf Prairies and Marshes. Each of these vegetation areas is described below. *Figure 1.9* shows the dominant plant species that occur in Region K.

[7] Hatch, et al., Op. Cit., July 1990.

**Figure 1.8: Vegetational Areas of Texas**
(Source: Dr. Stephen L. Hatch, Texas Agricultural Experiment Station)




1. Pineywoods
2. Gulf Prairies and Marshes
3. Post Oak Savannah
4. Blackland Prairies
5. Cross Timbers and Prairies
6. South Texas Plains
7. Edwards Plateau
8. Rolling Plains
9. High Plains
10. Trans-Pecos

The **Cross Timbers and Prairies** vegetational area includes all of Mills County, most of Burnet County, the north portions of San Saba and Travis Counties, and the section of Williamson County within the Lower Colorado Planning Region. This region falls within the southern extension of the Central Lowlands and the western edge of the Coastal Plains physiographic provinces. There are sharp contrasts in topography, soils, and vegetation in this region due to the wide variety of geologic formations in the area. Elevations range from 500 feet to 1,500 feet above mean sea level. Cross Timber soils are typically of the orders Mollisol and Alfisol. In the East and West Cross Timbers subregions, soils range from light, slightly acid loamy sands and sandy loams with yellowish-brown to red clayey subsoils in the upland areas to dark, neutral to calcareous clayey bottomland soils, and loamy alluvial soils along minor streambeds. The North Central Prairies subregion is interspersed with sandstone and shaley ridges and hills. Uplands are brown sandy loam to silt loam, slightly acid soils that overlay red to gray, neutral to alkaline clayey subsoils. The bottomlands have brown to dark gray, loamy, and clayey, neutral to calcareous, and alluvial soils.

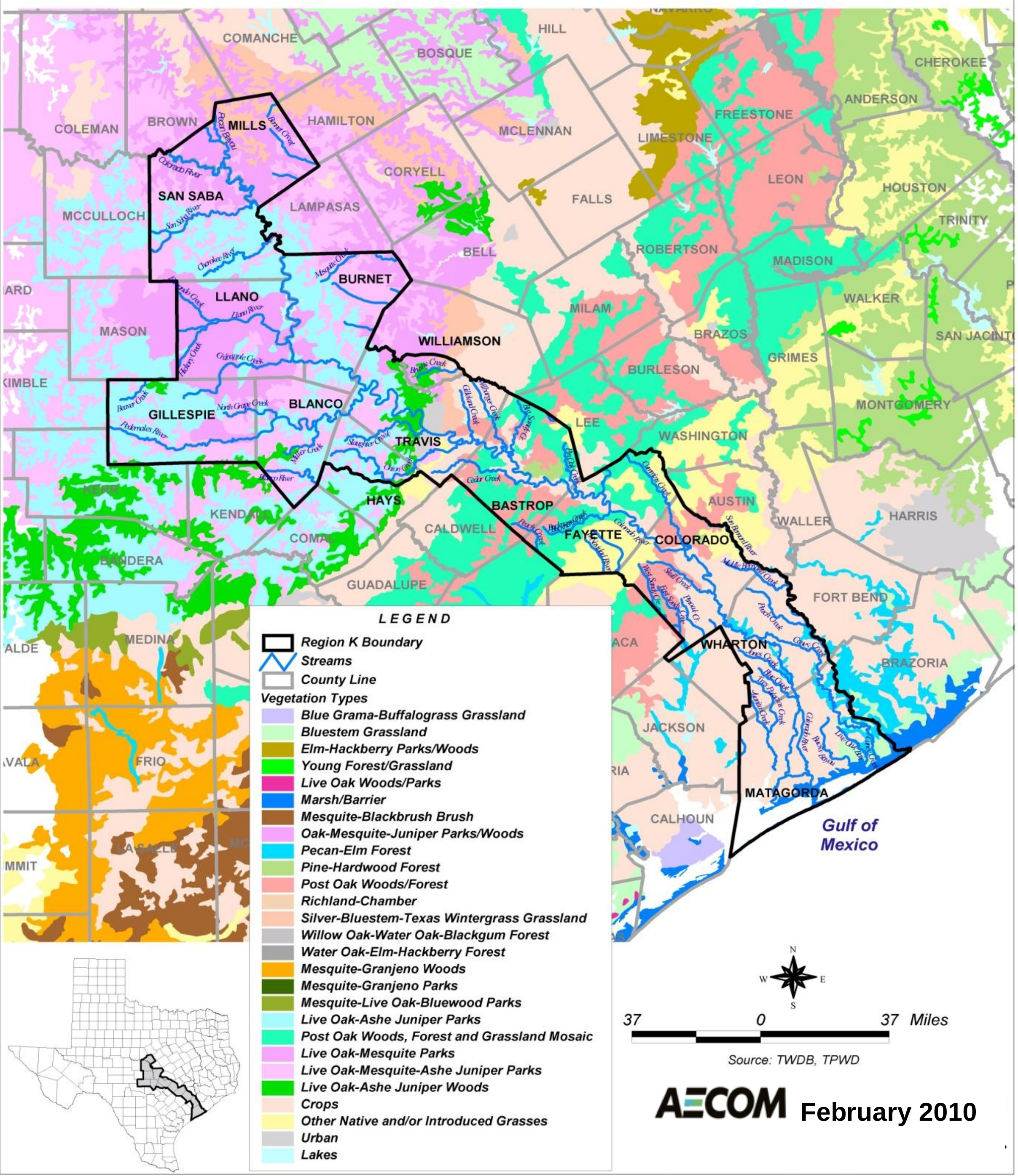
The Cross Timbers and Prairies support tallgrasses such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and Canada wildrye (*Elymus canadensis*), with minor populations of midgrasses and shortgrasses such as sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), hairy grama (*B. hirsuta*), Texas wintergrass (*Stipa leucotricha*), and buffalograss (*Buchloe dactyloides*). Overgrazing has allowed the midgrasses and shortgrasses to increase their range and has allowed the invasion of scrub oak (*Quercus turbinella*), honey mesquite (*Prosopis glandulosa*), and Ashe juniper (*Juniperus ashei*) in upland areas, as well as hairy tridens (*Erioneuron pilosum*), Texas grama (*Bouteloua rigidiseta*), red lovegrass (*Eragrostis secundiflora*), wild barleys (*Hordeum*), threeawns (*Aristida*), fringed-leaf paspalum (*Paspalum setaceum*), and tumble windmillgrass (*Chloris verticillata*). Bottomland trees include pecan (*Carya illinoensis*), oak (*Quercus*), and elm (*Ulmus*), with invasion of mesquite. Typical shrubs and vines include skunkbush (*Rhus aromatica*), saw greenbriar (*Smilax bona-nox*), bumelia (*Bumelia lanuginosa*), and poison ivy (*Rhus toxicodendron*).

Today, approximately 75 percent of the Cross Timbers and Prairies natural region is rangeland and pastureland. White-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), squirrel (*Sciurus spp*.), bob white quail (*Colinus virginianus*), and mourning dove (*Zenaida macroura*) are plentiful.

The **Edwards Plateau** vegetational area consists of an area of West Central Texas commonly known as the “Hill Country” and includes the entire portion of Hays County within the Lower Colorado Planning Region; all of Llano, Gillespie, and Blanco Counties; most of San Saba County; southern Burnet County; and western Travis County. The geologic formation known as the Balcones Escarpment forms the eastern and southern boundary of this region. Elevations range from 1,200 feet to over 3,000 feet above mean sea level, and the landscape is deeply dissected, hilly, rough, and well drained. Edwards Plateau soils are typically shallow Entisols, Mollisols, or Alfisols that have a variety of surface textures and are underlain by limestone.

Historically, the natural vegetation of the Edwards Plateau was grassland or open savannah-type plains with trees or brush along rocky slopes and streambeds. Tallgrasses such as cane bluestem (*Bothriochloa barbinodis*), big bluestem, little bluestem, Indiangrass, and switchgrass, are still common today along rocky outcrops and protected areas with good soil moisture. In areas with more shallow soils, tallgrasses have been replaced by midgrasses and shortgrasses such as sideoats grama, Texas grama, and buffalograss. Typical wildflowers are Engelmann daisy (*Engelmannia pinnatifida*), orange zexmania (*Wedelia hispida*), western ragweed (*Ambrosia psilostachya*), and sneezeweed (*Helenium quadridentatum*). Areas disturbed by over-grazing have been invaded by pricklypear (*Opuntia*), bitterweed (*Hymenoxys odorata*), broadleaf milkweed (*Asclepias latifolia*), smallhead sneezeweed (*H. microcephalum*), broomweeds (*Amphiachyris* and *Gutierrezia*), prairie coneflower (*Ratibida columnifera*), mealycup sage (*Salvia farinacea*), and tasajillo (*Opuntia leptocaulis*). Common woody species are live oak (*Quercus virginiana*), sand shin oak (*Quercus havardii*), post oak (*Quercus stellata*), mesquite, and juniper.

**Figure 1.9 : Lower Colorado Regional Water Planning Area (Region K) Vegetation Distribution**



Land suitable for cultivation occurs only along narrow streams and divides within the Edwards Plateau region and in these areas tree orchards are common. The majority of the region is utilized as rangeland for the production of livestock and wildlife. This area was once one of the major wool and mohair producers in the country, providing up to 98 percent of the nation's mohair; however, the loss of federal mohair subsidies has caused a decline in this industry over the past decade. The Edwards Plateau also supports the largest deer population in North America, and exotic big game ranches are increasing across the region.

Within Region K, the **Blackland Prairies** vegetational area occurs in eastern Travis County, several small sections of Bastrop County, western and eastern portions of Fayette County, and a minor portion of Colorado County. The characteristic topography is gently rolling hills to nearly level with well-defined contours for rapid surface drainage. Elevation varies from 250 to 700 feet above mean sea level. Major soil orders include Vertisols and Alfisols, which are naturally very productive and fertile. Upland soils are dark, calcareous, and clayey. Bottomland soils are typically reddish-brown to dark gray, slightly acid to calcareous, loamy to clayey to alluvial.

The Blackland Prairie once supported a tallgrass prairie dominated by big bluestem, little bluestem, Indiangrass, tall dropseed (*Sporobolus asper*), and Silveus dropseed (*S. silveanus*). Minor species including sideoats grama, hairy grama, Mead's sedge (*Carex meadii*), Texas wintergrass, and buffalograss have increased due to grazing pressure. Erosion and agricultural activities have decreased the productivity of these soils. Common wildflowers include asters (*Aster*), prairie bluet (*Hedyotis nigricans*), prairie-clover (*Petalostemon*), and late coneflower (*Rudbeckia serotina*). Typical legumes are snoutbeans (*Rhynchosia*), and vetch (*Vicia*). Areas disturbed by grazing and agriculture have been invaded by mesquite, huisache (*Acacia smallii*), oak, and elm trees. Oak, elm, cottonwood (*Populus deltoides*), and native pecan can be found in moist drainage areas. Isolated areas of Blackland Prairies are intermingled within the Post Oak Savannah vegetation area.

In the latter 19th and early 20th centuries, approximately 98 percent of the Blackland Prairies vegetational area had been converted to cropland. Pastureland and livestock forage cropland began to increase in the 1950s, and today only 50 percent of the area is used for cropland. Cultivated pastures make up 25 percent of the land area, and the rest is used as rangeland. Significant game species include dove, bobwhite quail, and squirrel.

The **Post Oak Savannah** vegetational area within Region K occurs in most of Bastrop and Colorado Counties and central Fayette County. The region is characterized by gently rolling, moderately dissected wooded plains with elevations between 300 feet and 800 feet above mean sea level. There are several areas of Blackland Prairie intermingled in the southern portion of the Post Oak Savannah. Typically shallow upland soils are gray, slightly acid sandy loams that overlay gray, mottled, or red, firm clayey subsoils. Infiltration-resistant claypan layers occur at varying soil depths, which impedes the percolation of moisture. Bottomland soils are reddish-brown to dark gray, slightly acid to calcareous, loamy to clayey alluvial.

Typically, short oak trees, such as post oak and blackjack oak (*Q. marilandica*), are interspersed among the tallgrass species of little bluestem, silver bluestem (*Bothriochloa saccharoides*), Indiangrass, switchgrass, and midgrass and shortgrass species of Texas wintergrass (*Stipa leucotricha*), purpletop (*Tridens flavus*), narrowleaf woodoats (*Chasmanthium sessiliflorum*), and beaked panicum (*Panicum anceps*). Elms, junipers, hickories (*Carya*), and hackberries (*Celtis*) are also common trees here. Shrubs and vines such as yaupon (*Ilex vomitoria*), American beautyberry (*Callicarpa americana*), coralberry (*Symphoricarpos orbiculatus*), greenbriar (*Smilax*), and grapes (*Vitis*) are typical. Historically, periodic wildfires have suppressed the overgrowth of brush and trees, and in their absence thickets tend to form. Wildflowers characteristic of the true prairie species include wild indigo (*Babtisia*), indigobush (*Amorpha fruticosa*), senna (*Cassia*), tickleclover (*Desmodium*), lespedezas (*Lespedeza*), prairie-clovers, western ragweed, crotons (*Croton*), and sneezeweeds.

The post oak savannah was extensively cultivated through the 1940s; however, today many acres have been returned to native habitat or tame pastureland, which have been seeded with nonnative species such as bermudagrass, bahiagrass, weeping lovegrass, and clover. The region supports game species such as deer, squirrel, and quail.

The **Gulf Prairies and Marshes** vegetational area encompasses all of Matagorda County, the entire portion of Wharton County within Region K, and the eastern tip of Colorado County. This is a 30- to 80-mile-wide strip of lowlands adjacent to the Texas coast from the Louisiana border to the Mexico border. The landscape consists of low, wet coastal marshes, and nearly flat, undissected plains with elevations from sea level to 250 feet. Marsh soils are typically dark, poorly drained, saline and sodic, sandy loams, and clays, and light neutral sands. Prairie soils are characterized by dark, neutral to slightly acid clay loams, and clays, with a narrow belt of light acid sands and darker loamy to clayey soils along the coast. Bottomland and delta soils are typically reddish-brown to dark gray, slightly acid to calcareous, loamy to clayey alluvial.

Original Gulf Prairie vegetation consisted of tallgrasses and post oak savannah. Today, however, trees and shrubs such as honey mesquite, oaks, acacia, and bushy sea-ox-eye (*Borrichia frutescens*) have formed thickets in many areas. Characteristic tallgrasses include gulf cordgrass (*Spartina spartinae*), big bluestem, little bluestem, Indiangrass, eastern gamagrass (*Tripsacum dactyloides*), gulf muhly (*Muhlenbergia capillaris*), tanglehead (*Heteropogon contortus*), as well as *Panicum* and *Paspalum* species. Typical wildflowers include asters, Indian paintbrush (*Castilleja indivisa*), poppy mallows (*Callirhoe*), phloxs (*Phlox*), bluebonnets (*Lupinus*), and evening primroses (*Oenothera*). Common invaders such as yankeeweed (*Eupatorium compositifolium*), broomsedge bluestem (*Andropogon virginicus*), smutgrass (*Sporobolus indicus*), western ragweed, tumblegrass (*Schedonnardus paniculatus*), threeawns (*Aristida*), pricklypear, and many annual wildflowers and grasses have increased their ranges. Saline Gulf Marsh areas support species of sedges (*Carex* and *Cyperus*), rushes (*Juncus*), bulrushes (*Scirpus*), cordgrasses (*Spartina*), seashore saltgrass (*Distichlis spicata*), common reed (*Phragmites australis*), marshmillet (*Zizaniopsis miliacea*), longtom (*Paspalum lividum*), seashore dropseed (*Sporobolus virginicus*), and knotroot bristlegrass (*Setaria geniculata*). Marshmillet and maidencane (*Panicum hemitomon*) are two important freshwater grass species found in the upper coast. Typical aquatic forbs include pepperweeds (*Lepidium*), smartweeds (*Polygonum*), docks (*Rumex*), bushy seedbox (*Ludwigia alternifolia*), green parrotfeather (*Myriophyllum pinnatum*), pennyworts (*Hydrocotyle*), water lilies (*Nymphaea*), narrowleaf cattail (*Typha domingensis*), spiderworts (*Tradescantia*), and duckweeds (*Lemna*). Common halophytic herbs and shrubs found on the salty sands of the coast include spikesedges (*Eleocharis*), fimbries (*Fimbrystalis*), glassworts (*Salicornia*), sea-rockets (*Cakile*), maritime saltwort (*Batis maritima*), morning glories (*Ipomoea*), and bushy sea-ox-eye.

The low coastal marshes of the Gulf Prairies and Marshes vegetational area provide excellent habitat for upland game and waterfowl. Higher elevations of the marshes are used for livestock and wildlife production. These coastal marshes and barrier islands contain most of the State's National Seashore parks. Urban, industrial, and recreational developments have been increasing in this region and cultivation has never been of much importance due to the saline soils and recurrent flooding of the area. However, approximately one-third of the inland prairies region is cultivated. This is also the major area of irrigated crop production, consisting primarily of rice cultivation, for the entire Lower Colorado Region. Bermudagrass and several bluestem species are common in tamed pasturelands. The Gulf Prairies and Marshes region has seen more industrialization than anywhere in Texas since World War II.

#### *1.2.1.4 Water Resources*[8, 9]

The primary surface water feature of Region K is the Colorado River. *Figure 1.10* displays the surface water hydrology characteristics of the region. The major sources of dependable surface water supplies in the region are the Highland Lakes reservoir system and the run-of-the-river (ROR) water from the Colorado River. ROR water rights allow permit holders to divert water directly from a watercourse up to their permitted amounts if the water is present in the river and after downstream senior priority rights are satisfied. Tributary ROR water rights and off-channel storage are also utilized by several water user groups (WUGs). In addition, a small portion of the planning region's surface water supply comes from local supplies within adjacent river basins. There are 12 water supply reservoirs within the Region K boundaries: Goldthwaite, Blanco, Llano, and Cedar Creek reservoirs, Lady Bird Lake, Lake Walter E. Long, and the Highland Lakes System (Lakes Buchanan, Inks, Lyndon B. Johnson, Marble Falls, Travis, and Austin). The major Colorado River ROR water rights holders (based on firm yield) in Region K are the Lower Colorado River Authority (LCRA), City of Austin (COA), and STP Nuclear Operating Company. The City of Corpus Christi, located in Region N, and the Colorado River Municipal Water District, located in Region F immediately upstream of Region K, are also major water right holders on the Colorado River. Region K also has many springs, which are the transition from groundwater to surface water. Overall, there are approximately 43 major and significant springs in Region K, with 19 of those in San Saba County. Other counties include Bastrop County, Blanco County, Burnet County, Fayette County, Gillespie County, Hays County, Llano County, and Travis County. For more information on the springs within Region K, please refer to *Texas Water Development Board Report 189: Major and Historical Springs of Texas, by Gunnar Brune, March 1975*.

Large quantities of fresh to slightly saline groundwater underlie more than 81 percent of the land in Texas. There are nine "major" aquifers that can produce large quantities of water over a large area, and 21 "minor" aquifers that yield smaller amounts of water over smaller geographic areas. At present, 56 percent of the State's annual water consumption is derived from the State's major and minor aquifers, 75 percent of which is used for agriculture. Of these 30 aquifers, five major and six minor aquifers occur within Region K.

The five major aquifers are the Carrizo-Wilcox, Edwards aquifer (Balcones Fault Zone [BFZ]), Edwards-Trinity (Plateau), Gulf Coast, and Trinity (*Figure 1.11*). These aquifers tend to run in curved belts northeast to southwest across the state.

[8] Dallas Morning News, 1999. *Texas Almanac 2000-2001, 60th Edition*, Texas A&M Press.
[9] Texas Water Development Board (TWDB), November 1995. *Aquifers of Texas, Report 345.*

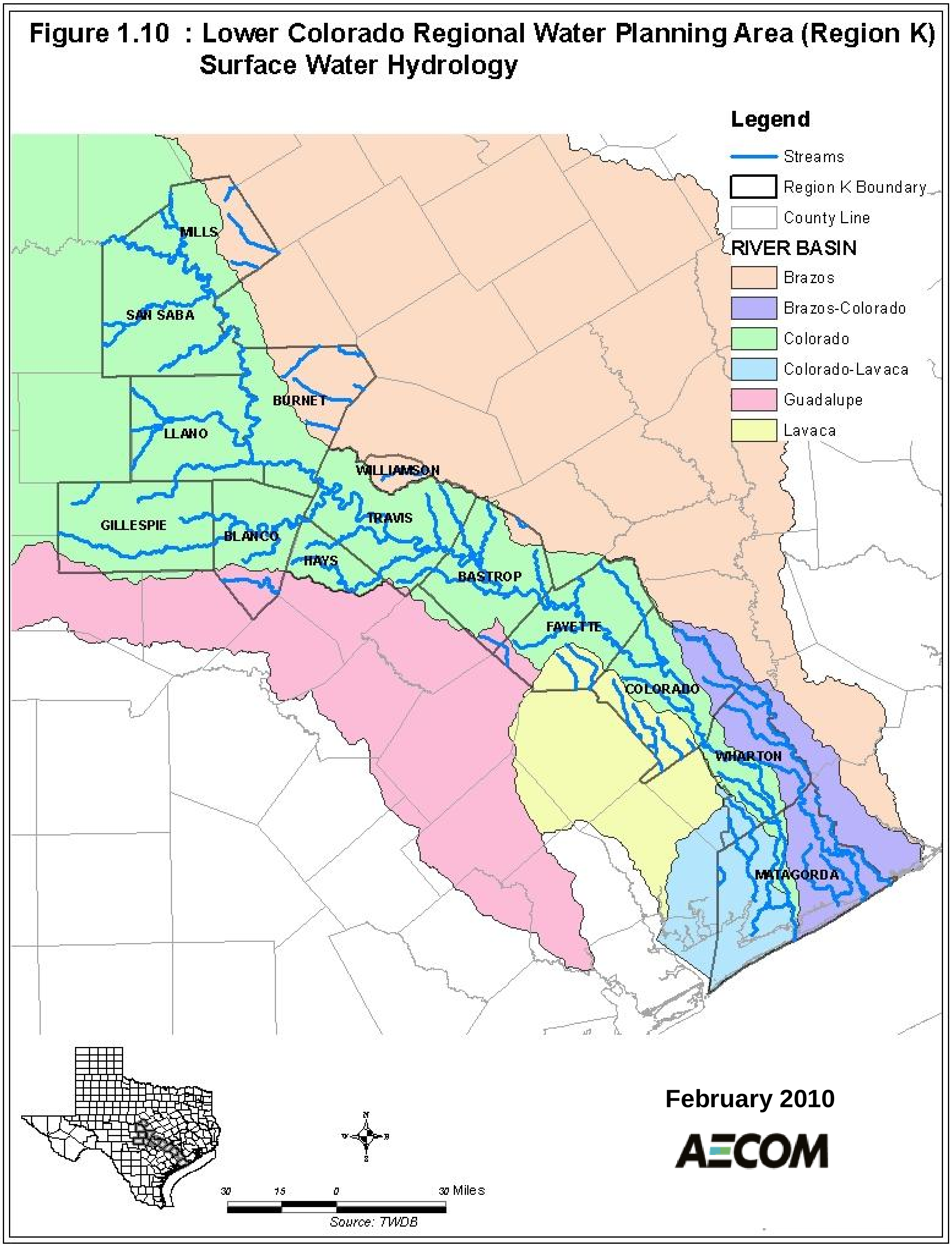


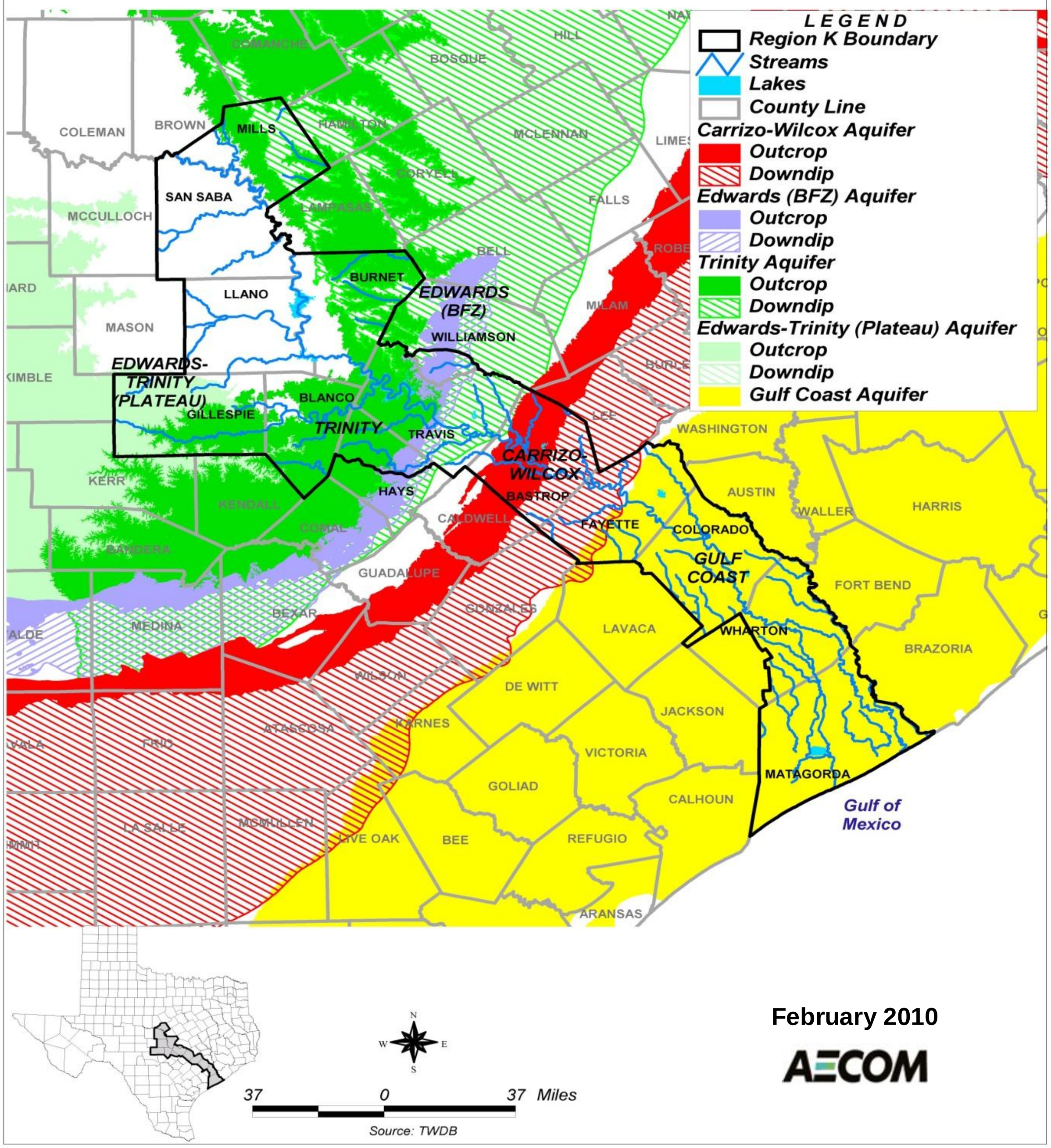
Figure 1.10 : Lower Colorado Regional Water Planning Area (Region K)
Surface Water Hydrology
Legend
Streams
Region K Boundary
County Line
RIVER BASIN
Brazos
Brazos-Colorado
Colorado
Colorado-Lavaca
Guadalupe
Lavaca
MILLS
SAN SABA
BURNET
LLANO
WILLIAMSON
GILLESPIE
BLANCO
TRAVIS
HAYS
BASTROP
FAYETTE
COLORADO
WHARTON
MATAGORDA
February 2010
AECOM
30 15 0 30 Miles
Source: TWDB

The northern most major aquifer in Region K is the Trinity, which has both unconfined water-table and pressurized artesian zones, and covers portions of Mills, Burnet, Gillespie, Blanco, Travis, Hays, and Bastrop Counties. Within the region, the Trinity aquifer contains two major early Cretaceous age formations: the Antlers formation, which consists of a maximum of 900 feet of sand and gravel, with clay beds in the middle section; and the Travis Peak formation, which contains calcareous sands and silts, conglomerates, and limestones. West of the Trinity aquifer in Gillespie County is a small eastern water-table portion of the Edwards-Trinity (Plateau) aquifer. Within the planning region, the Edwards-Trinity (Plateau) aquifer contains saturated sediments of lower Cretaceous age formations and overlying limestones and dolomites. Maximum saturated thickness of the aquifer is 800 feet; however, the eastern portion of the aquifer in Gillespie County is thinner. Overlying a portion of the Trinity artesian zone is the Edwards (BFZ) aquifer, which covers portions of Hays, Travis, and Williamson Counties within Region K. In this area, the aquifer contains both unconfined and artesian zones and feeds the well-known recreational Barton Springs, which contributes an estimated average of 50 cubic feet per second (cfs) of flow to the Colorado River. The Edwards BFZ is primarily composed of early Cretaceous age limestone deposits that have a thickness ranging between 200 feet and 600 feet. This aquifer has a high permeability and transmissivity, making it heavily dependent on consistent recharge and extremely sensitive to environmental stresses. Southeast of the Trinity is the Carrizo-Wilcox aquifer in portions of Bastrop and Fayette Counties. This aquifer contains both water-table and artesian zones and consists of two hydrologically connected formations, the Wilcox Group and the overlying Carrizo formation, which are predominantly composed of Tertiary age sand that is imbedded with gravel, silt, clay, and lignite. The thickness of the artesian zone ranges from 200 feet to 3,000 feet. The southernmost and largest major aquifer within Region K is the Gulf Coast aquifer, which stretches continuously from southeastern Fayette County through Matagorda County. This portion of the aquifer is described as a leaky artesian system, which is composed of Cenozoic age complex interbedded clays, silts, sands, and gravel. In some areas near the Gulf Coast, heavy pumping has caused the intrusion of saltwater into aquifer layers that previously had good water quality. The physical characteristics of this aquifer make it susceptible to dewatering, or a permanent compaction of the clay layer and loss of water storage capacity, as a result of overuse of the aquifer. This compaction can also cause subsidence of surface land overlying the aquifer, which can contribute to flood and structural damage in the area.

The minor aquifers occurring within Region K are the Ellenburger-San Saba, Hickory, Marble Falls, Queen City, Sparta, and Yegua-Jackson (*Figure 1.12*). All six of these aquifers contain unconfined zones and pressurized artesian zones. The Ellenburger-San Saba, Hickory, and Marble Falls aquifers occur in the northwestern portion of the planning region, have discontinuous circular coverage areas, and overlap one another. The Hickory aquifer is composed of the Hickory Sandstone Member of the Cambrian Riley formation, which contains some of the oldest sedimentary rocks found in Texas. This aquifer has a maximum thickness of 480 feet. The Ellenburger-San Saba aquifer has the same general shape as the Hickory and is composed of late Cambrian age limestone and dolomite. San Saba Springs is thought to be supplied primarily by the Ellenburger-San Saba and Marble Falls aquifers, which may be hydrologically connected in some areas. The Marble Falls aquifer occurs in several disconnected outcrops of Pennsylvanian age limestone that form fractures, solution cavities, and channels. The maximum thickness of this aquifer is 600 feet. Numerous large springs are fed by the Marble Falls aquifer, which provide a substantial portion of baseflow to the San Saba and Colorado Rivers in San Saba County. The Queen City, Sparta, and Yegua-Jackson aquifers overlap one another across southeastern Bastrop and northwestern Fayette Counties. The Queen City aquifer is composed of Tertiary age sand, loosely cemented sandstone, and interbedded clay. The maximum thickness of this aquifer is less than 500 feet. The Sparta aquifer overlies the downdip portion of the Queen City aquifer and consists of

Tertiary age sand and interbedded clay. The Yegua-Jackson aquifer consists of interbedded sands, silts, and clays.

**Figure 1.11: Lower Colorado Regional Water Planning Area (Region K) Major Aquifers**



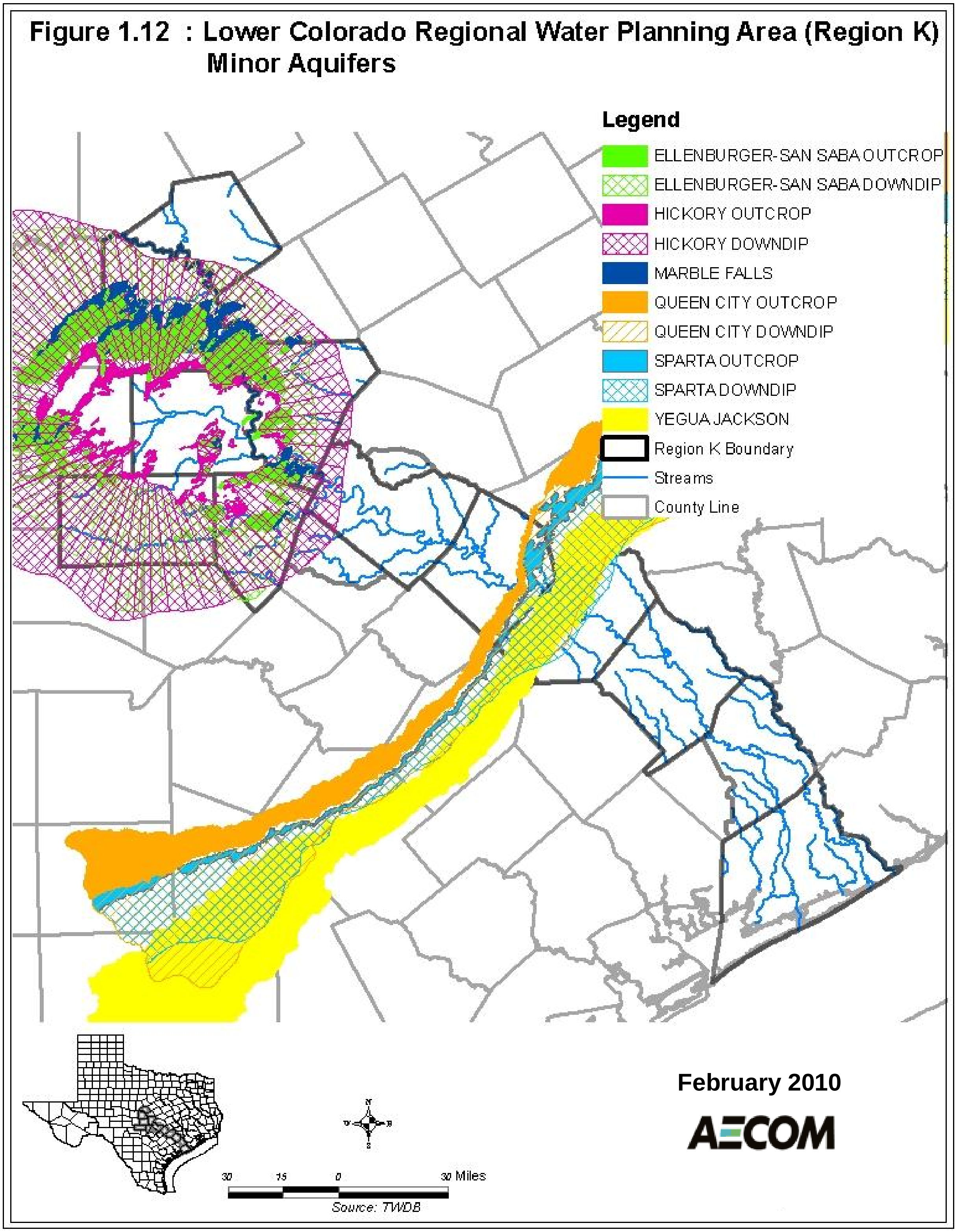


Figure 1.12 : Lower Colorado Regional Water Planning Area (Region K)
Minor Aquifers
Legend
ELLENBURGER-SAN SABA OUTCROP
ELLENBURGER-SAN SABA DOWNDIP
HICKORY OUTCROP
HICKORY DOWNDIP
MARBLE FALLS
QUEEN CITY OUTCROP
QUEEN CITY DOWNDIP
SPARTA OUTCROP
SPARTA DOWNDIP
YEGUA JACKSON
Region K Boundary
Streams
County Line
February 2010
AECOM
30 15 0 30 Miles
Source: TWDB

Surface water and groundwater supply availabilities for Region K are discussed in *Chapter 3* of this report.

### *1.2.1.5 Land Resources*[10]

The majority of Region K falls within the Colorado River Basin and 92 percent of the region's population resides in this portion of the basin. Land use (*Figure 1.13*) in Region K consists primarily of agricultural land in Matagorda, Wharton, Colorado, Fayette, and eastern Travis Counties. Forestland runs through the middle of Colorado and Fayette Counties; western Travis and Burnet Counties; southeastern Llano County; and a significant portion of Gillespie and Hays Counties. Rangeland predominates in Mills, San Saba, northwestern Llano, and eastern Burnet Counties. Blanco County is primarily a mixture of forestland and rangeland. Bastrop County is a mixture of forestland, agricultural land, and rangeland. A significant concentration of urban land only occurs in the Austin metropolitan area.

The State of Texas has 123 state parks and 14 of these, with a total of 28,316 acres, occur within the counties of Region K (*Table 1.2*). The Texas State Park System offers a variety of recreational and educational opportunities, including camping, hiking, fishing, boating, water skiing, swimming, wildlife viewing, picnicking, and tours of nature exhibits and historical sites.

### *1.2.1.6 Wildlife Resources*[11]

There are 17 national wildlife refuges in Texas, comprising over 470,000 acres, and four of these occur within Region K (67,468 acres). Refuges function to preserve and protect critical wildlife habitat for unique, rare, threatened, and/or endangered species. Many refuges allow bird and wildlife viewing, hunting, and fishing during specific times of the year. In addition, the Texas Parks & Wildlife Department (TPWD) currently manages 51 Wildlife Management Areas (WMAs) in the state with a total of 756,464 acres. Two WMAs lie within Region K and encompass approximately 7,500 acres. These areas preserve and manage quality wildlife habitat and can allow compatible activities such as research, hunting, fishing, hiking, camping, bicycling, and horseback riding. *Table 1.3* lists the wildlife refuges and management areas within Region K.

Region k hosts a diversity of plant and animal wildlife species. In addition to the more commonly found species, each county within Region K provides habitat for several threatened or endangered animal and plant species. Endangered species are those at risk of extinction. Threatened species are those likely to become endangered in the future. These designations are made at the state and federal level by the TPWD and the U.S. Fish and Wildlife Service (USFWS). State and federal threatened and endangered species listings for each county in Region K are presented in *Appendix 1A*. Rare species that are not listed as threatened or endangered are also included.

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[10] Dallas Morning News (Texas Almanac 2004–2005).
[11] Dallas Morning News (Texas Almanac 2004–2005).

**Table 1.2 State Parks Located Within the Lower Colorado Region**

| Name | County | Acreage | Description |
|---|---|---|---|
| Admiral Nimitz Museum and Historical Center | Gillespie | 7 | Established in 1969 and contains special exhibits from World War II. |
| Bastrop State Park | Bastrop | 3,504 | Established between 1933 and 1935 and contains the “Lost Pines” isolated region of loblolly pine and hardwoods. |
| Blanco State Park | Blanco | 105 | Established in 1933 along the Blanco River and has fishing for winter rainbow trout, perch, catfish, and bass. |
| Buescher State Park | Bastrop | 1,017 | Established between 1933 and 1936 and was part of Stephen F. Austin's colonial grant; an estimated 250 species of birds can be found in the park. |
| Colorado Bend State Park | San Saba | 5,328 | Established in 1984 and part is in Lampasas Co.; contains scenic Gorman Falls and is home to rare and endangered species including the bald eagle, golden-cheeked warbler, and black-capped vireo. |
| Enchanted Rock State Park | Gillespie and Llano | 1,644 | Established in 1978 along Big Sandy Creek and contains a large granite outcrop that is the second largest batholith in the U.S. Enchanted Rock is also a national natural landmark and a national historic site. |
| Inks Lake State Park | Burnet | 1,202 | Established in 1940 along Inks Lake. |
| Lake Bastrop S. Shore Park | Bastrop | 773 | Established in 1989. |
| Longhorn Cavern State Park | Burnet | 646 | Established between 1932 and 1937 and was dedicated as a natural landmark in 1971. The cave has been used as a shelter since prehistoric times. |
| LBJ State Historical Park | Gillespie | 733 | Established in 1965 along the banks of the Pedernales River; contains LBJ’s home and a portion of the official Texas Longhorn herd, as well as bison, deer, and wild turkey; living-history demonstrations at the restored Sauer-Beckmann house. |
| Matagorda Island State Park | Matagorda | 7,325 | A natural accreting barrier island located offshore between Port O’Conner and Fulton and is home to a variety of migratory and resident wildlife, including 18 state or federally listed endangered species. |
| McKinney Falls State Park | Travis | 744 | Established in 1970. |
| Monument Hill State Historical Park/Kreische Brewery State Historical Park | Fayette | 40/36 | Established in 1907/1977. Memorial to the Salado Creek Battle in 1842 and the “black bean lottery” of the Mier Expedition; and one of the first breweries in the state. |
| Pedernales Falls State Park | Blanco | 5,212 | Established in 1970 and has typical Edwards Plateau terrain with live oaks, deer, turkey, and stone hills. |

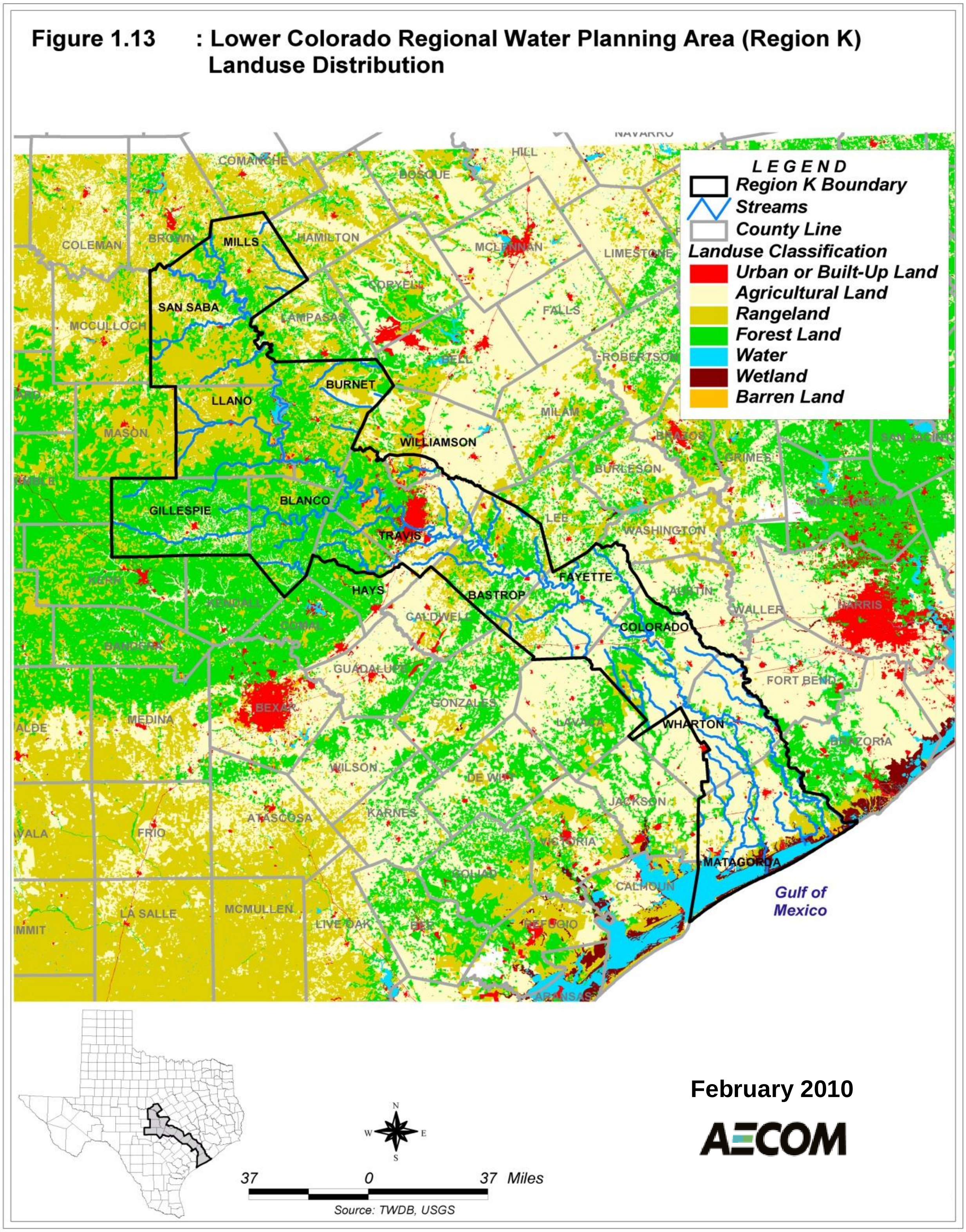


Figure 1.13 : Lower Colorado Regional Water Planning Area (Region K)
Landuse Distribution
LEGEND
Region K Boundary
Streams
County Line
Landuse Classification
Urban or Built-Up Land
Agricultural Land
Rangeland
Forest Land
Water
Wetland
Barren Land
MILLS
SAN SABA
LLANO
BURNET
WILLIAMSON
GILLESPIE
BLANCO
TRAVIS
HAYS
BASTROP
FAYETTE
COLORADO
WHARTON
MATAGORDA
Gulf of
Mexico
February 2010
AECOM
37 0 37 Miles
Source: TWDB, USGS

**Table 1.3 Wildlife Refuges/Management Areas Located Within the Lower Colorado Region**

| Name | County | Acreage | Description |
|---|---|---|---|
| *National Wildlife Refuges* | | | |
| Attwater Prairie Chicken | Colorado | 10,528 | Established in 1972 to preserve habitat for the endangered Attwater Prairie Chicken, which includes native tallgrass prairie, potholes, sandy knolls, marshes, and some wooded areas. |
| Balcones Canyonlands | Travis | 25,000 | Established in 1992 northwest of Austin to protect the nesting habitat of two endangered bird species: golden-cheeked warbler and the black-capped vireo. The refuge will eventually encompass 46,000 acres of oak-juniper woodlands and other habitats. |
| Big Boggy | Matagorda | 4,526 | Coastal prairie and salt marsh along East Matagorda Bay for the benefit of wintering waterfowl. |
| San Bernard | Matagorda | 27,414 | Established in 1968 near Freeport which attracts white-fronted and Canada geese and several species of duck |
| *Wildlife Management Areas* | | | |
| Mad Island | Matagorda | 7,281 | This area allows hunting and wildlife viewing. |
| D. R. Wintermann | Wharton | 246 | This area has restricted access. |

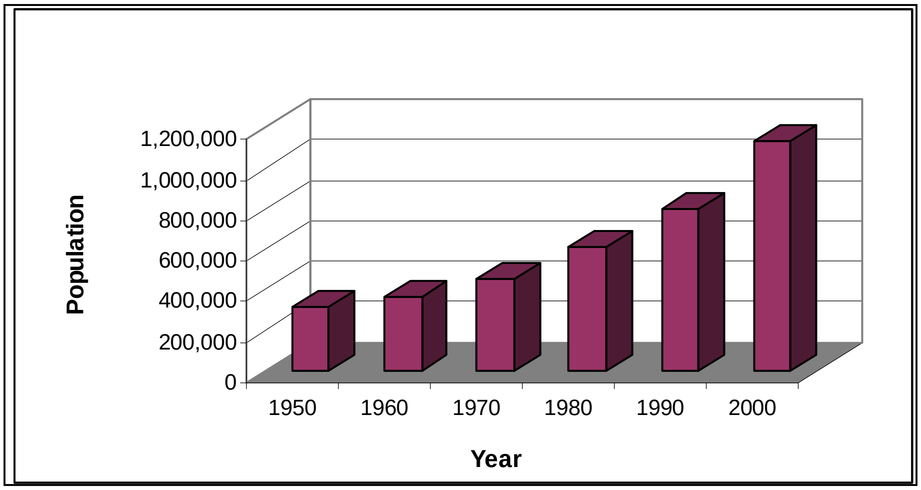
## 1.2.2 Socioeconomic Characteristics of the Lower Colorado Regional Water Planning Area

### *1.2.2.1 Historic and Current Population Trends*[12]

Region K has had a steady increase in population from 1950 to the present. As *Figure 1.14* shows, in 1950 there were approximately 316,573 people, which has increased to an estimated 1,132,228 people in 2000. This corresponds to an overall 257 percent increase in the number of people living in the region during that time period. The average compound annual growth rate for the 1950 to 2000 period was an estimated 2.4 percent. The period from 1990 to 2000 had the largest percent increase of almost 41 percent, or an addition of 331,199 people. The time period of smallest population growth occurred between 1950 and 1960, with an increase of 45,830 persons (14.5 percent). As discussed in Chapter 2, this growth trend is expected to continue for the entire State of Texas, as well as Region K. For the period 2000 to 2060, a compound annual growth rate of 1.5 percent is projected, resulting in a total regional population of 2,831,937 in 2060.

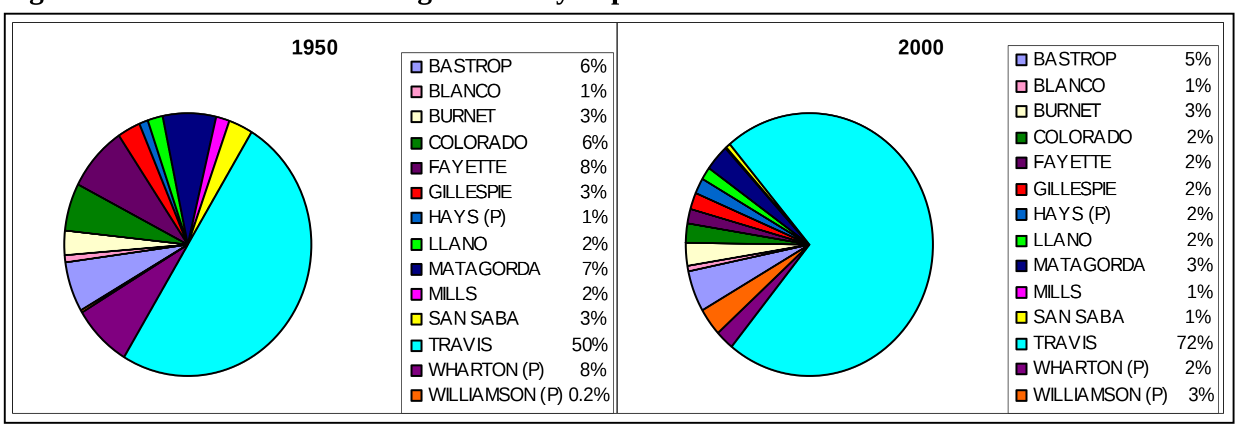
[12] Bureau of the Census, Decadal Censuses of 1950, 1960, 1970, 1980, 1990 and 2000; and Region K historic population data supplied by the Texas Water Development Board for 1980–2000. The Region K 2000 Population projections were developed utilizing year 2000 census data as a starting point with adjustments made by the LCRWPG as necessary. Populations for the Partial Region K counties of Hays, Williamson, and Wharton were estimated by determining the percent decreases observed in projections from the U.S. Census and the TWDB for 1980 and 1990; these percent decreases were then averaged and applied to the 1950, 1960, and 1970 U.S. Census partial-county populations.

**Figure 1.14: Historic Lower Colorado Regional Water Planning Area Population**




Comparison of the region's county population distribution between 1950 and 2000 (*Figure 1.15*) shows that Travis County still contains the majority of the region's population. However, this proportion has increased from 50 percent in 1950 to 72 percent in 2000 due to the rapid growth of the Austin area. Travis County's population has more than quadrupled between 1950 and 2000, with the addition of over half a million people. Hays County has also seen a large population increase with almost eight times as many people living in the county in 2000 as in 1950. Other counties in the region have experienced much smaller growth rates, historically.

**Figure 1.15: Lower Colorado Region County Population Distribution**




Recent population growth, since the year 2000, of the Austin metropolitan area has expanded from Travis County into Bastrop County, Hays County, and Williamson County. With the recent construction of the SH 130 and SH 45 corridors in Travis County, travel between counties has become easier and thus is facilitating increased population growth within a larger radius of the City of Austin. Increased development surrounding the corridors should continue for the next several decades. Areas surrounding the Highland Lakes are also seeing larger increases in population growth, specifically Burnet County and Llano County.

As part of the Phase I studies for this round of planning (Task 3 – Evaluation of High Growth Areas), the LCRWPG evaluated the question of whether the County-Other population projections for 2010 through 2060 in the 2006 Region K Plan was sufficient for handling the growth due to SH 130 as well as the population of County-Other elsewhere in Travis County. Two methods of determining the population projections within the County-Other portion of the SH 130 Corridor were used. The first used population density, which was provided by the SH 130 report written by the Greater Austin Chamber of Commerce. The second method used mid-census data provided by the State as well as growth estimates for several WUGs within the Corridor area that were provided in a study done by the Capital Area Metropolitan Planning Organization (CAMPO), entitled *Revised Draft CAMPO 2035 Regional Growth Concept*. The results of both methods showed that it is likely the County-Other population projections in the 2006 Region K Plan were sufficient. Population projections for other WUGs in the Corridor were updated during Phase II of this round of planning. Please refer to the First Biennium Studies *Evaluation of High Growth Areas Study* (Task 3) for more detailed information of the analysis.

#### *1.2.2.2 Primary Economic Activities*[13, 14]

Economic activities in Region K include agriculture, government/services, manufacturing, mining, and trades. *Table 1.4* lists the primary economic base of each county as well as the breakdown of mining and agricultural activities. *Appendix 1B* has a list of the Region K industry economic value estimates.

[13] Dallas Morning News (Texas Almanac 2004–2005),.
[14] Texas Comptroller of Public Accounts, Texas Economy, www.window.state.tx.us/ecodata/regional/.

**Table 1.4 Lower Colorado Region Primary Economic Activities by County**

| County | Primary Economic Base | Mineral Deposits | Agriculture |
|---|---|---|---|
| Bastrop | government/services, tourism, agribusiness, bio-technology research, computer equipment | clay, oil, gas, lignite | hay, beef cattle, horses, goats, pecans, pine, oak |
| Blanco | tourism, agribusiness, ranch supplies and equipment manufacturing, hunting/fishing | insignificant | cattle, sheep, goats, hay, vegetables, wheat, peaches, pecans, greenhouse nurseries |
| Burnet | stone processing, manufacturing, tourism, hunting | granite, limestone, graphite | cattle, goats, hay, hunting, |
| Colorado | agribusiness, oilfield services/ equipment, manufacturing, mineral processing | gas, oil | rice, cattle, nursery, corn, poultry, hay, sorghum, |
| Fayette | agribusiness, tourism, electrical power generation, mineral production, small manufacturing, government/services | oil, gas, sand, gravel, bentonite, clay | beef cattle, corn, sorghum, peanuts, hay, pecans |
| Gillespie | agribusiness, tourism, government/ services, food processing, hunting, small manufacturing, granite processing | sand, gravel, gypsum, limestone | beef cattle, turkeys, sheep, goats, peaches, hay, sorghum, oats, wheat, grapes |
| Hays (p) | tourism, retirement, some manufacturing | sand, gravel, cement | beef cattle, goats, exotic wildlife, greenhouse nurseries, hay, corn, sorghum, wheat, cotton |
| Llano | tourism, retirement, ranch commerce center, vineyards, granite mining | granite, vermiculite, llanite | beef cattle, sheep, goats |
| Matagorda | petroleum operations, petrochemicals, agribusiness, varied manufacturing, significant tourism, electrical power generation | gas, oil, salt | major rice-growing area, cotton, turfgrass, grains, corn, cattle, catfish |
| Mills | agribusiness, hunting | insignificant | beef cattle, sheep, goats, pecans |
| San Saba | retail pecan industry, tourism, hunting, government/ services | Limestone, rock, quarry | cattle, sheep, goats, pecans, wheat, hay |
| Travis | education, state government, tourism, research, industries, conventions | Lime, stone, sand, gravel, oil, gas | cattle, nursery crops, hogs, sorghum, corn, cotton, small grains, pecans |
| Wharton (p) | oil, agribusiness, hunting, varied manufacturing, government/services | oil, gas | leading rice producing county, cotton, milo, corn, sorghum, soybeans, turfgrass, eggs, beef cattle, rice, aquaculture |
| Williamson (p) | agribusiness, varied manufacturing, government/services, education | stone, sand, gravel | beef cattle, sorghum, cotton, corn, wheat |

(p) - a portion of the county lies within the REGION K boundaries

Agriculture plays a major role in most of the counties in Region K. Livestock accounts for more than 60 percent of the planning region's agricultural cash receipts and important crops include rice, hay, wheat, and cotton. The counties located in the northwestern portion of the planning region depend heavily on livestock production. Rice is the major crop produced in the southernmost counties of Colorado, Wharton, and Matagorda.

The manufacturing sector consists primarily of the technology and semiconductor industries, in the mid-region counties of Bastrop, Travis, and Williamson. The largest single manufacturing industry in the coastal counties is petroleum refining and petrochemicals. Electrical generation is a notable industry in Matagorda County. The South Texas Project Electric Generating Station provides generation capacity to serve more than 2 million homes as well as being the largest employer and source of revenue for the county. At the same time, there has been significant economic growth in food processing, lumber, wood products, and construction supplies for the coastal counties. Textile and apparel industries are found throughout Region K; however, the economic growth rate has been on the decline over the past decade. The construction sector economic trend was productive throughout the planning region due to increases in residential markets, prison facilities, and shopping malls.

In the decade between 1984 and 1994, almost every sector of the regional economy experienced growth, except construction and mining. During this time, average annual employment growth rates for Region K were 2.7 percent for the far northern portion of the region, 3.5 percent for the middle portion, and 1.3 percent for the lower portion of the region.

Population and economic estimates are presented in *Table 1.5* for the Lower Colorado Region by county. Italicized numbers were left unchanged from the January 2006 Region K Water Plan as new data was not available. Individuals in poverty numbers were calculated by multiplying the poverty rate by the resident population.

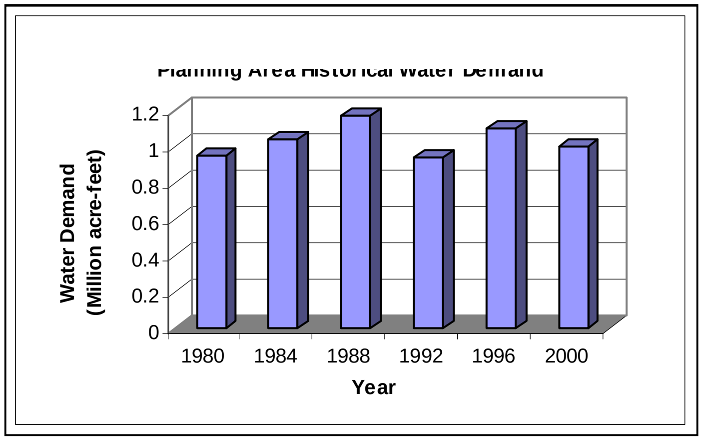
**Table 1.5 Lower Colorado Region County Population and Economic Estimates**

| County Name | July 2006 Resident Population [1] | CY 2006 Personal Income [1] | | CY 2005-2007 | CY 2005-2007 Poverty [2] | | CY 2006 Average Labor Force Employment and Unemployment [3] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Per Capita ($) | Total (millions $) | Median Household Income ($)[2] | Individuals in Poverty | Poverty Rate (%) | Labor Force | Persons Employed | Persons Un-employed | Unemploy-ment Rate (%) |
| Bastrop | 70,396 | $25,830 | $1,818 | $49,799 | 7,673 | 10.9 | 34,274 | 32,681 | 1,593 | 4.6 |
| Blanco | 9,035 | $34,287 | $310 | *$39,369* | *922* | *11.2* | 4,676 | 4,495 | 181 | 3.9 |
| Burnet | 42,398 | $32,023 | $1,358 | $47,355 | 5,215 | 12.3 | 21,389 | 20,507 | 882 | 4.1 |
| Colorado | 20,573 | $30,062 | $618 | $38,167 | 3,168 | 15.4 | 10,723 | 10,261 | 462 | 4.3 |
| Fayette | 22,383 | $33,352 | $747 | $40,882 | 2,820 | 12.6 | 12,033 | 11,588 | 445 | 3.7 |
| Gillespie | 23,203 | $36,682 | $851 | $50,400 | 1,508 | 6.5 | 12,868 | 12,445 | 423 | 3.3 |
| Hays | 133,151 | $27,860 | $3,710 | $52,396 | 20,239 | 15.2 | 69,820 | 66,888 | 2932 | 4.2 |
| Llano | 18,022 | $30,039 | $541 | *$34,830* | *1,733* | *10.3* | 8,168 | 7,785 | 383 | 4.7 |
| Matagorda | 37,122 | $24,962 | $927 | $39,123 | 9,503 | 25.6 | 16,039 | 14,904 | 1,135 | 7.1 |
| Mills | 5,006 | $26,358 | $132 | *$30,579* | *900* | *18.4* | 2,412 | 2,314 | 98 | 4.1 |
| San Saba | 5,973 | $22,821 | $136 | *$30,104* | *936* | *16.6* | 2,566 | 2,439 | 127 | 4.9 |
| Travis | 941,577 | $39,781 | $37,457 | $52,073 | 144,061 | 15.3 | 517,398 | 496,271 | 21,127 | 4.1 |
| Wharton | 40,997 | $28,152 | $1,154 | $39,966 | 6,068 | 14.8 | 20,639 | 19,648 | 991 | 4.8 |
| Williamson | 350,879 | $33,691 | $11,821 | $66,468 | 21,755 | 6.2 | 189,424 | 181,431 | 7,993 | 4.2 |
| Region K [4] | 1,720,715 | $35,787 | $61,580 | - | 226,501 | - | 922,429 | 883,657 | 38,772 | 4.2 |
| Texas | 23,407,629 | $35,166 | $823,159 | $46,248 | 3,955,889 | 16.9 | 11,377,568 | 10, 815,873 | 561,695 | 4.9 |

[1] U.S. Bureau of Economic Analysis (URL: http://www.bea.doc.gov/bea/regional/bearfacts/countybf.cfm)
[2] U.S. Bureau of the Census (URL: http://factfinder.census.gov) (Fact Sheet for community profiles.)
[3] Texas Workforce Commission (URL: http://www.twc.state.tx.us/lmi/) (http://www.tracer2.com/)
[4] Includes all of Hays, Wharton, and Williamson Counties.

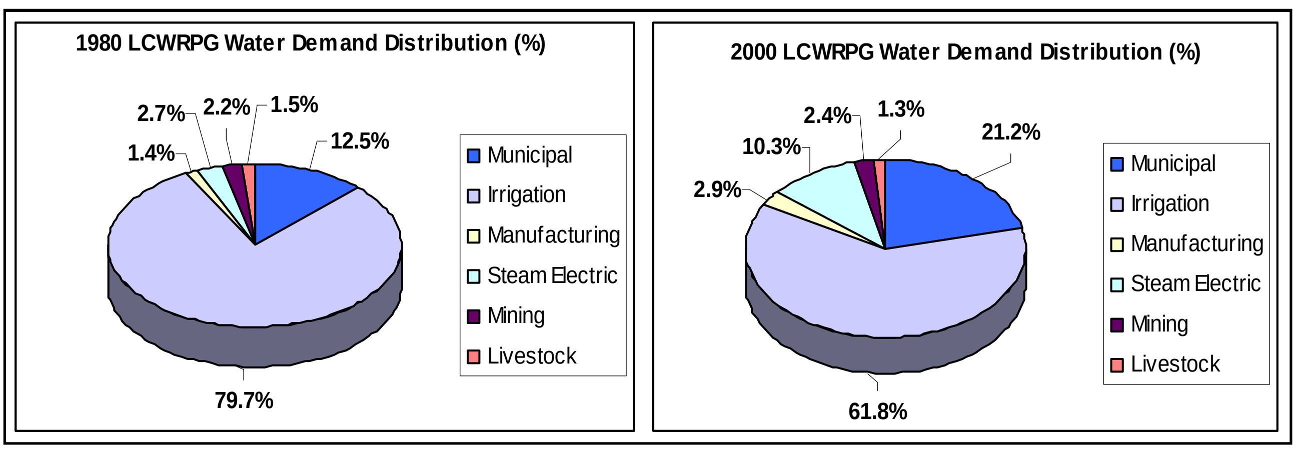
### *1.2.2.3 Historical Water Uses*[15, 16, 17]

**Figure 1.16: Lower Colorado Regional Water Planning Area Historical Water Demand**




Total annual water use in the Lower Colorado Regional Planning Area has increased approximately 5 percent from 1980 to 2000 (*Figure 1.16*). A peak water use of 1.17 million ac-ft occurred in 1988. By 1992 the region's water use had decreased almost 20 percent to 0.94 million ac-ft. The period from 1980 to 2000 has seen a relatively moderate fluctuation of +/- 17 percent as compared to the 20-year annual water demand average of approximately one million ac-ft. When compared to the region's consistently increasing population and industry, the effect of improvements in water use efficiencies is evident. Relative water use distribution, by water use category, has remained relatively similar between 1980 and 2000 (*Figure 1.17*). Irrigation is the largest water use in Region K, which accounted for almost 80 percent of water use in 1980 and 62 percent in 2000. Municipal has consistently been the second largest water use since 1980, followed by steam-electric power, mining, manufacturing, and livestock water uses.

**Figure 1.17: Lower Colorado Region User Group Water Demand Distribution**




Irrigation water demand has decreased over this 20-year period, with a decrease of approximately 18 percent. Municipal experienced an 80 percent increase in water demand between 1980–2000, while livestock experienced a 6 percent decrease, mining experienced a 15 percent increase, and manufacturing experienced a 117 percent increase. Steam-electric power generation experienced the largest water demand increase of 305 percent.

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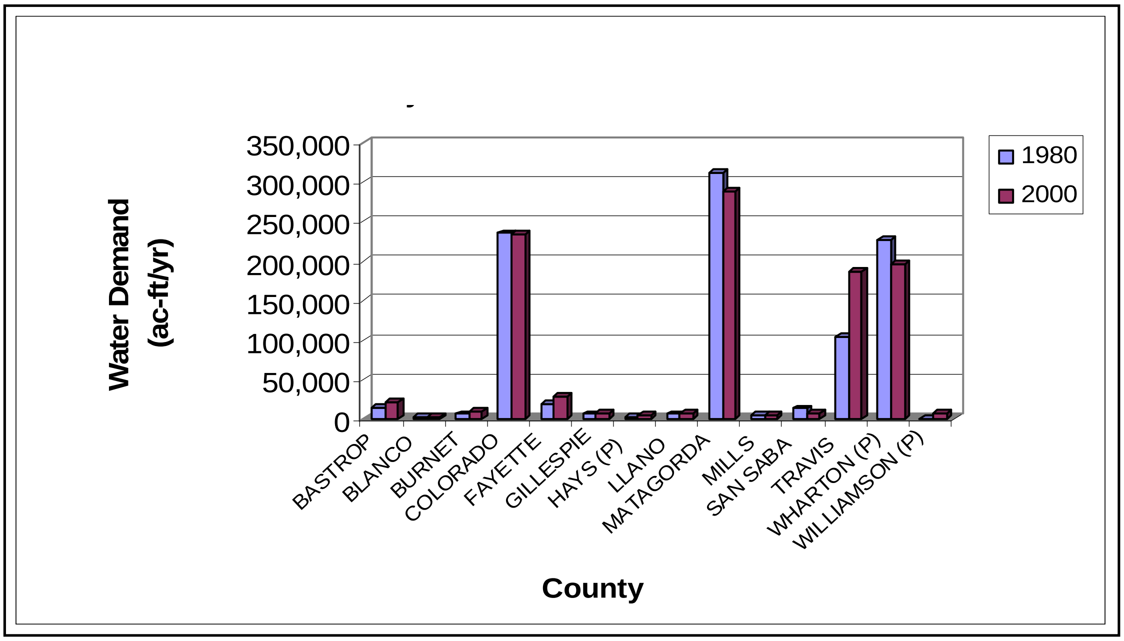
15 The Region K 2000 population projections were developed utilizing year 2000 Census data as a starting point with adjustments made by the LCRWPG as necessary.
16 LCRA, March 1999, *Water Management Plan*.
17 Lower Colorado River Authority (LCRA), December 1997. *Freshwater Inflow Needs of the Matagorda Bay System.*

The water demand distribution between the 14 counties in Region K shows that during the period from 1980 to 2000, demand was consistently the greatest in Matagorda County, which accounted for approximately 33 percent of the region's total water demand in 1980 and 29 percent in 2000 (*Figure 1.18*). The major water use in Matagorda County is rice irrigation. Colorado and Wharton Counties are among the largest water users in the region, which is also attributed to the extensive rice irrigation in these counties. Travis County contains the region's only major demand center, and its water use ranked fourth overall in 1980 and in 2000. Overall, these four counties account for approximately 93 and 90 percent of the region's total water demand, respectively, for 1980 and 2000. Details of Region K's water demand are presented in Chapter 2.

**Figure 1.18: Lower Colorado Regional Water Planning Area County Water Demand Distribution**

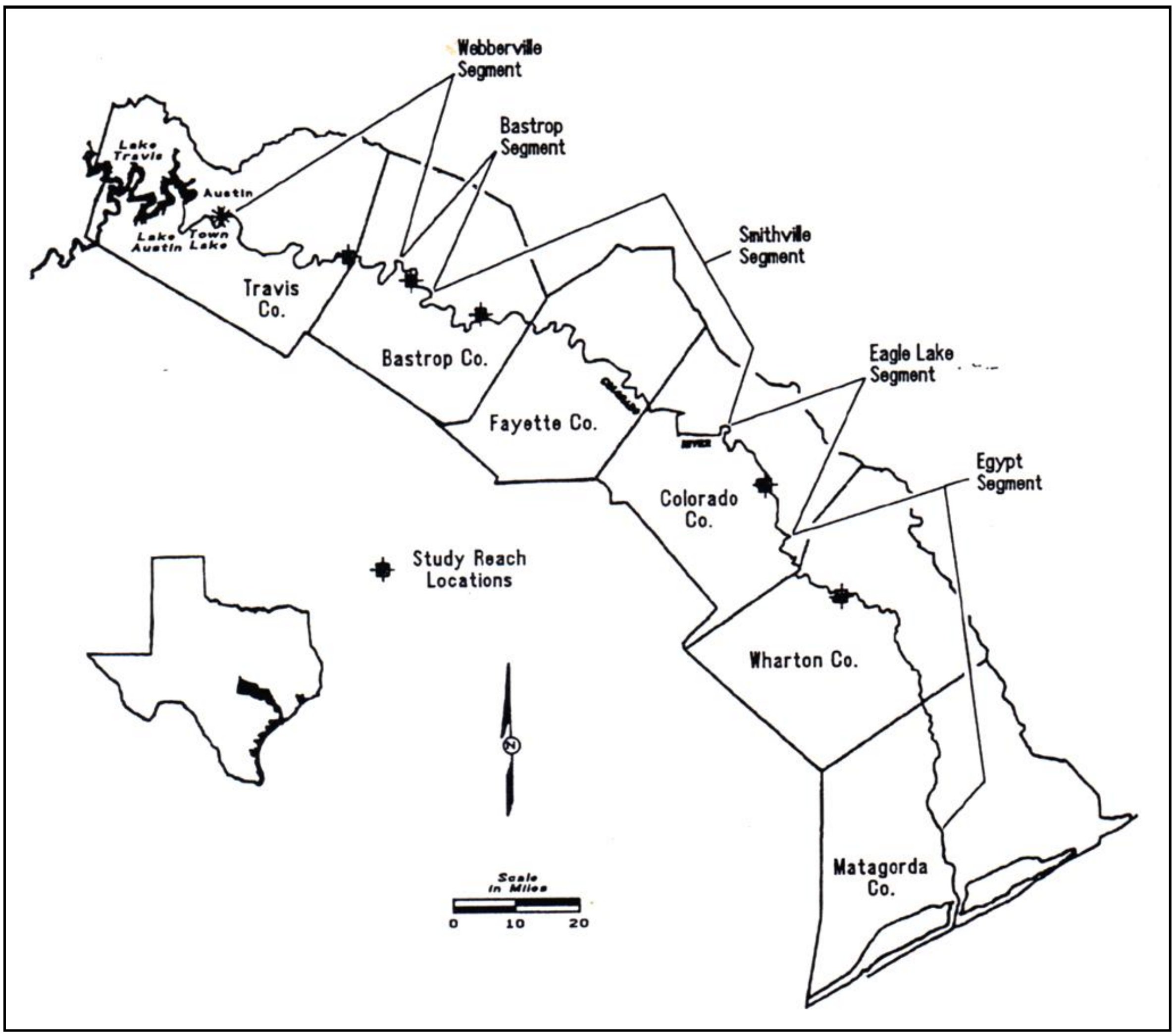



Flows for the maintenance of important environmental resources are also a significant water use within the free-flowing reaches of streams in Region K. Free-flowing reaches above the Highland Lakes System in San Saba and Mills Counties are dependent on rainfall, springflow and water releases from Stacy Dam at O.H. Ivie Reservoir, which is outside Region K and is under the control of the Colorado River Municipal Water District within Region F. A management plan has been implemented in this area, between O. H. Ivie Reservoir and Lake Buchanan, to protect the federally endangered Concho Water Snake. The minimum continuous instream flow releases from Stacy Dam are 11 cfs from April through September and 2.5 cfs from October through March. These flow regimes are designed to preserve and protect the aquatic foodbase of the Concho Water Snake. These instream flows were required by the USFWS as a mitigation component to obtain a Section 404 permit from the U.S. Army Corps of Engineers (USACE) in order to build Stacy Dam. The water management plan also specifies that once every 2 years Stacy Dam will release a 2-day 2,500 cfs instream flow to provide channel maintenance for the water snake habitat.

The free-flowing reaches below the Highland Lakes System downstream to the mouth of the Colorado River are under the control of the LCRA. A 1992 instream flow study was performed by the LCRA for five consecutive study reaches, which start downstream of Austin at river mile 290 (from the mouth of the

Colorado River) to river mile 34 near Bay City (*Figure 1.19*). The results of the 1992 study were subsequently incorporated into the TCEQ approved LCRA Water Management Plan (WMP). The LCRA Water Management Plan is updated approximately every five years on an as-needed basis to reflect changing conditions in the basin. The latest update to the LCRA WMP was approved by the LCRA Board and submitted for approval to the TCEQ in 2003. When work began on the 2011 Region K update, the latest update to the LCRA WMP was not approved by the TCEQ. The latest version of the LCRA WMP (2003 submittal) was approved by the TCEQ in January 2010. However, this was after all of the water supply determinations and the identification, evaluation and selection of water management strategies based on need had been made. Therefore, the information used for the 2011 Region K update is from the 1999 LCRA WMP.

**Figure 1.19: Lower Colorado River Instream Study Reaches (Source: LCRA)**




Subsistence or critical instream flows are classified as a non-interruptible demand on water resources, and instream flows have been maintained by LCRA at or above the minimum critical flow in accordance with the current WMP. *Table 1.6* gives the minimal critical flow requirements recommended by the LCRA for two gage stations along the Lower Colorado River.

Target instream flows are designed to provide an optimal range of habitat complexity to support a well-balanced, native aquatic community within a stream reach. *Table 1.6* provides a schedule of flows recommended by the LCRA for the Colorado River study stream reaches to meet the physical habitat requirements of the native fish communities and other critical aquatic habitats. Target flows were adjusted monthly to incorporate the normal seasonal variations in flows for which native fish species are adapted. LCRA has maintained these flow regimes whenever water resources are adequate, but target flows are classified as interruptible demands that have been reduced during drought conditions. For further details, please refer to LCRA's WMP.

**Table 1.6 Schedule of Recommended Flows for the Colorado River Downstream of Austin**

| Month | Critical Flows (cfs) | | Target Flows (cfs) | | |
|---|---|---|---|---|---|
| | Austin Gage [c] | Bastrop Gage | Bastrop Gage | Eagle Lake | Egypt |
| January | 46 | 120 | 370 | 300 | 240 |
| February | 46 | 120 | 430 | 340 | 280 |
| March | 46 | 500 [b] | 560 | 500 [a] | 360 |
| April | 46 | 500 [b] | 600 | 500 [a] | 390 |
| May | 46 | 500 [b] | 1,030 | 820 | 670 |
| June | 46 | 120 | 830 | 660 | 540 |
| July | 46 | 120 | 370 | 300 | 240 |
| August | 46 | 120 | 240 | 200 | 160 |
| September | 46 | 120 | 400 | 320 | 260 |
| October | 46 | 120 | 470 | 380 | 310 |
| November | 46 | 120 | 370 | 290 | 240 |
| December | 46 | 120 | 340 | 270 | 220 |

Source: LCRA, March 1999, *Water Management Plan*.

[a] Since target flow at Eagle Lake (based on overall community habitat availability) were insufficient to meet Blue Sucker (*Cycleptus elongatus*) spawning requirements during March and April, target flows were superseded by critical flow recommendations for this reach.

[b] This flow should be maintained for a continuous period of not less than six weeks during these months. A flow of 120 cfs will be maintained on all days not within the six week period.

[c] LCRA will maintain a mean daily flow of 100 cfs at the Austin gage at all times, to the extent of inflows each day to the Highland Lakes as measured by upstream gages, until the combined storage of Lakes Buchanan and Travis reaches 1.1 million acre-feet of water. A mean daily flow of 75 cfs, to the extent of inflows each day to the Highland Lakes as measured by upstream gages, will then be maintained until the combined storage of Lakes Buchanan and Travis reaches 1.0 million acre-feet of water, then a subsistence/critical flow of 46 cfs will be maintained at all times, regardless of inflows.

In addition, if the subsistence/critical flow of 46 cfs should occur for an extended period of time, then operational releases will be made by LCRA to temporarily alleviate the subsistence/critical flow conditions. Specifically, should the flow at the Austin gage be below a 65 cfs daily average for a period of 21 consecutive days, LCRA will make operational releases from storage sufficient to maintain daily average flow at the Austin gage of at least 200 cfs for two consecutive days. If this operational release conditions persists for three consecutive cycles (69 days), then a minimum average daily flow of at least 75 cfs will be maintained for the next 30 days.

Maintenance flows are classified as short periods of higher than normal flows that are needed to remove the buildup of silt and overgrowth of macrophytic vegetation. These flows should occur naturally during rainfall events, but may benefit from periodic dam releases to accomplish this task.

Freshwater inflow is also essential for healthy coastal estuarine ecosystems along the Texas Coast. Ninety-seven percent of the fishery species (shellfish and finfish) in the Gulf of Mexico spend all or a portion of their life cycle in estuaries. The life cycles of estuarine-dependent species vary seasonally and have different migratory patterns between the estuary and the Gulf. The Matagorda Bay system is the second largest estuary in the state, and this system receives freshwater inflow from the Colorado River, the Lavaca River, and surface runoff from the contributing drainage basin areas. On average, Matagorda Bay annually receives approximately 560 billion gallons (more than 1.7 million ac-ft) of freshwater from the Colorado River and basin. This corresponds to about 69 percent of the river's available water supply from surface runoff inflow. The LCRA performed a freshwater inflow study on the bay system in 1997 and determined the critical inflow that would keep salinity near the mouth of the river less than 25 parts per million (ppm) for protection of fishery sanctuary habitat during droughts. Target inflows were also determined that would result in producing 98 percent of the maximum total normalized biomass for key estuarine fishery species, while maintaining a certain salinity, population density, and nutrient inflow conditions. Modeling efforts determined that the optimal total critical flows and target flows for the Matagorda Bay system are 287,400 ac-ft/yr and 2,000,000 ac-ft/yr, respectively. *Table 1.7* provides the monthly flows required exclusively from the Colorado River's contribution to the bay system. The Colorado River provides about 52 percent of the bay system's target freshwater inflows and about 60 percent of the critical inflows.

A revision of the Freshwater Inflow Needs Study (FINS) was completed in 2006. The results of this study showed increased target and critical needs for Matagorda Bay. The 2006 FINS critical and target flows were used in this round of planning when determining the quantitative environmental impacts of the water management strategies. *Table 1.7* also shows the increased required monthly flows from the Colorado River as shown in the 2006 Freshwater Inflow Needs Study. The critical needs from the 2006 Study are approximately 150 percent higher than the 1997 Study, while the target needs from the 2006 Study are approximately 40 percent higher.

**Table 1.7 Critical and Target Flows Schedule For Matagorda Bay System From the Colorado River**

| Month | 1997 FINS Freshwater Inflows (1,000 ac-ft)[1] | | 2006 FINS Freshwater Inflows (1,000 ac-ft)[1] | |
|---|---|---|---|---|
| | Critical | Target | Critical | Target |
| January | 14.26 | 44.1 | 36 | 205.6 |
| February | 14.26 | 45.3 | 36 | 194.5 |
| March | 14.26 | 129.1 | 36 | 63.2 |
| April | 14.26 | 150.7 | 36 | 60.4 |
| May | 14.26 | 162.2 | 36 | 255.4 |
| June | 14.26 | 159.3 | 36 | 210.5 |
| July | 14.26 | 107.0 | 36 | 108.4 |
| August | 14.26 | 59.4 | 36 | 62.0 |
| September | 14.26 | 38.8 | 36 | 61.9 |
| October | 14.26 | 47.4 | 36 | 71.3 |
| November | 14.26 | 44.4 | 36 | 66.5 |
| December | 14.26 | 45.2 | 36 | 68.0 |
| Annual Totals | 171 | 1,033 | 432 | 1,428 |

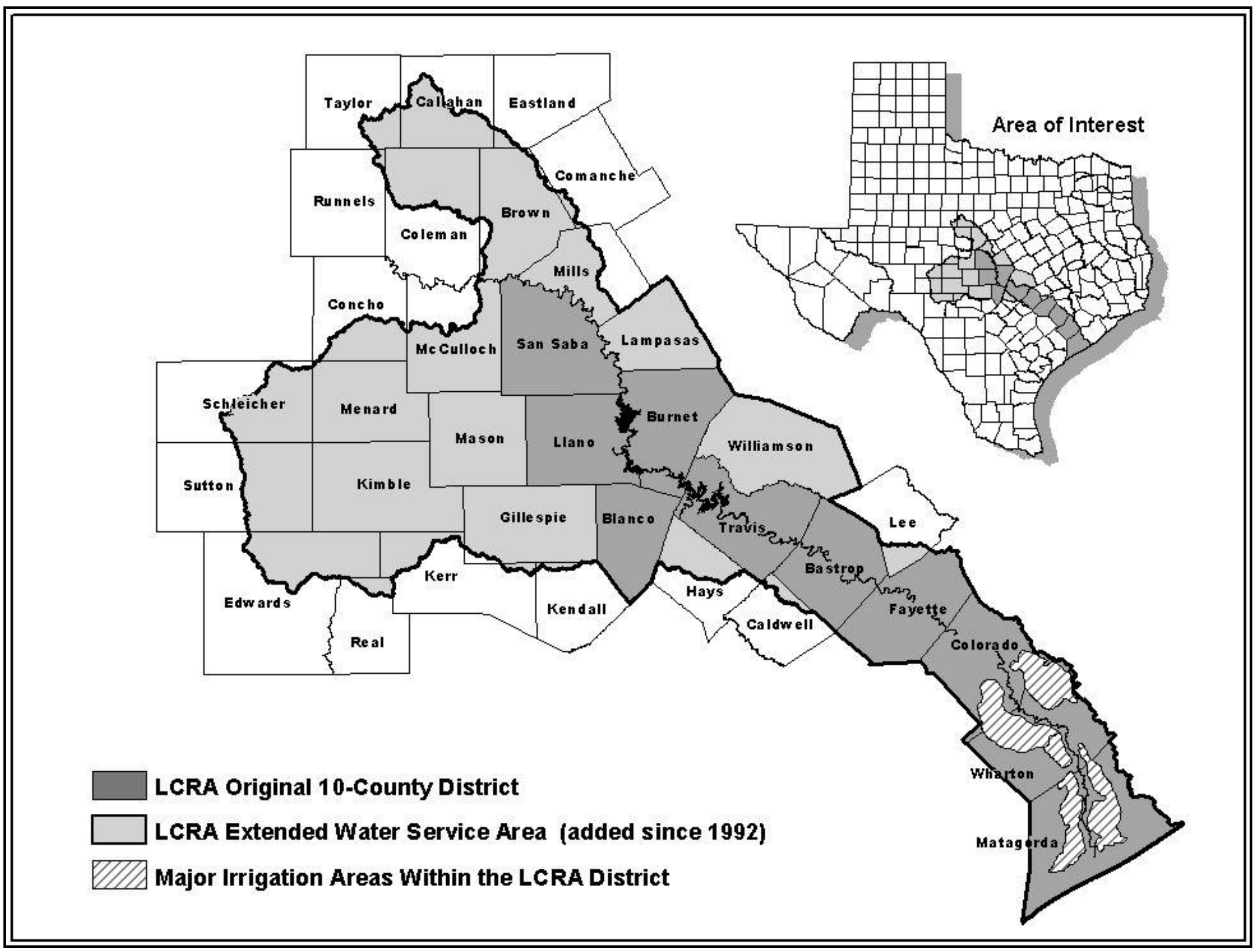
[1] Schedule of flows is designed to optimize biodiversity/productivity under normal rainfall. Under drought conditions, target flows should be curtailed in accordance to the severity of the drought and flows should be maintained at or above critical levels based on water quality considerations.

### *1.2.2.4 Wholesale Water Providers*

The TWDB guidelines allow each RWPG to identify and designate “wholesale water provider(s)” for each region. These guidelines define a wholesale water provider as an entity “. . . which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale basis.” The intent of these TWDB guidelines is to ensure that there is an adequate future supply of water for each entity that receives all or a significant portion of its current water supply from another entity.

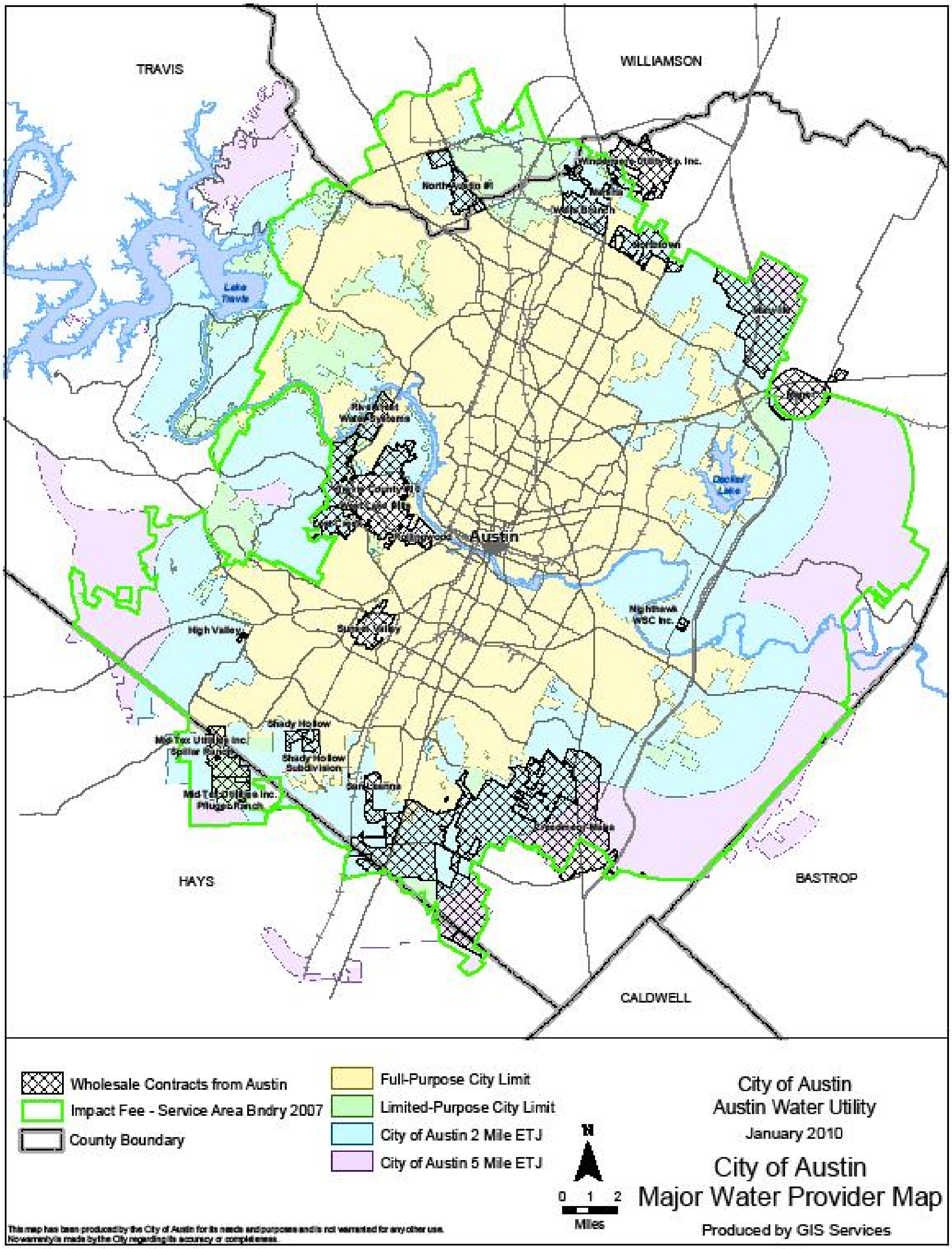
As discussed in Chapter 2, the LCRWPG has officially designated the LCRA and the City of Austin (COA) as wholesale water providers. The LCRA provides water for municipal, agricultural (irrigation), manufacturing, steam-electric, mining and other uses within a 33-county service area. LCRA’s current service area allows it to provide water to entities in each of the 14 counties within the Lower Colorado Regional Planning Area (*Figure 1.20*). The COA supplies water for municipal, manufacturing, and steam-electric uses. The City’s water planning area encompasses portions of Travis, Williamson, and Hays Counties (*Figure 1.21*).

**Figure 1.20: Lower Colorado River Authority Water Supply Service Area**




Source: The Lower Colorado River Authority (March 2000)

**Figure 1.21: City of Austin Water Supply Service Area**



### 1.2.3 Water Quality in the Colorado River Basin[18, 19, 20]

The chemical characteristics of and the State Water Quality Criteria assigned to the Colorado River vary along its length (900 river miles) from the upper basin that is mainly within the West Texas Regional Water Planning Area (Region F) to the mouth of the river at Matagorda Bay in the Lower Colorado Regional Planning Area (Region K) (*Table 1.8*). The water quality differences of the various stream segments of the Colorado River are due to variations in both natural and man-made influences affecting each segment's drainage area. In addition, water flowing from upstream segments of the Colorado River and its tributaries also contribute to each downstream segment's water quality characteristics.

The Colorado River is divided into 18 mainstream classified stream segments, which are defined by the TCEQ, which was formerly the Texas Natural Resource Conservation Commission (TNRCC), as:

> Surface waters of an approved planning area exhibiting common biological, chemical, hydrological, natural, and physical characteristics and processes. Segments will normally exhibit common reactions to external stresses (e.g., discharge or pollutants). Segmented waters include most rivers and their major tributaries, major reservoirs and lakes, and marine waters, which have designated physical boundaries, specific uses, and specific numerical physicochemical criteria. Segments are classified in the water identification system utilized by the TNRCC Office of Water Resources Management (OWRM) and are the management unit to which water quality standards and regulations are applicable under the Clean Water Act.

Approximately 70 percent of the Colorado River mainstream segments are located within Region K. There are also 16 classified stream segments that are tributaries of the Colorado River, and almost 40 percent of these are within Region K.

The TNRCC initiated the Texas Clean Rivers Program (CRP) in 1991 to address the Texas Clean Rivers Act. The State Legislature passed this act in response to concerns within the state that water quality issues were being addressed in an uncoordinated fashion. The CRP established a watershed management approach to identify and evaluate water quality issues, as well as to set priorities for the improvement of water quality throughout the state. The CRP set up a partnership in each river basin that consisted of the TNRCC, other state agencies, river authorities, local governments, and private citizens. Each river basin is to provide the TNRCC with updated regional water quality data, and the TNRCC is required to summarize these basin-wide assessments into a statewide report every 2 years.

In 1996, the TNRCC published two reports that updated water quality information for each river basin and stream segment in the state: *The State of Texas Water Quality Inventory* and *Texas Water Quality: A Summary of River Basin Assessments*. The CRP's Colorado River Basin regional assessment technical report defines the "Upper Basin" of the Colorado River as the classified mainstream segments 1411–1413 and 1426 and classified tributary segments 1421–1425. These segments fall within the SB 1 Regions F and G. The "Middle Basin" contains mainstream segments 1403–1410, 1429, and 1433 and tributary segments 1414–1417, 1427, 1431, and 1432. These segments fall within SB 1 Region F and the Lower

[18] TWDB, Op. Cit., May 1977.
[19] TNRCC, December 1996. *Texas Water Quality: A Summary of River Basin Assessments*, Texas Clean Rivers Program Report SFR-46.
[20] TNRCC, October 1996. *Regional Assessment of Water Quality: Colorado River Basin & Colorado/Lavaca Coastal Basin*, Texas Clean Rivers Program Technical Report.

**Table 1.8 Classified Stream Segment Uses and Water Quality Criteria in the Colorado River Basin 2002**

| COLORADO RIVER BASIN | | | USES [1] | | | STATE STREAM STANDARDS CRITERIA [2] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stream Segment # | Stream Segment Name | SB 1 Planning Region | Recreation | Aquatic Life | Water Supply | Chloride Annual Avg. (mg/L) | Sulfate Annual Avg (mg/L) | TDS Annual Avg (mg/L) | D.O. (mg/L) | pH Range | Fecal Coliform (30-day geometric mean, CFU/100ml) | Temp (*F) |
| 1401 | Colorado River - Tidal | K | CR | H | | | | | 4.0 | 6.5–9.0 | 35/200 | 95 |
| 1402 | Colorado River below Smithville | K | CR | H | PS | 100 | 100 | 500 | 5.0 | 6.5–9.0 | 126/200 | 95 |
| 1403 | Lake Austin | K | CR | H | PS | 100 | 75 | 400 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1404 | Lake Travis | K | CR | E | PS | 100 | 75 | 400 | 6.0 | 6.5–9.0 | 126/200 | 90 |
| 1405 | Marble Falls Lake | K | CR | H | PS | 125 | 75 | 500 | 5.0 | 6.5–9.0 | 126/200 | 94 |
| 1406 | Lake LBJ | K | CR | H | PS | 125 | 75 | 500 | 5.0 | 6.5–9.0 | 126/200 | 94 |
| 1407 | Inks Lake | K | CR | H | PS | 150 | 100 | 600 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1408 | Lake Buchanan | K | CR | H | PS | 150 | 100 | 600 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1409 | Colorado River above Lake Buchanan | K | CR | H | PS | 200 | 200 | 900 | 5.0 | 6.5–9.0 | 126/200 | 91 |
| 1410 | Colorado River below Ivie Reservoir | K | CR | H | PS | 500 | 455 | 1,475 | 5.0 | 6.5–9.0 | 126/200 | 91 |
| 1411 | E. V. Spence Reservoir | F | CR | H | PS | 950 | 450 | 1,500 | 5.0 | 6.5–9.0 | 126/200 | 93 |
| 1412 | Colorado River below Lake J. B. Thomas | F | CR | H | | 11,000 | 2,500 | 20,000 | 5.0 | 6.5–9.0 | 126/200 | 93 |
| 1413 | Lake J. B. Thomas | F | CR | H | PS | 80 | 110 | 500 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1414 | Pedernales River | K | CR | H | PS | 125 | 75 | 525 | 5.0 | 6.5–9.0 | 126/200 | 91 |
| 1415 | Llano River | K | CR | H | PS | 50 | 50 | 350 | 5.0 | 6.5–9.0 | 126/200 | 91 |
| 1416 | San Saba River | K/G | CR | H | PS | 50 | 50 | 425 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1417 | Lower Pecan Bayou | K | CR | H | | 310 | 120 | 1,025 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1418 | Lake Brownwood | F | CR | H | PS | 150 | 100 | 500 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1419 | Lake Coleman | F | CR | H | PS | 150 | 100 | 500 | 5.0 | 6.5–9.0 | 126/200 | 93 |
| 1420 | Pecan Bayou above Lake Brownwood | F | CR | H | PS | 500 | 500 | 1,500 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1421 | Concho River | F | CR | H | PS | 775 | 425 | 1,600 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1422 | Lake Nasworthy | F | CR | H | PS | 450 | 400 | 1,500 | 5.0 | 6.5–9.0 | 126/200 | 93 |
| 1423 | Twin Buttes Reservoir | F | CR | H | PS | 200 | 100 | 700 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1424 | Middle Concho/S. Concho River | F | CR | H | PS | 150 | 150 | 700 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1425 | O. C. Fisher Lake | F | CR | H | PS | 150 | 150 | 700 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1426 | Colorado River blw E. V. Spence Reservoir | F | CR | H | PS | 610 | 980 | 2,000 | 5.0 | 6.5–9.0 | 126/200 | 91 |
| 1427 | Onion Creek[4] | K | CR | H | PS/AP[5] | 50/100 | 50/100 | 400/500 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1428 | Colorado River below Town Lake [3] | K | CR | E | PS | 100 | 100 | 500 | 6.0 | 6.5–9.0 | 126/200 | 95 |
| 1429 | Town Lake [6] | K | CR | H | PS | 75 | 75 | 400 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1430 | Barton Creek | K | CR | H | AP[5] | 50 | 50 | 500 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1431 | Middle Pecan Bayou | F | CR | | | 410 | 120 | 1,100 | 2.0 | 6.5–9.0 | 126/200 | 90 |
| 1432 | Upper Pecan Bayou | F | CR | H | PS | 200 | 150 | 800 | 5.0 | 6.5–9.0 | 126/200 | 90 |
| 1433 | O. H. Ivie Reservoir | F | CR | H | PS | ____[8] | ____[8] | ____[8] | 5.0 | 6.5–9.0 | 126/200 | 93 |
| 1434 | Colorado River above La Grange | K | CR | E | PS | 100 | 100 | 500 | 6.0 | 6.5–9.0 | 126/200 | 95 |

Source: TCEQ (formerly TNRCC), 2002. (Developed from water quality data collected between March 1, 1996 and Feb 28, 2001) URL: http://www.tceq.state.tx.us/assets/public/legal/rules/rules/pdflib/307%60.pdf (pg 68, 69)

[1] Uses: CR = Contact Recreation; H = High Aquatic Life; E = Exceptional Aquatic Life; PS = Public Water Supply; AP = Aquifer Protection

[2] Criteria: Standards set by the TCEQ (formerly TNRCC) do not guarantee the water to be usable for municipal, domestic, irrigation, livestock, &/or industrial uses, such as segment #1412 & others; this causes the above screening process to be misleading for certain segments, especially for salinity.

[3] The indicator bacteria for freshwater is *E. coli* and Enterococci for saltwater. Fecal coliform is an alternative indicator.

[4] The aquifer protection reach of Onion Creek is assigned a criteria of 50 mg/L for $Cl^{-1}$, 50 mg/L for $SO4^{-2}$, and 400 mg/L for TDS.

[5] The aquifer protection use applies to the contributing, recharge, and transition zones of the Edwards Aquifer.

[6] Dissolved oxygen criterion of 6.0 mg/L only applies at stream flows greater than or equal to 150 cfs as measured at USGS gage number 8158000 located in Travis County upstream from U.S. Highway 183. Dissolved oxygen criteria of 5.0 mg/L will apply to stream flows less than 150 cfs and greater than or equal to the 7Q2 for the segment.

[7] While Segment 1429 may exhibit quality characteristics which would make it suitable for contact recreation, the use is prohibited by local regulation for reasons unrelated to water quality.

[8] Numerical criteria for chloride, sulfate, and total dissolved solids cannot be established at this time for this new reservoir.

Colorado Regional Water Planning Area (Region K). The Colorado River's "Lower Basin" lies wholly within Region K and includes the mainstream segments 1401, 1402, 1428, and 1434 as well as several unclassified tributary segments.

Upstream of Region K, high salinity concentrations are the primary concern in the CRP's "Upper Basin" stream segments. This is caused both by the natural characteristics of the geologic formations in the watershed as well as pollution from oil and gas activities. As *Table 1.8* shows, some of these stream segments have very high water quality criteria for salinity, or total dissolved solids (TDS), which is an aggregate measurement of various mineral concentrations including chlorides, carbonates, and sulfates. The designated uses of a stream segment, such as recreation, aquatic life, and water supply, are based on the Texas Surface Water Quality Standards, which are criteria with the force of law. Potential uses for water in segments with very high salinity criteria, such as segment 1412 below Lake J. B. Thomas, are limited by the high TDS concentrations that exist, despite the fact that the criteria are rarely exceeded. For example, the secondary drinking water standard for TDS is 1,000 milligrams per liter (mg/l).

The water quality of the "Middle Basin" and "Lower Basin" improves significantly due largely to the dilution of the upstream base flow by inflow of higher quality tributary waters. Major tributaries from the headwaters of O. H. Ivie Reservoir down through the Highland Lakes System, namely the Llano River and the San Saba River, have TDS concentrations that are generally less than 500 mg/l at their confluence with the Colorado River. Water quality of the "Lower Basin" is subject to poor quality at low flow conditions due to salt water intrusion (i.e., tidal influence).

### 1.2.4 Agricultural and Natural Resources Issues Within the Lower Colorado Region[21, 22, 23, 24, 25]

The primary agricultural issue in Region K is the availability of sufficient quantities of irrigation water for rice farming under drought of record conditions. Natural resources, on the other hand, have impacts from both water quantity and water quality issues. Classified stream segments in the Colorado River Basin are shown in *Figure 1.22* and those with water quality concerns are listed. The stream segments that have water quality concerns within Region K are discussed below. Section 1.2.4.2 discusses threats due to water quantity issues.

#### *1.2.4.1 Threats Within the Lower Colorado Region Due to Water Quality Issues*

The primary water quality issue for all of the surface water stream segments and the major groundwater aquifers in Region K is the increasing potential for water contamination due to nonpoint source pollution. Nonpoint source pollution is precipitation runoff that, as it flows over the land, picks up various pollutants that adhere to plants, soils, and man-made objects and which eventually infiltrates into the groundwater table or flows into a surface water stream. As more and more land in the Colorado River watershed and aquifer recharge zones is developed, the runoff from precipitation events will pick up increasing amounts of pollution. Another nonpoint source of pollution is the accidental spill of toxic

[21] TCEQ (formerly TNRCC), Op. Cit., December 1996.
[22] TCEQ (formerly TNRCC), Op. Cit., October 1996.
[23] LCRA, March 1999, *Water Management Plan*.
[24] Texas Water Development Board (TWDB), February 2000. *A Numerical Groundwater Flow Model of the Upper and Middle Trinity aquifer*, *Hill Country Area*, Open-file report 00–02.
[25] TWDB, et al., April 1999. *Assessment of Groundwater Availability in the Carrizo-Wilcox aquifer in Central Texas – Results of Numerical Simulations of Six Groundwater-Withdrawal Projections (2000–2050),* Draft Final Contract Report.

chemicals near streams or over recharge zones that will send a concentrated pulse of contaminated water through stream segments and/or aquifers. Public water supply groundwater wells that currently use only chlorination for water treatment, and domestic groundwater wells that may not treat the water before consumption, may be especially vulnerable to nonpoint source pollution, depending on how directly influenced they are by surface or near surface contamination. Habitats of threatened and endangered species that live in and near springs and certain stream segments may be vulnerable as well. Nonpoint sources of pollution are difficult to control and there has been increased awareness and research of this issue as well as interest in the initiation of abatement programs.

The TCEQ categorizes the physical use of a stream into various defined uses such as "general use", "aquatic life use", "recreational contact use", and "public water supply use". Assessments of the basin conducted by TCEQ determine whether or not a stream segment will support its use. Segments which do not support its designated or assumed use are classified as impaired. Additionally, these assessments will identify segments which are of concern for not meeting the use, but are not at the time of the assessment considered impaired. There are 19 stream segments in Region K considered impaired as published in the 2008 303(d) List. Additionally, 50 stream segments are listed as "of concern" for exceeding the State Water Quality Criteria in Region K (*Table 1.8 Table 1.9 and Table 1.10*).

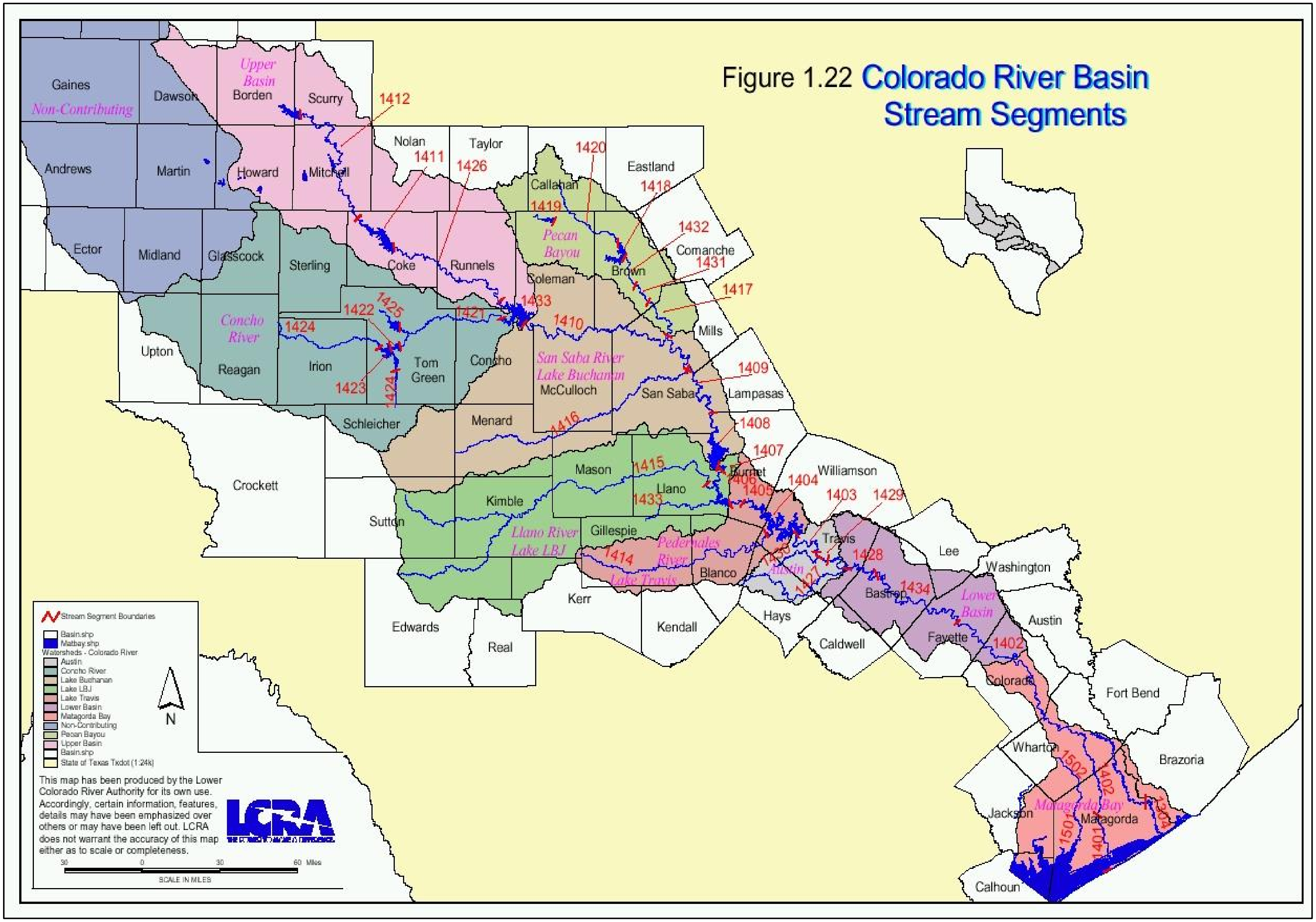


Figure 1.22 Colorado River Basin
Stream Segments
Gaines
Non-Contributing
Dawson
Upper Basin
Borden
Scurry
1412
Andrews
Martin
Howard
Mitchell
Nolan
1411
Taylor
1426
1420
Callahan
Eastland
1418
1419
Pecan Bayou
1432
Comanche
1431
Ector
Midland
Glasscock
Sterling
Coke
Runnels
Coleman
Brown
1417
1433
Concho River
1424
1422
1425
1421
1410
Mills
Upton
Reagan
Irion
Tom Green
Concho
San Saba River
Lake Buchanan
McCulloch
1409
1423
1424
San Saba
Lampasas
Schleicher
Menard
1416
1408
1407
Crockett
Mason
1415
Burnet
1406
Williamson
1404
1405
Llano
1433
1403
1429
Kimble
Sutton
Gillespie
Llano River
Lake LBJ
Pedernales River
Travis
1414
Lake Travis
Blanco
Austin
1427
1428
Lee
Washington
Bastrop
1434
Lower Basin
Kerr
Hays
Edwards
Kendall
Real
Caldwell
Fayette
Austin
1402
Colorado
Fort Bend
Wharton
Brazoria
1502
1402
Matagorda Bay
Jackson
Matagorda
1501
1401
1304
Calhoun
Stream Segment Boundaries
Basin.shp
Matbay.shp
Watersheds - Colorado River
Austin
Concho River
Lake Buchanan
Lake LBJ
Lake Travis
Lower Basin
Matagorda Bay
Non-Contributing
Pecan Bayou
Upper Basin
Basin.shp
State of Texas Txdot (1:24k)
N
This map has been produced by the Lower Colorado River Authority for its own use. Accordingly, certain information, features, details may have been emphasized over others or may have been left out. LCRA does not warrant the accuracy of this map either as to scale or completeness.
30 0 30 60 Miles
SCALE IN MILES

**Table 1.9 Stream Segment Water Quality Impairments in the Lower Colorado Region**

| Segment ID # | Segment Name | Stream Use | Impairment |
|---|---|---|---|
| 1401 | Colorado River Tidal | Recreation Use | Bacteria |
| 1402A | Cummins Creek (unclassified water body) | Aquatic Life Use | Impaired fish community and Impaired macrobenthos community |
| 1402H | Skull Creek (unclassified water body) | Aquatic Life Use | Depressed dissolved oxygen |
| 1403 | Lake Austin | Aquatic Life Use | Depressed dissolved oxygen |
| 1403K | Taylor Slough South (unclassified water body) | Recreation Use | Bacteria |
| 1403R | Westlake-Davenport Tributary to Lake Austin (unclassified water body) | Recreation Use | Bacteria |
| 1411 | E. V. Spence Reservoir | General Use | Sulfate and total dissolved solids |
| 1412 | Colorado River Below Lake J. B. Thomas | Recreation Use | Bacteria |
| 1413 | Lake J. B. Thomas | General Use | Chloride |
| 1416 | San Saba River | Recreation Use | Bacteria |
| 1416A | Brady Creek (unclassified water body) | Aquatic Life Use | Depressed dissolved oxygen |
| 1421 | Concho River | Aquatic Life and Recreation Use | Depressed dissolved oxygen and Bacteria |
| 1425 | O. C. Fisher Lake | General Use | Chloride |
| 1426 | Colorado River Below E. V. Spence Reservoir | General Use | Chloride and total dissolved solids |
| 1428 | Colorado River Below Town Lake | Recreation Use | Bacteria |
| 1428B | Walnut Creek (unclassified water body) | Recreation Use | Bacteria |
| 1428C | Gilleland Creek (unclassified water body) | Recreation Use | Bacteria |
| 1429C | Waller Creek (unclassified water body) | Recreation Use | Bacteria |
| 1431 | Mid Pecan Bayou | Recreation Use | Bacteria |

**Table 1.10 Stream Segment Water Quality Concerns in the Lower Colorado Region**

| Segment ID # | Segment Name | Stream Use | Concern |
|---|---|---|---|
| 1401 | Colorado River Tidal | General Use | Nutrient |
| 1402A | Cummins Creek (unclassified water body) | Aquatic Life Use | Impaired habitat |
| 1402C | Buckners Creek (unclassified water body) | General and Aquatic Life Use | Nutrient and depressed dissolved oxygen |
| 1402G | Fayette Reservoir (unclassified water body) | General Use | Nutrient |
| 1402H | Skull Creek (unclassified water body) | Aquatic Life Use | Depressed dissolved oxygen |
| 1403 | Lake Austin | Aquatic Life Use | Depressed dissolved oxygen and manganese in sediment |
| 1403A | Bull Creek (unclassified water body) | Aquatic Life Use | Impaired macrobenthos community |
| 1403D | Barrow Preserve Tributary (unclassified water body) | General Use | Nitrate |
| 1403E | Stillhouse Hollow (unclassified water body) | General Use | Nitrate |
| 1403J | Spicewood Tributary to Shoal Creek (unclassified water body) | Recreation Use | Bacteria |
| 1403K | Taylor Slough South (unclassified water body) | General Use | Nitrate |
| 1404 | Lake Travis | Aquatic Life Use | Depressed dissolved oxygen |
| 1406 | Lake Lyndon B. Johnson | Aquatic Life Use | Depressed dissolved oxygen |
| 1407 | Inks Lake | Aquatic Life Use | Depressed dissolved oxygen and manganese in sediment |
| 1407A | Clear Creek | General Use | pH, sulfate and Total dissolved solids |
| 1408 | Lake Buchanan | General Use | Chlorophyll-a |
| 1410 | Colorado River Below O. H. Ivie Reservoir | General Use | Chlorophyll-a |
| 1411 | E. V. Spence Reservoir | General Use | Chlorophyll-a and harmful algal bloom/golden alga |
| 1412 | Colorado River Below Lake J. B. Thomas | General and Aquatic Life Use | Chlorophyll-a and depressed dissolved oxygen |
| 1412A | Lake Colorado City (unclassified water body) | General Use | Chlorophyll-a and harmful algal bloom/golden alga |
| 1412B | Beals Creek (unclassified water body) | General and Recreation Use | Bacteria and Nutrient |

| Segment ID # | Segment Name | Stream Use | Concern |
|---|---|---|---|
| 1416A | Brady Creek (unclassified water body) | General and Aquatic Life Use | Nutrient and depressed dissolved oxygen |
| 1417 | Lower Pecan Bayou | Recreation Use | Bacteria and Nutrient |
| 1418 | Lake Brownwood | Aquatic Life Use | Manganese in sediment |
| 1420 | Pecan Bayou Above Lake Brownwood | General Use | Chlorophyll-a |
| 1421 | Concho River | General and Aquatic Life Use | Nutrient, depressed dissolved oxygen and impaired macrobenthos community |
| 1421A | Dry Hollow Creek (unclassified water body) | General Use | Nitrate |
| 1423 | Twin Buttes Reservoir | General Use | Nitrate and orthophosphorus |
| 1423B | Dove Creek (unclassified water body) | Aquatic Life Use | Depressed dissolved oxygen |
| 1425 | O. C. Fisher Lake | General Use | Nutrient |
| 1425A | North Concho River (unclassified water body) | Recreation and Aquatic Life Use | Bacteria and depressed dissolved oxygen |
| 1426 | Colorado River Below E. V. Spence Reservoir | General and Aquatic Life Use | Nutrient and depressed dissolved oxygen |
| 1426A | Oak Creek Reservoir (unclassified water body) | Public Water Supply Use | Sulfate in finished drinking water |
| 1426C | Bluff Creek (unclassified water body) | General Use | Nitrate |
| 1426D | Coyote Creek (unclassified water body) | General Use | Nitrate |
| 1427A | Slaughter Creek (unclassified water body) | Aquatic Life Use | Depressed dissolved oxygen and impaired macrobenthos community |
| 1427G | Granada Hills Tributary to Slaughter Creek (unclassified water body) | General Use | Nitrate |
| 1428 | Colorado River Below Town Lake | Recreation and Aquatic Life Use | Bacteria, impaired fish community and impaired Macrobenthos community |
| 1428B | Walnut Creek (unclassified water body) | Recreation and Aquatic Life Use | Bacteria and impaired macrobenthos community |
| 1428C | Gilleland Creek (unclassified water body) | Recreation and General Use | Bacteria and nutrient |
| 1429 | Town Lake | General Use | Nitrate |
| 1429B | Eanes Creek (unclassified water body) | Recreation Use | Bacteria |

| Segment ID # | Segment Name | Stream Use | Concern |
|---|---|---|---|
| 1429C | Waller Creek (unclassified water body) | Recreation and Aquatic Life Use | Bacteria, lead and synthetic organic in sediment, and impaired macrobenthos community |
| 1429D | East Bouldin Creek (unclassified water body) | Aquatic Life Use | lLead and synthetic organic in sediment |
| 1430 | Barton Creek | Aquatic Life Use | Toxic sediment (LOE) and depressed dissolved oxygen |
| 1430A | Barton Springs (unclassified water body) | Aquatic Life Use | Toxic sediment (LOE) |
| 1430B | Tributaries to Barton Creek (unclassified water bodies) | General Use | Nitrate |
| 1431 | Mid Pecan Bayou | General Use | Nutrient |
| 1434 | Colorado River above La Grange | General Use | Orthophosphorus |
| 1434B | Cedar Creek (unclassified water body) | Aquatic Life Use | Depressed dissolved oxygen |

A major surface water quality indicator for protection of aquatic life is dissolved oxygen (DO) and the associated biochemical oxygen demand (BOD). DO is a measure of the amount of oxygen that is available in the water for metabolism by microbes, fish, and other aquatic organisms. BOD is a measure of the amount of organic material, containing carbon and/or nitrogen, in a body of water that is available as a food source to microbial and other aquatic organisms, which require the consumption of dissolved oxygen from the water to metabolize the organic material. The basin-wide concentrations of DO that have existed in the past were indicative of relatively unpolluted waters; however, these have been changing and have become a concern in some segments of the Colorado River and its tributaries, as populations and urban development continue to increase. The primary manmade sources of BOD in bodies of water are the discharge of municipal and industrial waste, as well as nonpoint source pollution from urban and agricultural runoff. Thus, the presence of excess amounts of BOD allows increased rates of microbial and algal metabolism, which in turn depletes the dissolved oxygen concentrations in the water. Without sufficient levels of DO in the water, other aquatic organisms such as fish cannot survive. Data from 2008 indicates that there are fifteen classified stream segments with a concern for DO, based on the State Water Quality Criteria in the Lower Colorado Regional Water Planning Area (*Tables 1.8, 1.9,* and *1.10*). This is a 200% increase over the number of stream segments with a concern for DO shown in 2002 data.

Another set of surface water quality indicators that can deplete DO levels in surface water bodies are termed “nutrients” and includes nitrogen (Kjeldahl nitrogen, nitrite+nitrate, and ammonia nitrogen), phosphorus (phosphates, orthophosphates, and total phosphorus), sulfur, potassium, calcium, magnesium, iron, and sodium. Nutrients are monitored by the TCEQ as a part of the Texas Clean Rivers Program; however, there are no state or federal standards for screening nutrients. Currently, naturally occurring background levels reported by the U.S. Geological Survey (USGS) or historical data collected by the TCEQ are used to determine the level of concern for nutrients. Nutrients have the same primary man-made sources as the BOD sources described above. Based on 2008 data, there are eight classified stream segments with a concern in the Lower Colorado Regional Water Planning Area (*Tables 1.8, 1.9,* and *1.10*).

Fecal indicator organisms E. coli and Enterococcus are harmless bacteria that are present in human and/or animal waste. However, the presence of these organisms is an indicator for the presence of disease-causing bacteria, protozoa and viruses that are also found in human/animal wastes. Municipal waste is treated to remove most of the bacterial, protozoan and viral contaminants so that safe levels will exist in the surface water body upon discharge from the point source. Therefore, when fecal indicators are detected, the most likely source of contamination should be nonpoint source pollution, which can include agricultural runoff as well as runoff from failed septic systems. A wastewater treatment plant point source could also be the source of contamination if the system is not functioning properly. Data reported for 2008 indicate that there are a number of classified stream segments with impairments for E. coli and the tidal portion is impaired for the presence of Enterococcus, based on the State Water Quality Criteria in Region K (*Tables 1.8, 1.9,* and *1.10*).

The presence of toxic dissolved metals, such as aluminum, barium, arsenic, chromium, cadmium, copper, lead, nickel, mercury, selenium, silver, and zinc, in surface water are a concern in two classified stream segments in the Lower Colorado Regional Water Planning Area (*Tables 1.8, 1.9,* and *1.10*).

#### *1.2.4.2 Threats Due to Water Quantity Issues*

Threats are present in Region K from both too much water and from too little water. Too much water can be an issue during high river flows and during flooding episodes. The Highland Lakes provide the primary surface water storage and flood control capabilities for Region K. The issue of providing maintenance of these reservoirs to retain the maximum water storage capacity will become increasingly important as natural sedimentation processes decrease the volume of water each reservoir can hold. Currently, there are no programs in place to address this issue.

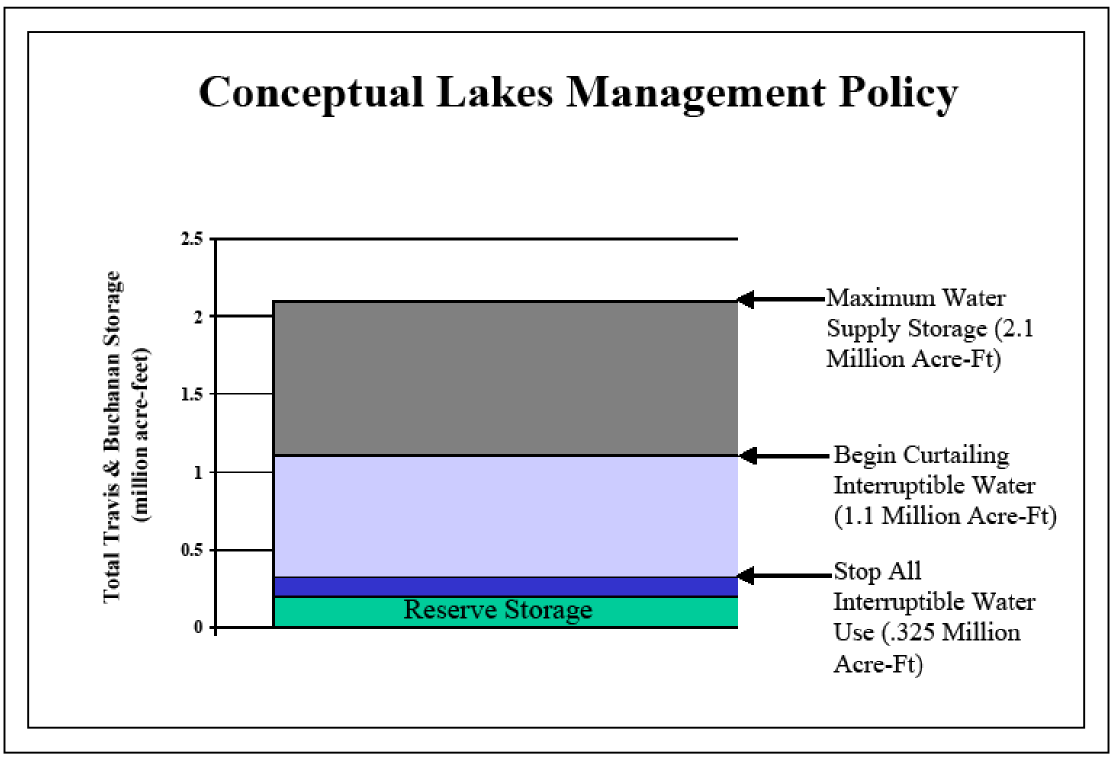
With regard to flood control, Lake Travis is the only reservoir in the Highland Lakes System specifically designated for this purpose. Currently, the LCRA must regulate the release of flood flows from Mansfield Dam so as to minimize and balance the impacts of floodwaters upstream and downstream of the dam without compromising the safety of the dam. Because development continues to encroach upon and alter the floodplain of the Lower Colorado River, the LCRA, in cooperation with the USACE, is currently studying alternative flood control measures, such as modifying current flood control operations and the possible addition of new off-channel flood control structures.

As mentioned previously, the primary threat to agriculture in Region K is water shortages for irrigation that are anticipated to occur in Matagorda, Wharton, and Colorado Counties during a repeat of the drought of record. The water supply available for irrigation is from three sources: ROR supplies, stored water from the Highland Lakes System, and groundwater. Whenever the Colorado River's natural flows are insufficient to meet irrigation demands, the LCRA releases water from upstream storage reservoirs to supplement the available downstream ROR supplies. The water supplied from the Highland Lakes storage is considered an interruptible supply and is subject to curtailment in accordance with policies and procedures specified in LCRA's Water Management Plan. Consequently, under drought of record conditions, there are substantial shortages of water for irrigation in Matagorda, Wharton, and Colorado Counties. Potential strategies for meeting these irrigation needs are presented in Chapter 4.

Water quantity is also a concern during drought conditions in terms of instream flows and freshwater inflows to Matagorda Bay. As discussed in Section 1.2.2.3, the free-flowing reaches below the Highland Lakes System downstream to the mouth of the Colorado River have been studied by the LCRA, and critical instream flows have been determined as the non interruptible demand on water resources. Instream flows have been maintained by LCRA at or above the minimum critical flow in accordance with the current WMP. Target instream flows, also determined by the LCRA study, provide flows to support an optimal range of habitat complexity for a well-balanced, native aquatic community within a stream reach. LCRA has maintained these flow regimes whenever water resources are adequate, but target flows are classified as interruptible demands that have been reduced during drought conditions. For further details, please refer to LCRA's WMP at http://www.lcra.org/library/media/public/docs/1999_WMP.pdf.

The following figure is from page 77 of the LCRA's 1999 Water Management Plan and summarizes the trigger levels for the allocation of interruptible supplies.

**Figure 1.23: LCRA 1999 WMP Trigger Levels for Interruptible Supplies**




The Highland Lakes provide the primary surface water storage and flood control capabilities for Region K. The issue of providing maintenance of these reservoirs to retain the maximum water storage capacity will become increasingly important as natural sedimentation processes decrease the volume of water each reservoir can hold. Currently, there are no programs in place to address this issue.

With regard to flood control, Lake Travis is the only reservoir in the Highland Lakes System specifically designed for this purpose. Releases by LCRA from the flood pool of Lake Travis are governed by rules of the U.S. Corps of Engineers (USACE). Under the rules, flood releases are determined by: specified ranges of observed or forecasted reservoir levels; the pool condition (i.e. rising or falling); the month of the year; and stage and flow criteria at three designated downstream locations. The amount of release increases with higher ranges of reservoir level and as long as downstream stage and flow limitations are not exceeded. The rules also provide that the U.S. Bureau of Reclamation will schedule flood releases as required for the safety of the dam when the reservoir level is forecast to exceed 722 feet above mean sea level. Because development continues to encroach upon and alter the floodplain of the Lower Colorado River, the LCRA, in cooperation with the USACE, the Federal Emergency Management Agency (FEMA) and over 60 local cities and counties in the Texas Colorado River Floodplain Coalition are currently studying flood damage reduction alternatives, such as modifying current flood control operations, updating floodplain maps, and the addition of new levees and off-channel flood control structures.

One of the major groundwater quantity concerns involves the Barton Springs segments of the Edwards aquifer (BFZ), which is a karst formation that responds quickly to changes in the environment due to its highly permeable and transmissive characteristics. South of the artesian zone of the Edwards aquifer there exists an interface, or “bad water line,” that separates the good quality groundwater from a layer of water that is not usable for human consumption, without further treatment, due to the high TDS content. This line, which is also referred to as the saline-water line or freshwater/saline-water interface, marks the interface where the groundwater reaches a TDS concentration of 1,000 mg/l. Research is currently being conducted to determine the effects that pumping large quantities of aquifer water will have on its location.

The second major issue in the Barton Springs segments of the Edwards aquifer (BFZ) is the minimum required environmental flows discharged from the artesian zone through Barton Springs. Increased groundwater pumping from the aquifer during drought conditions decreases all spring discharges, which can potentially impact the state- and federally-listed threatened and endangered species that depend on the springs for habitat, such as the Barton Springs salamander, and can potentially affect water supply availability downstream.

The primary water quantity issue in the Gulf Coast aquifer is subsidence, which is the dewatering of the interlayers of clay within the aquifer as a result of continued or long-term over-pumping. The resultant compaction of the clay causes a loss of water storage capacity in the aquifer, which in turn causes the land surface to sink, or subside. Once the ability of the clay to store water is gone, it can never be restored. The implementation of water conservation practices and conversion to other sources are currently the only remedies for this situation. Saltwater intrusion from the Gulf of Mexico into the Gulf Coast aquifer is also a potential concern due to groundwater pumping rates that are greater than the recharge rates of the aquifer.

The Trinity aquifer’s primary water quantity concern is the anticipated water-level declines during drought conditions due to increased demand that will be placed on the aquifer’s resources. A computer model was developed to simulate the flow of groundwater within the Trinity aquifer. The results for the portion of the aquifer that lies within Region K suggest that water levels in the Dripping Springs area of Hays County could decline more than 100 feet by the year 2040. Other portions of Hays County as well as Blanco and Travis Counties, may experience moderate water-level declines between 50 to 100 feet by the year 2010. Most of the streams gain water as they pass over the Trinity aquifer and in consequence may be affected by the declining water levels in the underlying aquifer. In addition, drought conditions may further decrease the base flow of the streams.

The Carrizo-Wilcox aquifer's primary water quantity concern is the water-level declines anticipated through the year 2060 due to increased pumping. Groundwater withdrawals increased an estimated 270 percent between 1988 and 1996, from 10,100 to 37,200 ac-ft/yr, from the mostly porous and permeable sandstone aquifer. The area in and around the Carrizo-Wilcox aquifer is expected to see continued population growth and increases in water demand. The TWDB co-sponsored a study of the Central Texas portion of the Carrizo-Wilcox aquifer using a computer model to assess the availability of groundwater in the area. Six water demand scenarios were simulated in the model, which ranged from considering only the current 1999 demand to analyzing all projected future water demands through the year 2050. On the basis of the calibrated model, all withdrawal scenario water demands appear to be met by groundwater from the Carrizo-Wilcox aquifer through the year 2050. The simulations indicate that the aquifer units remain fully saturated over most of the study area. The simulated water-level declines in the Carrizo-Wilcox aquifer mainly reflect a pressure reduction within the aquifer's artesian zone. Some dewatering takes place in the center of certain pumping areas. In addition, simulations indicate that drawdown within the confined portion of the aquifer will significantly increase the movement of groundwater out of the shallow, unconfined portions to the deeper artesian portions of the aquifer. Both a pressure reduction within the artesian zone and the migration of groundwater from the unconfined portions of the aquifer may impact historical access to groundwater in the region. The relationships that currently exist between surface and groundwater may also change. Simulations indicate that the Colorado River, which currently gains water from the Carrizo-Wilcox aquifer, may begin to lose water to the aquifer by the year 2050.

The LCRWPG passed a resolution regarding the "mining of groundwater" on February 9, 2000, which strongly opposes the over-utilization of groundwater, including the mining of groundwater, within its region at rates that could lead to eventual harm to the groundwater resources, except during limited periods of extreme drought. They define groundwater mining as "the withdrawal of groundwater from an aquifer at an annualized rate, which exceeds the average annualized recharge rate to an aquifer where the recharge rate can be scientifically derived with reasonable accuracy." This resolution addresses the concerns listed above for the Barton Springs segments of the Edwards (BFZ), Gulf Coast, Trinity, and Carrizo-Wilcox aquifers that are located within Region K. Based on the projected future groundwater demand in Region K, the LCRWPG's position on groundwater mining restricts the water supply strategies that can be considered for the Lower Colorado Regional Water Plan, which are discussed in more detail in Chapter 4.

### 1.2.5 Existing Water Planning in the Lower Colorado Regional Water Planning Area

As charged by Senate Bill 1, enacted in 1997, the LCRWPG prepared, adopted, and submitted the *2000 Region "K" Water Supply Plan* to the TWDB, which described how local entities may address future water supply needs for the next 50 years. Subsequently, a State Water Plan, Water for Texas-2002, was delivered by the TWDB to the Texas Legislature in January 2002, and incorporated the approved Regional Water Plan and contained legislative recommendations for future water policies. Five years later, the *2006 Region K Water Plan* was submitted to the TWDB by the Lower Colorado Regional Water Planning Group. This 2006 version assisted in the creation of the most recent 2007 State Water Plan by the TWDB.

SB 1 legislation also amended Chapter 36 of the Texas Water Code to require certain water supply entities to develop water management plans (WMPs), water conservation plans (WCPs), and/or drought contingency plans (DCPs). WCPs and DCPs must be submitted to TNRCC (now TCEQ) for review and certification. TCEQ received the plans, reviewed them for minimum criteria according to TCEQ's

Chapter 288 Rules that reflect SB 1 requirements. Finally, TCEQ sent the water supply entity a letter of certification that its plan contains the necessary minimum criteria components. It should be noted that TCEQ has not subjectively critiqued the quality of the water management, water conservation, or drought contingency plans; it only determined whether or not minimum criteria have been met. Each water supply entity is required to update their respective plan every five years, starting with the most recent submission date of May 1, 2009, so that the plan will improve as the water supply entity gains experience in managing its water resources. TWDB also receives copies of each certified WCP and DCP for review with respect to TWDB's water planning efforts. However, there are no rules requiring action by TWDB.

### *1.2.5.1 Water Management Plans (WMP)*

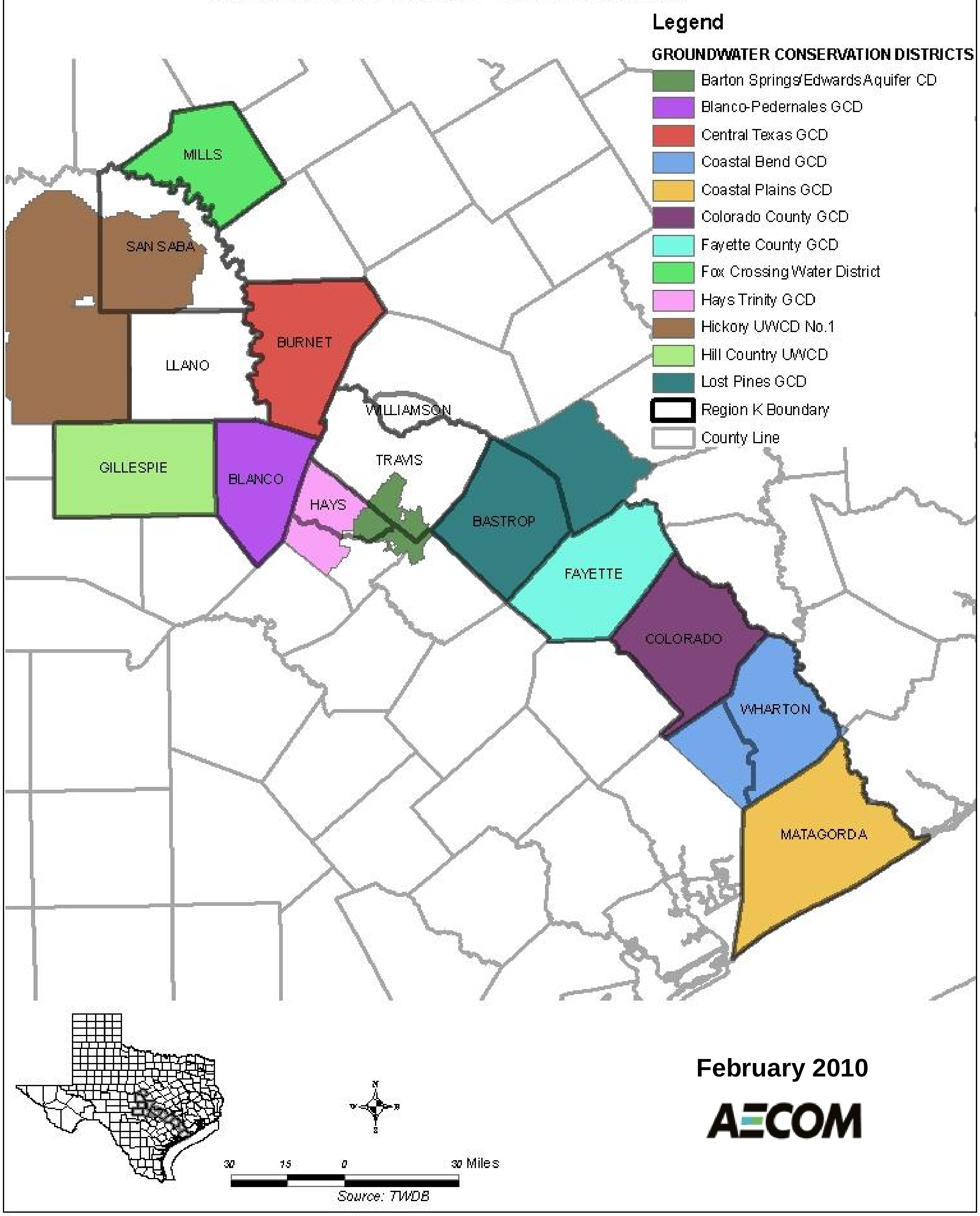
One category of the SB 1 required plan is the WMP, which must be developed by each Groundwater Conservation District (GCD) and surface water conservation district in the state. The intent of a WMP is to conserve, preserve, prevent waste, protect, and recharge water supplies within the water conservation district. These WMPs are required to be submitted to TWDB for review and administrative certification. Plans for existing districts were required to be submitted by 1 September 1998. Plans for districts established and confirmed after that date are generally required to be submitted within two years of the date that the district is confirmed by election. Surface water conservation districts, primarily river authorities, are also required to submit WMPs as a provision of the final adjudication of the river authority's water rights and receive administrative certification from TCEQ. In Region K, there were initially four designated GCDs and one surface water conservation district (LCRA), and all have received certification from TWDB or TCEQ for their WMPs. Additional districts have been established and confirmed since that time and *Table 1.11* shows each district along with the status of their WMPs. WMPs are also submitted to RWPGs for inclusion in the Regional Water Plan and to allow the regional planning groups to focus on strategies for current and future shortages that do not conflict with the management plans. *Figure 1.24* shows the groundwater conservation districts located in Region K.

**Table 1.11 Groundwater Conservation Districts in Lower Colorado Region and Their Water Management Plan Status**

| Groundwater Conservation District [1] | Lower Colorado Region County | Aquifers Managed [2] | Water Management Plan Status[3] |
|---|---|---|---|
| Barton Springs/Edwards Aquifer Conservation District (BSEACD) | Hays, Travis | Edwards (BFZ) & Trinity Aquifers, & Alluvial Deposits | Approved 9/15/2008 |
| Blanco-Pedernales GCD | Blanco | Trinity, Edwards-Trinity, Ellenburger, Hickory and Marble Falls Aquifers | Approved 1/7/2009 |
| Central Texas GCD | Burnet | Trinity, Marble Falls, Ellenburger-San Saba, Hickory | Approved 7/3/2007 |
| Coastal Bend GCD | Wharton | Gulf Coast Aquifer | Approved 9/28/2004 |
| Coastal Plains GCD | Matagorda | Gulf Coast Aquifer | Approved 9/10/2004 |
| Colorado County GCD | Colorado | Gulf Coast Aquifer | Due 11/6/2010 |
| Fayette County GCD | Fayette | Gulf Coast, Carrizo-Wilcox, Queen City, Sparta Aquifer, Yegua- Jackson and Colorado River Alluvium | Approved 12/17/2003 |
| Fox Crossing UWCD | Mills | Trinity Aquifer | Approved 3/30/2004 |
| Hays-Trinity GCD | Hays | Trinity Aquifer | Approved 10/7/2005 |
| Hickory UWCD #1 | San Saba | Hickory Aquifer, Ellenberger-San Saba, & Marble Falls Aquifers | Approved 12/4/2003 |
| Hill Country UWCD | Gillespie | Edwards-Trinity, Ellenberger-San Saba, & Hickory Aquifers | Approved 10/30/2003 |
| Lost Pines GCD | Bastrop | Carrizo-Wilcox Aquifer | Approved 2/15/2005 |

Source: TWDB
[1] UWCD = Underground Water Conservation District; GCD = Groundwater Conservation District.
[2] Water systems managed: Only portions of the indicated aquifer systems are located within a GCD's jurisdiction.
[3] TWDB approval/due date of latest management plan.

**Figure 1.24 : Lower Colorado Regional Water Planning Area (Region K) Groundwater Conservation Districts**



#### 1.2.5.2 Groundwater Management Areas (GMA)

In response to legislation passed in 2001, in December 2002 the TWDB designated 16 GMAs covering the entire state. In 2005, the legislature required all GCDs located within a GMA to conduct joint planning. The new requirements indicated that.

“Not later than September 1, 2010, and every five years thereafter, the districts shall consider groundwater availability models and other data or information for the management area and shall establish desired future conditions for the relevant aquifers within the management area.” .

Groundwater districts are required to meet at least annually to decide on “desired future conditions” for the aquifers within their GMA. A desired future condition is a quantifiable future groundwater condition. These conditions, called metrics, can be a particular groundwater level, level of water quality, volume of spring flow, etc. Based on the adopted desired future condition, the TWDB is responsible for providing each groundwater conservation district and regional water planning group, located wholly or partly in the management area, with a managed available groundwater volume (MAG) that will be used for planning and groundwater management purposes. Groundwater availability models and other data or information help in establishing managed available groundwater for the relevant aquifers within the management area.

In Region K, there are six groundwater management areas (GMAs). They include GMA-7, GMA-8, GMA-9, GMA-10, GMA-12, and GMA-15. Figure 1.25 shows the delineation of these groundwater management areas while Table 1.12 shows the status of each GMA’s Desired Future Conditions and Managed Available Groundwater reports.

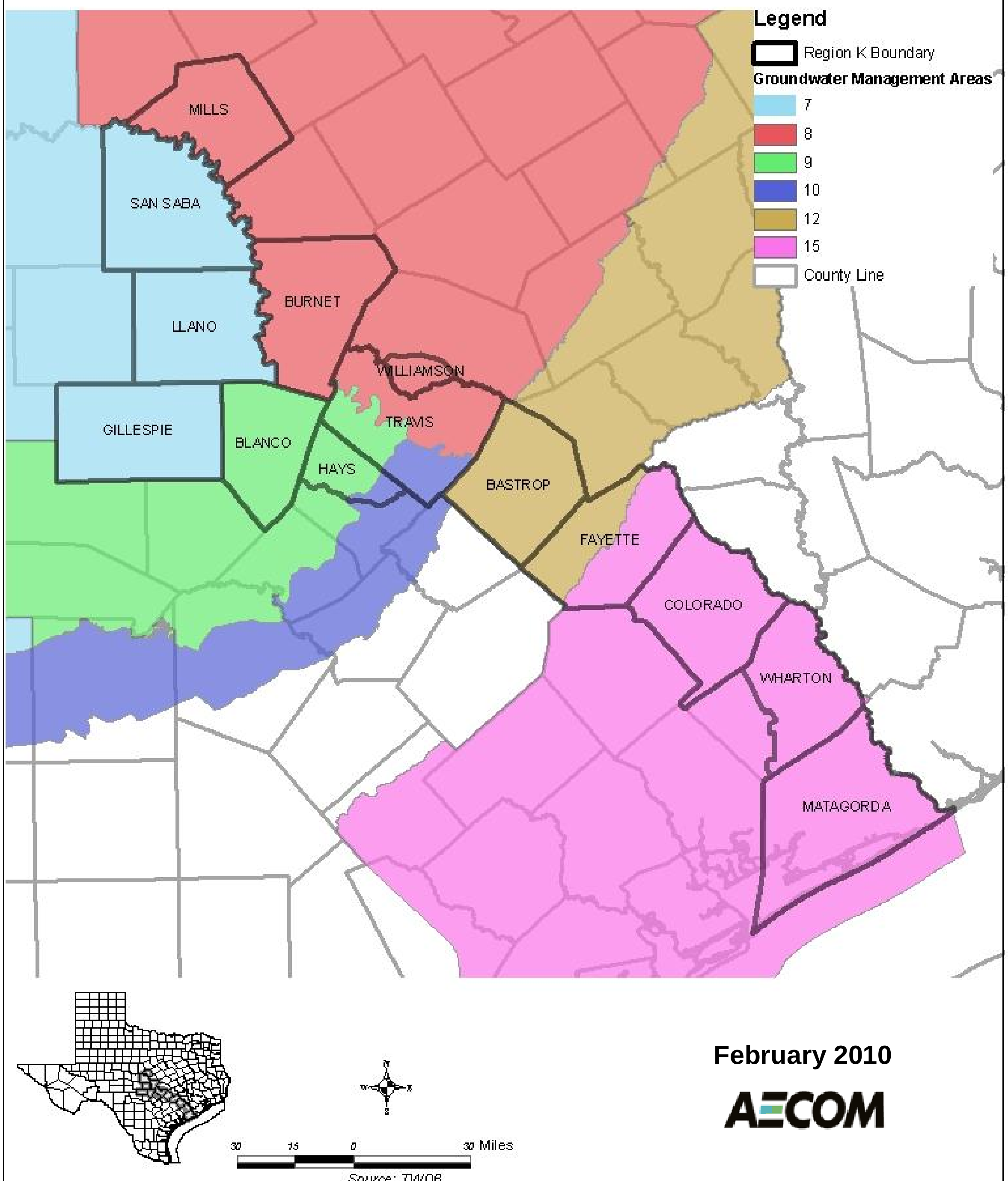
**Table 1.12 GMA Desired Future Conditions and Managed Available Groundwater Report Status**

| | Aquifers in Region K | Desired Future Conditions (DFC) Status | Managed Available Groundwater (MAG) Status[1] |
|---|---|---|---|
| GMA 7 | Edwards Trinity (Plateau) | Not Adopted | None |
| | Ellenburger - San Saba | Not Adopted | None |
| | Hickory | Not Adopted | None |
| | Trinity | Not Adopted | None |
| GMA 8 | Edwards (BFZ) | Adopted 12/17/07 | Final 9/30/08 |
| | Ellenburger - San Saba | Adopted 5/19/08 | Final 12/10/09 |
| | Hickory | Adopted 5/19/08 | Final 12/10/09 |
| | Marble Falls | Adopted 5/19/08 | Final 4/30/09 |
| GMA 9 | Edwards (BFZ) | Not Adopted | None |
| | Edwards Trinity (Plateau) – Trinity Group | Not Adopted | None |
| | Ellenburger - San Saba | Adopted 8/29/08 | None |
| | Hickory | Adopted 8/29/08 | None |
| | Marble Falls | Adopted 8/29/08 | None |
| | Trinity | Not Adopted | None |
| GMA 10 | Edwards (BFZ) | Not Adopted | None |
| | Trinity | Not Adopted | None |
| GMA 12 | Carrizo Wilcox | Not Adopted | None |
| | Queen City | Not Adopted | None |
| | Sparta | Not Adopted | None |
| | Trinity | Not Adopted | None |
| | Yegua - Jackson | Not Adopted | None |
| GMA 15 | Carrizo Wilcox | Not Adopted | None |
| | Queen City | Not Adopted | None |
| | Sparta | Not Adopted | None |
| | Yegua - Jackson | Not Adopted | None |

Source: TCEQ (formerly TNRCC) List of SB1-required WCPs, dated 3/27/2000. Confirmation of completion from TCEQ personnel's verification of the TCEQ database 11/05/2004.

[1] MAG reports not available until DFC has been adopted.

Figure 1.25 : Lower Colorado Regional Water Planning Area (Region K) Groundwater Management Areas




February 2010

### 1.2.5.3 Water Conservation Plans (WCP) and Drought Contingency Plans (DCP)

SB 1 also required each entity that possesses major surface water and/or groundwater rights to develop a WCP. These plans include irrigation water rights of at least 10,000 ac-ft/yr, non-irrigation (municipal, industrial, mining, recreational) water rights of at least 1,000 ac-ft/yr, which are listed in *Table 1.13*, and retail public water suppliers which serve 3,300 connections or more, which are listed in *Table 1.14b*. The intent of the WCP is to develop and implement programs that will reduce water use within each of the major WUGs listed below, primarily through utilizing advances in technology, reducing distribution system water losses, and educating customers and encouraging voluntary participation in water use efficiency efforts. Approximately 90 percent of Region K's water use occurs in the agricultural irrigation and municipal sectors, and the majority of the WCPs have targeted these two water use groups. There are currently 15 entities in the Lower Colorado Regional Water Planning Area required to develop WCPs, and these WCPs have been submitted and have received certification from TCEQ. The remainder of entities holding water rights in Region K are not required to develop or submit a WCP unless they petition TCEQ for an amendment to their water right or apply for a capital improvement loan with TWDB. In addition, Chapter 288 of the TCEQ Rules requires wholesale water supply purchasers to submit water conservation plans to their wholesale supplier.

**Table 1.13 Entities in the Lower Colorado Region SB 1-Required to Submit Water Conservation Plans (Irrigation Rights of 10,000 ac-ft or more and Non-Irrigation Rights of 1,000 ac-ft or more)**

| Entity | County | Water Uses [1] | Water Conservation Plan |
|---|---|---|---|
| Kempner WSC | Burnet | MUN, IND | Updated 4/23/2009 |
| City of Llano | Llano | MUN, IRR | Complete 4/04/2002 |
| Lake LBJ Municipal Utility District | Llano | MUN | Complete 2/05/2002 |
| Don A. Culwell/Leslie L. Appelt | Matagorda | IND, REC | na |
| Equistar Chemicals | Matagorda | IND | na |
| Farmers Canal Company | Matagorda | IRR | Updated 4/17/2009 |
| STP Nuclear Operating Company | Matagorda | IND | Updated 5/01/2009 |
| Texas Brine Co. LLC | Matagorda | IND | Complete 9/20/2001 |
| City of Goldthwaite | Mills | MUN, IND, IRR | Complete 8/07/2002 |
| Lower Colorado River Authority (LCRA) | Region K | MUN, IND, MIN, IRR, HYD | Updated 2009 |
| Capitol Aggregates, Ltd. | Travis | MIN, IRR | Complete 3/27/2000 |
| City of Austin | Travis | MUN, IND, IRR, REC, HYD | Complete 6/18/2002, Update in Progress |
| City of Pflugerville | Travis | MUN, IND | Updated 4/27/2009 |
| City of Cedar Park | Travis/Williamson | MUN, IND | Updated 5/04/2009 |
| H & L New Gulf, Inc. | Wharton | MUN, MIN, IND | Complete 1/05/2000 |
| Lacy Withers Armour Trust et al. | Wharton | MUN, IND, IRR, REC | Complete 9/07/2000 |
| Leonard Wittig | Wharton | MUN, MIN, IND, IRR | Complete 6/03/1999 |

Source: TCEQ (formerly TNRCC) List of SB1-required WCPs, updated 7-27-2009. Confirmation of completion from TCEQ personnel's verification of the TCEQ database 11/05/2004.

[1] Water uses: IRR = irrigation; MUN = municipal; IND = industrial; MIN = mining; REC = recreation; HYD = hydroelectric.

The third category of water resource planning effort required by SB 1 is the DCP. The intent of the DCP is to specify how a water supply entity will contract and supply dependable stored water supplies to its customers during a repeat of the drought of record, which is the period 1947–1957 for Region K. Triggering conditions for water shortages during a drought must be defined, and the actions that will be taken by the water supplier to mitigate the adverse effects of these water shortages must be specified. The DCP's major goals are extending the supplies of dependable water, preserving essential water uses, protecting public health and safety, and establishing equitable distributions of water among the water supplier's customers.

All wholesale water suppliers (*Table 1.14a*) and those retail water suppliers with at least 3,300 water supply connections (*Table 1.14b*) were to submit DCPs to TNRCC by 1 September 1999. Retail entities with fewer than 3,300 connections were required to submit DCPs to the RWPGs by 1 September 2000. However, the RWPGs do not review or certify drought contingency plans. All wholesale water suppliers (*Table 1.14a*) and those retail water suppliers with at least 3,300 water supply connections (*Table 1.14b*) are required to submit DCPs to the TCEQ (formerly TNRCC) again in May 2009.

**Table 1.14a Water Wholesalers in Lower Colorado Region SB 1-Required to Submit Drought Contingency Plans (Entities With Contract Water Sales to Others)**

| Water Wholesaler [1] | County | Drought Contingency Plan (Date Received) |
|---|---|---|
| CITY OF AUSTIN WATER & WASTEWATER* | TRAVIS | 4/28/2009 |
| CITY OF CEDAR PARK* | WILLIAMSON | 5/4/2009 |
| CITY OF EL CAMPO* | WHARTON | |
| CITY OF FLORENCE | WILLIAMSON | |
| CITY OF GEORGETOWN | WILLIAMSON | 5/1/2009 |
| CITY OF HORSESHOE BAY | LLANO | |
| CITY OF MARBLE FALLS | BURNET | 4/30/2009 |
| CITY OF PFLUGERVILLE | TRAVIS | |
| CITY OF ROUND ROCK* | WILLIAMSON | |
| CITY OF SAN MARCOS* | HAYS | |
| CITY OF TAYLOR* | WILLIAMSON | |
| DRIPPING SPRINGS WSC | HAYS | |
| ELLIOTT RANCH WATER SYSTEM | HAYS | |
| FAYETTE COUNTY WCID MONUMENT HILL | FAYETTE | |
| KINGSLAND WSC | LLANO | |
| MUNICIPAL GROUNDWATER SOLUTIONS | TRAVIS | |
| RIVER PLACE MUD | TRAVIS | |
| RIVERCREST WATER SYSTEM | TRAVIS | |
| TRAVIS COUNTY MUD 4 | TRAVIS | 4/16/2009 |
| TRAVIS COUNTY WCID 17* | TRAVIS | |
| WEIR WATER WORKS | WILLIAMSON | |

Sources: TCEQ (formerly TNRCC) List of SB1-Required Drought Contingency Plans, updated 7-27-2009; and the Public Drinking Water Public Water Supply System database, updated 7-27-2009.
[1] MUD = Municipal Utility District; WCID = Water Control & Improvement District; WS = Water System or Water Supply.
*Wholesaler also supplies retail water service with more than 3,300 connections.

**Table 1.14b Lower Colorado Region SB 1-Required Water Conservation Plans and Drought Contingency Plans (Retail Water Suppliers With > 3,300 Connections)**

| Retail Public Water Supplier (> 3,300 connections)[1] | County | Drought Contingency Plan (Date Received) |
|---|---|---|
| AQUA WSC | BASTROP | 4/24/2009 |
| BRUSHY CREEK MUD | WILLIAMSON | |
| CHISHOLM TRAIL SUD | WILLIAMSON | 4/24/2009 |
| CITY OF AUSTIN WATER & WASTEWATER* | TRAVIS | 4/28/2009 |
| CITY OF BAY CITY | MATAGORDA | |
| CITY OF CEDAR PARK* | WILLIAMSON | 5/4/2009 |
| CITY OF EL CAMPO* | WHARTON | |
| CITY OF FREDERICKSBURG | GILLESPIE | 4/16/2009 |
| CITY OF GEORGETOWN | WILLIAMSON | 5/1/2009 |
| CITY OF HORSESHOE BAY | LLANO | |
| CITY OF KYLE | HAYS | 5/1/2009 |
| CITY OF LAGO VISTA | TRAVIS | |
| CITY OF LEANDER | WILLIAMSON | 4/14/2009 |
| CITY OF PFLUGERVILLE | TRAVIS | |
| CITY OF ROUND ROCK* | WILLIAMSON | 6/10/2009 |
| CITY OF SAN MARCOS* | HAYS | |
| CITY OF TAYLOR* | WILLIAMSON | |
| CITY OF WHARTON | WHARTON | |
| GOFORTH SUD | HAYS | 6/4/2009 |
| JONAH WATER SUD | WILLIAMSON | |
| KINGSLAND WSC | LLANO | |
| LAKEWAY MUD | TRAVIS | 5/18/2009 |
| MANVILLE WSC* | TRAVIS | 4/30/2009 |
| TRAVIS COUNTY WCID 17* | TRAVIS | |
| WINDERMERE COMMUNITY | TRAVIS | |

Sources: TCEQ (formerly TNRCC) List of SB1-Required Drought Contingency Plans, updated 7-27-2009; and the Public Drinking Water Public Water Supply System database, updated 7-27-2009.

[1] MUD = Municipal Utility District; WCID = Water Control & Improvement District; WS = Water System or Water Supply.

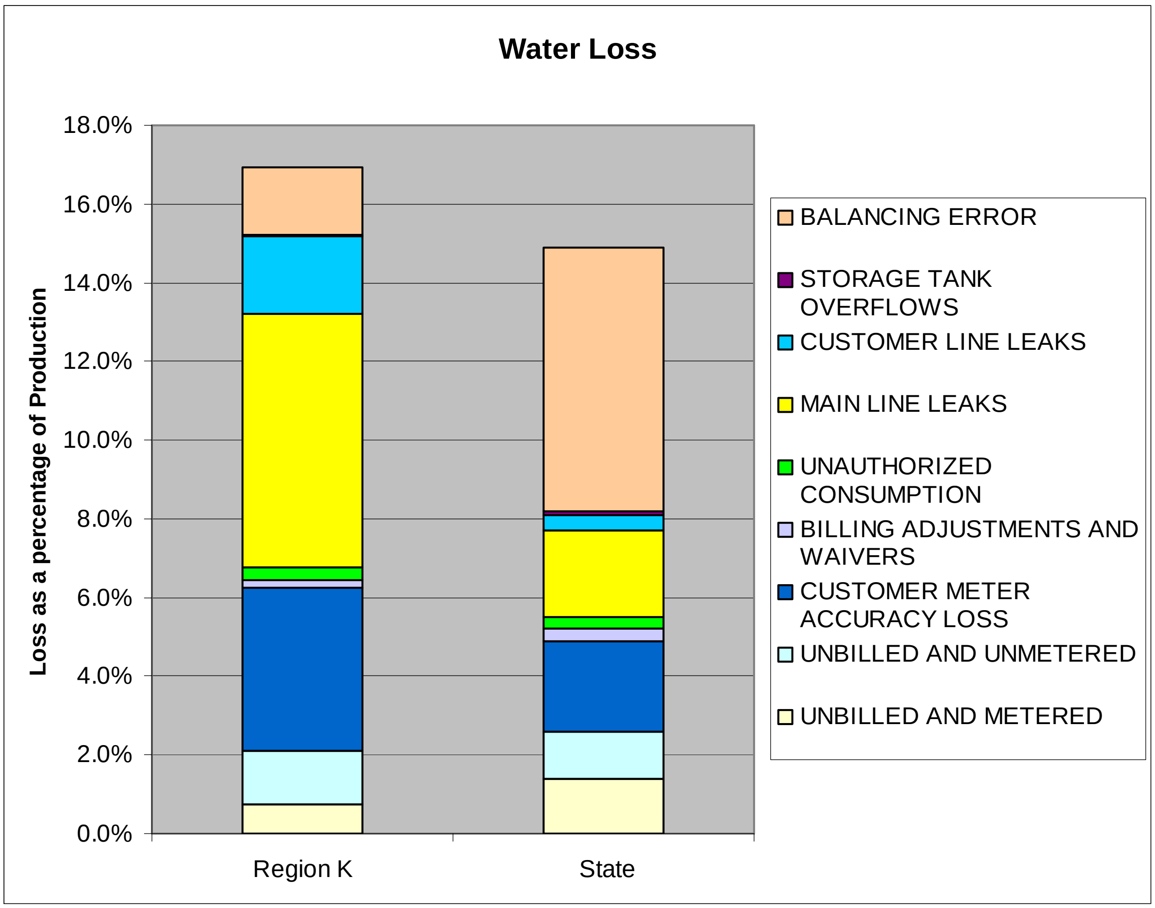
*Retailer also supplies wholesale water service.

All of the remaining municipal WUGs serve less than 3,300 connections. These WUGs are required to have drought contingency plans, but they are not required to be submitted to the TCEQ for review and comment. The definition of a WUG for municipal purposes has been expanded to include entities that provide retail water service in excess of 280 ac-ft/yr, or approximately 250,000 gallons per day (gpd). Systems which serve 3,300 connections, assuming 3.2 persons per connection and 130 gallons per person per day, would be serving approximately 1.4 million gallons per day (mgd). As a result, the WUGs covered in the category of less than 3,300 connections will have water usage ranging from 250,000 gpd to 1.3 mgd, or 280 to 1,540 ac-ft/yr. Entities with less than 280 ac-ft/yr of usage are included in the County-Other Municipal WUG. In the interest of brevity, the remaining WUGs are not listed individually.

### 1.2.5.4 Water Audits

A fourth water supply planning effort is for water systems to perform a water audit. The 78th Texas Legislature passed House Bill 3338, which required retail public utilities that provide potable water to "perform and file with the [Texas Water Development Board] a water audit computing the utility's most recent annual system water loss" every five years. Under this authority, the TWDB instituted new water audit reporting requirements that require retail public utilities to carefully audit their system water use at least once every five years; to estimate system water use in standard, well defined categories; and to report their first set of water loss data to the TWDB by 31 March 2006. The results of this statewide data gathering was compiled into the "Analysis of Water Loss as Reported by Public Water Suppliers in Texas", TWDB, 24 January 2007. A comparison between Region K and the state averages of the various water loss categories is presented below in *Figure 1.26*.

**Figure 1.26: Water Loss Comparison**




The water loss audit comparison shows that Region K has a higher than average percentage of main line losses. Region K has a large number of rural areas and the water audit shows that some of these rural areas may have lower per capita water use, but can still incorporate water conservation strategies to reduce demands by repairing their water line leaks.

# *APPENDIX 1A*

## *THREATENED AND ENDANGERED SPECIES IN THE LOWER COLORADO REGIONAL WATER PLANNING AREA (Texas Parks & Wildlife Department Special Species Lists and Annotated County Lists of Rare Species)*

# *APPENDIX 1B*

## *LOWER COLORADO REGION INDUSTRY ECONOMIC VALUE ESTIMATES*
## *(LCRA Community and Economic Development, IMPLAN 2004 - base year 2001)*

# *APPENDIX 1A*

## *THREATENED AND ENDANGERED SPECIES IN THE LOWER COLORADO REGIONAL WATER PLANNING AREA (Texas Parks and Wildlife Department Special Species Lists and Annotated County Lists of Rare Species)*

## KEY: COUNTY THREATENED OR ENDANGERED SPECIES

| | |
|---|---|
| LE,LT | Federally Listed Endangered/Threatened |
| PE,PT | Federally Proposed Endangered/Threatened |
| SAE, SAT | Federally Endangered/Threatened by Similarity of Appearance |
| C1 | Federal Candidate for Listing, formerly Category 1 Candidate |
| DL,PDL | Federally Delisted/Proposed for Delisting |
| NL | Not Federally Listed |
| E,T | State Listed Endangered/Threatened |
| NT | Not tracked or no longer tracked by the State |
| "blank" | Rare, but with no regulatory listing status |

***Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.***

*Source: Texas Parks and Wildlife Department Special Species Lists and Annotated County Lists of Rare Species (current as of January 2009)*

## TABLE 1A-1: THREATENED OR ENDANGERED SPECIES OF BASTROP COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Houston Toad | *Bufo houstonensis* | endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations | LE | E |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Henslow's Sparrow | *Ammodramus henslowii* | wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county | | |
| Interior Least Tern | *Sterna antillarum athalassos* | subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Wood Stork | *Mycteria americana* | forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960 | | T |
| ******CRUSTACEANS****** | | | | |
| A crayfish | *Procambarus texanus* | ponds | | |
| ******FISHES****** | | | | |
| Blue Sucker | *Cycleptus elongatus* | larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles | | T |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Guadalupe bass | *Micropterus treculii* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| *******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in man-made structures or in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; usually roosts in clusters that may number in the thousands; hibernates in caves during winter; opportunistic insectivore | | |
| Elliot's Short-tailed Shrew | *Blarina hylophaga hylophaga* | sandy areas in live oak mottes, grassy areas with a Loblolly pine (Pinus taeda) overstory, and grassy areas near Post oak (Quercus stellata) stands; burrows extensively under leaf litter, logs, and into soil, but ground cover is not required; needs soft damp soils for ease of burrowing | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| *******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| *******REPTILES****** | | | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas horned lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| Timber/Canebrake Rattlesnake | *Crotalus horridus* | swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto | | T |
| *******PLANTS****** | | | | |
| Navasota ladies'-tresses | *Spiranthes parksii* | endemic; margins of and openings within post oak woodlands in sandy loams along intermittent tributaries of rivers; flowering late October-early November | LE | E |
| Sandhill woolywhite | *Hymenopappus carrizoanus* | endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall | | |
| Shinner's sunflower | *Helianthus occidentalis ssp plantagineus* | mostly in prairies on the Coastal Plain, with several slightly disjunct populations in the Pineywoods and South Texas Brush Country | | |

## TABLE 1A-2: THREATENED OR ENDANGERED SPECIES OF BLANCO COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Blanco River Springs Salamander | *Eurycea pterophila* | subaquatic; springs and caves in the Blanco River drainage | | |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Zone-tailed Hawk | *Buteo albonotatus* | arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions | | T |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| Headwater catfish | *Ictalurus lupus* | originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers | | |
| ******INSECTS****** | | | | |
| A mayfly | *Allenhyphes michaeli* | TX Hill Country; mayflies distinguished by aquatic larval stage; adult stage generally found in shoreline vegetation | | |
| Disjunct crawling | *Haliplus* | unknown, maybe shallow water | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| water beetle | *nitens* | | | |
| ******MAMMALS****** | | | | |
| Black Bear | *Ursus americanus* | bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear (LT, T), treat all east Texas black bears as federal and state listed Threatened | T/SA; NL | T |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Hirundo pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Gray wolf | *Canis lupus* | extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands | LE | E |
| Llano Pocket Gopher | *Geomys texensis texensis* | found in deep, brown loamy sands or gravelly sandy loams and is isolated from other species of pocket gophers by intervening shallow stony to gravelly clayey soils | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Golden orb | *Quadrula aurea* | sand and gravel in some locations and mud at others; intolerant of impoundment in most instances; Guadalupe, San Antonio, and Nueces River basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Spot-tailed Earless Lizard | *Holbrookia lacerata* | central & southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ****** PLANTS****** | | | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Canyon mock-orange | *Philadelphus ernestii* | endemic; solution-pitted outcrops of Cretaceous limestone in mesic canyons, usually in shade of mostly deciduous slope forest; flowering April-May | | |
| Granite spiderwort | *Tradescantia pedicellata* | endemic; rocky soils in the Edwards Plateau; flowering March-June (July?) | | |
| Hill country wild-mercury | *Argythamnia aphoroides* | Texas endemic; mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands, also in partial shade of oak-juniper woodlands in gravelly soils on rocky limestone slopes; flowering April-May with fruit persisting until midsummer | | |

## TABLE 1A-3: THREATENED OR ENDANGERED SPECIES OF BURNET COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******ARACHNIDS****** | | | | |
| Reddell harvestman | *Texella reddelli* | small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties | LE | |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haltaeetus leucocephalus* | found primarily near rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter, hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Interior Least Tern | *Sterna antillarum athalassos* | this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| ******CRUSTACEANS****** | | | | |
| An amphipod | *Stygobromus russelli* | subterranean waters, usually in caves and limestone aquifers; resident of numerous caves in ca. 10 counties of the Edwards Plateau | | |
| Bifurcated cave amphipod | *Stygobromus bifurcatus* | found in cave pools | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| Headwater catfish | *Ictalurus lupus* | originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers | | |
| ******INSECTS****** | | | | |
| Disjunct crawling water beetle | *Haliplus nitens* | unknown, maybe shallow water | | |
| Leonora's dancer damselfly | *Argia leonorae* | south central and western Texas; small streams and seepages | | |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Gray Wolf | *Canis lupus* | extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands | LE | E |
| Llano pocket gopher | *Geomys texensis texensis* | found in deep, brown loamy sands or gravelly sandy loams and is isolated from other species of pocket gophers by intervening shallow stony to gravelly clayey soils | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic in habitat; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Concho water snake | *Nerodia paucimaculata* | Texas endemic; Concho and Colorado river systems; shallow fast-flowing water with a rocky or gravelly substrate preferred; adults can be found in deep water with mud bottoms; breeding Mar-Oct | LT-PDL | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Spot-tailed earless lizard | *Holbrookia lacerata* | central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ******VASCULAR PLANTS****** | | | | |
| Basin bellflower | *Campanula reverchonii* | Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July | | |
| Enquist's sandmint | *Brazoria enquistii* | primarily on sand banks in and along beds of streams that drain granitic /gneissic landscapes; flowering/fruiting late April-early June | | |
| Rock Quillwort | *Isoetes lithophila* | very shallow seasonally wet sand or gravel in vernal pools on granite or gneiss outcrops; sporulating in late spring and opportunistically at other seasons | | |
| Granite spiderwort | *Tradescantia pedicellata* | endemic; rocky soils in the Edwards Plateau; flowering March-June (July?) | | |
| Edwards Plateau Cornsalad | *Valerianella texana* | very shallow, well-drained but seasonally moist gravelly soils derived from igneous or metamorphic rocks, often along the downslope margin of rock outcrop, in full sun or in partial shade of oak-juniper woodlands; flowering March–April | | |

## TABLE 1A-4: THREATENED OR ENDANGERED SPECIES OF COLORADO COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Houston Toad | *Bufo houstonensis* | endemic; species sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations | LE | E |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Attwater's Greater Prairie-chicken | *Tympanuchus cupido attwateri* | this county within historic range; endemic; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July | LE | E |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Henslow's Sparrow | *Ammodramus henslowii* | wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county | | |
| Interior Least Tern | *Sterna antillarum athalassos* | subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| White-faced Ibis | *Plegadis chihi* | prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats | | T |
| White-tailed Hawk | *Buteo albicaudatus* | near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May | | T |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Wood Stork | *Mycteria americana* | forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960 | | T |
| ******FISHES****** | | | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Blue sucker | *Cycleptus elongatus* | larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles | | T |
| Guadalupe bass | *Micropterus treculii* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| ******INSECTS****** | | | | |
| Texas asaphomyian tabanid fly | *Asaphomyia texensis* | globally historic; adults of tabanid spp. found near slow-moving water; eggs laid in masses on leaves or other objects near or over water; larvae are aquatic and predaceous; females of tabanid spp. bite, while males chiefly feed on pollen and nectar; using sight, carbon dioxide, and odor for selection, tabanid spp. lie in wait in shady areas under bushes and trees for a host to happen by | | |
| ******MAMMALS****** | | | | |
| Louisiana Black Bear | *Ursus americanus luteolus* | possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas | LT | T |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| Timber/Canebrake Rattlesnake | *Crotalus horridus* | swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto | | T |
| ******VASCULAR PLANTS****** | | | | |
| Coastal gay-feather | *Liatris bracteata* | endemic; black clay soils of prairie remnants; flowering in fall | | |
| Shinner's sunflower | *Helianthus occidentalis ssp plantagineus* | mostly in prairies on the Coastal Plain, with several slightly disjunct populations in the Pineywoods and South Texas Brush Country | | |

## TABLE 1A-5: THREATENED OR ENDANGERED SPECIES OF FAYETTE COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Henslow's Sparrow | *Ammodramus henslowii* | wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking | | |
| Interior Least Tern | *Sterna antillarum athalassos* | this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Wood Stork | *Mycteria americana* | forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960 | | T |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic in habitat; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |

| | | | | |
|---|---|---|---|---|
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| Timber/Canebrake Rattlesnake | *Crotalus horridus* | swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto | | T |
| ******VASCULAR PLANTS****** | | | | |
| Texas Meadow-rue | *Thalictrum texanim* | endemic; mesic woodlands or forests, including wet ditches on partially shaded roadsides; flowering March-May | | |
| Navasota Ladies' Tresses | *Spiranthes parksii* | endemic; margins of and openings within post oak woodlands in sandy loams along intermittent tributaries of rivers; flowering late October-early November | LE | E |
| Shinner's sunflower | *Helianthus occidentalis ssp plantagineus* | mostly in prairies on the Coastal Plain, with several slightly disjunct populations in the Pineywoods and South Texas Brush Country | | |

## TABLE 1A-6: THREATENED OR ENDANGERED SPECIES OF GILLESPIE COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Valdina Farms sinkhole salamander | *Eurycea troglodytes complex* | isolated, intermittent pools of a subterranean streams and sinkhole in Nueces, Frio, Guadalupe, and Pedernales watersheds within Edwards Aquifer area | | |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Baird's Sparrow | *Ammodramus bairdii* | shortgrass prairie with scattered low bushes and matted vegetation; mostly migratory in western half of State, though winters in Mexico and just across Rio Grande into Texas from Brewster through Hudspetth counties | | |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Zone-tailed Hawk | *Buteo albonotatus* | arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions | | T |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| Headwater catfish | *Ictalurus lupus* | originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| | | springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers | | |
| ******MAMMALS****** | | | | |
| Black Bear | *Ursus americanus* | bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear (LT, T), treat all east Texas black bears as federal and state listed Threatened | T/SA; NL | T |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Gray Wolf | *Canis lupus* | extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands | LE | E |
| Llano Pocket Gopher | *Geomys texensis texensis* | found in deep, brown loamy sands or gravelly sandy loams and is isolated from other species of pocket gophers by intervening shallow stony to gravelly clayey soils | | |
| Plains spotted skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Golden orb | *Quadrula aurea* | sand and gravel in some locations and mud at others; intolerant of impoundment in most instances; Guadalupe, San Antonio, and Nueces River basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Spot-tailed Earless Lizard | *Holbrookia lacerata* | central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ******VASCULAR PLANTS****** | | | | |
| Basin bellflower | *Campanula reverchonii* | Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July | | |
| Big Red Sage | *Salvia penstemonoides* | endemic; moist to seasonally wet clay or silt soils in creekbeds and seepage slopes of limestone canyons; flowering June-October | | |
| Canyon rattlesnake-root | *Prenanthes carrii* | rich humus soil in upper limestone woodland canyon drainages | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Edwards Plateau Cornsalad | *Valerianella texana* | very shallow, well-drained but seasonally moist gravelly soils derived from igneous or metamorphic rocks, often along the downslope margin of rock outcrop, in full sun or in partial shade of oak-juniper woodlands; flowering March–April | | |
| Hill country wild-mercury | *Argythamnia aphoroides* | Texas endemic; mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands, also in partial shade of oak-juniper woodlands in gravelly soils on rocky limestone slopes; flowering April-May with fruit persisting until midsummer | | |
| Warnock's coral root | *Hexalectris warnockii* | leaf litter and humus in oak-juniper woodlands in mountain canyons in the Trans Pecos but at lower elevations to the east, often on narrow terraces along creekbeds | | |
| Rock quillwort | *Isoetes lithophila* | very shallow seasonally wet sand or gravel in vernal pools on granite or gneiss outcrops; sporulating in late spring and opportunistically at other seasons | | |
| Small-headed pipewort | *Eriocaulon körnickianum* | in East Texas, post-oak woodlands and xeric sandhill openings on permanently wet acid sands of upland seeps and hillside seepage bogs, usually in patches of bare sand rather than among dense vegetation or on muck; in Gillespie County, on permanently wet or moist hillside seep on decomposing granite gravel and sand among granite outcrops; flowering/fruiting late May-late June | | |

## TABLE 1A-7: THREATENED OR ENDANGERED SPECIES OF HAYS COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Blanco Blind Salamander | *Eurycea robusta* | troglobitic; water-filled subterranean caverns; may inhabit deep levels of the Balcones aquifer to the north and east of the Blanco River | | T |
| Blanco River Springs Salamander | *Eurycea pterophila* | subaquatic; springs and caves in the Blanco River drainage | | |
| San Marcos Salamander | *Eurycea nana* | headwaters of the San Marcos River downstream to ca. ½ mile past IH-35; water over gravelly substrate characterized by dense mats of algae (*Lyng bya*) and aquatic moss (*Leptodictym riparium*), and water temperatures of 21-22 $^{O}$ C; diet includes amphipods, midge larve, and aquatic snails | LT | T |
| Texas Blind Salamander | *Eurycea rathbuni* | troglobitic; water-filled subterranean caverns along a six mile stretch of the San Marcos Spring Fault, in the vicinity of San Marcos; eats small invertebrates, including snails, copepods, amphipods, and shrimp | LE | E |
| ******ARACHNIDS****** | | | | |
| Bandit Cave spider | *Cicurina bandida* | very small, subterrestrial, subterranean obligate | | |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Zone-tailed Hawk | *Buteo albonotatus* | arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions | | T |
| ******CRUSTACEANS****** | | | | |
| A cave obligate crustaean | *Monodella texana* | subaquatic, subterranean obligate; underground freshwater aquifers | | |
| Balcones Cave amphipod | *Stygobromus balconis* | subaquatic, subterranean obligate amphipod | | |
| Texas Cave Shrimp | *Palaemonetes antrorum* | subterranean sluggish streams and pools | | |
| Ezell's Cave Amphipod | *Stygobromus flagellatus* | known only from artesian wells | | |
| Texas troglobitic water slater | *Lirceolus smithii* | subaquatic, subterranean obligate, aquifer | | |
| ******FISHES****** | | | | |
| Fountain Darter | *Etheostoma fonticola* | known only from the San Marcos and Comal rivers; springs and spring-fed streams in dense beds of aquatic plants growing close to bottom, which is normally mucky; feeding mostly diurnal; spawns year-round with August and late winter to early spring peaks | LE | E |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| Guadalupe Darter | *Percina sciera apristis* | Guadalupe River basin; most common over gravel or gravel and sand raceways of large streams and rivers | | |
| San Marcos Gambusia | *Gambusia georgei* | (extirpated) – endemic; formerly known from upper San Marcos River; restricted to shallow, quiet, mud-bottomed shoreline areas without dense vegetation in thermally constant main channel | LE | E |
| ******INSECTS****** | | | | |
| A mayfly | *Procloeon distinctum* | mayflies distinguished by aquatic larval stage; adult stage generally found in shoreline vegetation | | |
| Comal Springs Dryopid Beetle | *Stygoparnus comalensis* | dryopids usually cling to objects in a stream; dryopids are sometimes found crawling on stream bottoms or along shores; adults may leave the stream and fly about, especially at night; most dryopid larvae are vermiform and line in soil or decaying wood | LE | |
| Comal Springs Riffle Beetle | *Heterelmis comalensis* | Comal and San Marcos Springs | LE | |
| Edwards Aquifer Diving Beetle | *Haideoporus texanus* | habitat poorly known; known from an artesian well in Hays County | | |
| Flint's Net-spinning Caddisfly | *Cheumatopsyche flinti* | very poorly known species with habitat description limited to "a spring" | | |
| Leonora's dancer damselfly | *Argia leonorae* | south central and western Texas; small streams and seepages | | |
| Rawson's metalmark | *Calephelis rawsoni* | moist areas in shaded limestone outcrops in central Texas, desert scrub or oak woodland in foothills, or along rivers elsehwere; larval hosts are Eupatorium havanense, E. greggi. | | |
| San Marcos Saddle-case Caddisfly | *Protoptila arca* | known from an artesian well in Hays County; locally very abundant; swift, well-oxygenated warm water about 1-2 m deep; larvae and pupal cases abundant on rocks | | |
| Texas austrotinodes caddisfly | *Austrotinodes texensis* | appears endemic to the karst springs and spring runs of the Edwards Plateau region; flow in type locality swift but may drop significantly during periods of little drought; substrate coarse and ranges from cobble and gravel to limestone bedrock; many limestone outcroppings also found along the streams | | |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Golden orb | *Quadrula aurea* | sand and gravel in some locations and mud at others; intolerant of impoundment in most instances; Guadalupe, San Antonio, and Nueces River basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Cagle's Map Turtle | *Graptemys caglei* | endemic; Guadalupe River System; short stretches of shallow water with swift to moderate flow and gravel or cobble bottom, connected by deeper pools with a slower flow rate and a silt or mud bottom; gravel bar riffles and transition areas between riffles and pools especially important in providing insect prey items; nest on gently sloping sand banks within ca. 30 feet of water's edge | | T |
| Spot-tailed Earless Lizard | *Holbrookia lacerata* | central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ******VASCULAR PLANTS****** | | | | |
| Canyon mock-orange | *Philadelphus ernestii* | endemic; solution-pitted outcrops of Cretaceous limestone in mesic canyons, usually in shade of mostly deciduous slope forest; flowering April-May | | |
| Hill country wild-mercury | *Argythamnia aphoroides* | Texas endemic; mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands, also in partial shade of oak-juniper woodlands in gravelly soils on rocky limestone slopes; flowering April-May with fruit persisting until midsummer | | |
| Texas wild-rice | *Zizania texana* | perennial, emergent, aquatic grass known only from the upper 2.5 km of the San Marcos River in Hays County | LE | E |
| Warnock's coral root | *Hexalectris warnockii* | leaf litter and humus in oak-juniper woodlands in mountain canyons in the Trans Pecos but at lower elevations to the east, often on narrow terraces along creekbeds | | |

## TABLE 1A-8: THREATENED OR ENDANGERED SPECIES OF LLANO COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Zone-tailed Hawk | *Buteo albonotatus* | arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions | | T |
| Interior Least Tern | *Sterna antillarum athalassos* | this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Headwater catfish | *Ictalurus lupus* | originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers | | |
| ******MAMMALS****** | | | | |
| Black Bear | *Ursus americanus* | bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear (LT, T), treat all east Texas black bears as federal and state listed Threatened | T/SA; NL | T |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Gray Wolf | *Canis lupus* | extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands | LE | E |
| Llano Pocket Gopher | *Geomys texensis texensis* | found in deep, brown loamy sands or gravelly sandy loams and is isolated from other species of pocket gophers by intervening shallow stony to gravelly clayey soils | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red Wolf | *Canis Rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Spot-tailed Earless Lizard | *Holbrookia lacerata* | central & southern Texas & adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ******VASCULAR PLANTS****** | | | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Basin bellflower | *Campanula reverchonii* | Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July | | |
| Edward Plateau Cornsalad | *Valerianellla texana* | very shallow, well-drained but seasonally moist gravelly soils derived from igneous or metamorphic rocks, often along the downslope margin of rock outcrops, in full sun or in partial shade of oak-juniper woodlands; flowering and fruiting March-April | | |
| Elmendorf's Onion | *Allium elmendorfii* | endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May | | |
| Enquist's sandmint | *Brazoria enquistii* | primarily on sand banks in and along beds of streams that drain granitic /gneissic landscapes; flowering/fruiting late April-early June | | |
| Granite spiderwort | *Tradescantia pedicellata* | endemic; rocky soils in the Edwards Plateau; flowering March-June (July?) | | |
| Rock quillwort | *Isoetes lithophila* | very shallow seasonally wet sand or gravel in vernal pools on granite or gneiss outcrops; sporulating in late spring and opportunistically at other seasons | | |

## TABLE 1A-9: THREATENED OR ENDANGERED SPECIES OF MATAGORDA COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black Rail | *Laterallus jamaicensis* | salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia | | |
| Brown Pelican | *Pelecanus occidentalis* | largely coastal and near shore areas, where it roosts on islands and spoil banks | LE-PDL | E |
| Eskimo Curlew | *Numenius borealis* | historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats | LE | E |
| Henslow's Sparrow | *Ammodramus henslowii* | wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Piping Plover | *Charadrius melodus* | wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats | LT | T |
| Reddish Egret | *Egretta rufescens* | resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear | | T |
| Snowy Plover | *Charadrius alexandrinus* | formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast | | |
| Sooty Tern | *Sterna fuscata* | predominately "on the wing"; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July | | T |
| Southeastern Snowy Plover | *Charadrius alexandrinus tenuirostris* | wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats | | |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Western Snowy Plover | *Charadrius alexandrinus nivosus* | uncommon breeder in the Panhandle; potential migrant; winter along coast | | |
| White-faced Ibis | *Plegadis chihi* | prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats | | T |
| White-tailed Hawk | *Buteo albicaudatus* | near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May | | T |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Wood Stork | *Mycteria americana* | forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); birds move into Gulf States in search of mud flats and wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960 | | T |
| ******CRUSTACEANS****** | | | | |
| A crayfish | *Cambarellus texanus* | shallow water; benthic, burrowing in or using soil; apparently tolerant of warmer waters; prefers standing water of ditches in which there is emergent vegetation; wll burrow in dry periods; detritivore | | |
| ******FISHES****** | | | | |
| American Eel | *Anguilla rostrata* | coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally | | |
| ******INSECTS****** | | | | |
| Gulf Coast clubtail | *Gomphus modestus* | medium river, moderate gradient,and streams with silty sand or rocky bottoms; adults forage in trees, males perch near riffles to wait for females, larvae overwinter; flight season late Apr - late Jun | | |
| ******MAMMALS****** | | | | |
| Louisiana Black Bear | *Ursus americanus luteolus* | possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas | LT | T |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; in habitat; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Ocelot | *Felis pardalis* | dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November | LE | E |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| West Indian Manatee | *Trichechus manatus* | Gulf and bay system; opportunistic, aquatic herbivore | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| ******REPTILES****** | | | | |
| Atlantic Hawksbill Sea Turtle | *Eretmochelys imbricata* | Gulf and bay system, warm shallow waters especially in rocky marine environments, such as coral reefs and jetties, juveniles found in floating mats of sea plants; feed on sponges, jellyfish, sea urchins, molluscs, and crustaceans, nests April through November | LE | E |
| Green sea turtle | *Chelonia mydas* | Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially | LT | T |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| | | on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June | | |
| Gulf Saltmarsh Snake | *Nerodia clarkii* | saline flats, coastal bays, & brackish river mouths | | |
| Kemp's Ridley Sea Turtle | *Lepidochelys kempii* | Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna; nests April through August | LE | E |
| Leatherback Sea Turtle | *Dermochelys coriacea* | Gulf and bay systems, and wide-ranging open water sea turtle; omnivorous, shows a preference for jellyfish; nests from November to February, but not known to nest in Gulf of Mexico, just forages | LE | E |
| Loggerhead Sea Turtle | *Caretta caretta* | Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral; nests from April through November | LT | T |
| Smooth Green Snake | *Liochlorophis vernalis* | Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation | | T |
| Texas Diamond-back Terrapin | *Malaclemys terrapin littoralis* | coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| Texas scarlet snake | *Cemophora coccinea lineri* | mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September | | T |
| Texas Tortoise | *Gopherus berlandieri* | open brush with a grass understory is preferred; open grass and bare ground are avoided; when inactive occupies shallow depressions at base of bush or cactus, sometimes in underground burrows or under objects; longevity greater than 50 years; active March-November; breeds April-November | | T |
| Timber/Canebrake Rattlesnake | *Crotalus horridus* | swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto | | T |
| ******VASCULAR PLANTS****** | | | | |
| Coastal Gay-Feather | *Liatris bracteata* | endemic; black clay soils of prairie remnants; flowering in fall | | |
| Shinner's sunflower | *Helianthus occidentalis ssp plantagineus* | mostly in prairies on the Coastal Plain, with several slightly disjunct populations in the Pineywoods and South Texas Brush Country | | |
| Threeflower broomweed | *Thurovia triflora* | endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November | | |

## TABLE 1A-10: THREATENED OR ENDANGERED SPECIES OF MILLS COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Interior Least Tern | *Sterna antillarumathalassos* | this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Gray Wolf | *Canis lupus* | extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands | LE | E |
| Llano pocket gopher | *Geomys texensis* | found in deep, brown loamy sands or gravelly sandy loams and is isolated | | |

| | | | | |
|---|---|---|---|---|
| | *texensis* | from other species of pocket gophers by intervening shallow stony to gravelly clayey soils | | |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| *******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| *******REPTILES****** | | | | |
| Concho Water Snake | *Nerodia Paucimaculata* | Texas endemic; Concho and Colorado river systems; shallow fast-flowing water with a rocky or gravelly substrate preferred; adults can be found in deep water with mud bottoms; breeding March-October | LT-PDL | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| *******VASCULAR PLANTS****** | | | | |
| Hill Country Wild-Mercury | *Argythamnia Aphoroides* | Texas endemic; mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands, also in partial shade of oak-juniper woodlands in gravelly soils on rocky limestone slopes; flowering April-May with fruit persisting until midsummer | | |

## TABLE 1A-11: THREATENED OR ENDANGERED SPECIES OF SAN SABA COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Baird's Sparrow | *Ammodramus bairdii* | shortgrass prairie with scattered low bushes and matted vegetation; mostly migratory in western half of State, though winters in Mexico and just across Rio Grande into Texas from Brewster through Hudspetth counties | | |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Interior Least Tern | *Sterna Antillarum Athalassos* | this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Zone-tailed Hawk | *Buteo albonotatus* | arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions | | T |
| ******CRUSTACEANS****** | | | | |
| Reddell's cave amphipod | *Stygobromus reddelli* | subterranean obligate; small cave streams | | |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus* | endemic to perennial streams of the Edward's Plateau region; introduced in | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| | *treculi* | Nueces River system | | |
| Headwater catfish | *Ictalurus lupus* | originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers | | |
| Sharpnose shiner | *Notropis oxyrhynchus* | endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud | C | |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Llano Pocket Gopher | *Geomys texensis texensis* | found in deep, brown loamy sands or gravelly sandy loams and is isolated from other species of pocket gophers by intervening shallow stony to gravelly clayey soils | | |
| Gray Wolf | *Canis lupus* | extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands | LE | E |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Concho water snake | *Nerodia paucimaculata* | Texas endemic; Concho and Colorado river systems; shallow fast-flowing water with a rocky or gravelly substrate preferred; adults can be found in deep water with mud bottoms; breeding March-October | LT-PDL | |
| Spot-tailed earless lizard | *Holbrookia lacerata* | central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas horned lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ******PLANTS****** | | | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Basin bellflower | *Campanula reverchonii* | Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July | | |

## TABLE 1A-12: THREATENED OR ENDANGERED SPECIES OF TRAVIS COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Austin Blind Salamander | *Eurycea waterlooensis* | mostly restricted to subterranean cavities of the Edwards Aquifer; dependent upon water flow/quality from the Barton Springs segment of the Edwards Aquifer; only known from the outlets of Barton Springs [Sunken Gardens (Old Mill) Spring, Eliza Spring, and Parthenia (Main) Spring which forms Barton Springs Pool]; feeds on amphipods, ostracods, copepods, plant material, and (in captivity) a wide variety of small aquatic invertebrates | C | |
| Barton Springs Salamander | *Eurycea sosorum* | dependent upon water flow from the Barton Springs segment of the Edwards Aquifer; only known from the outlets of Barton Springs; spring dweller, but ranges into subterranean water-filled caverns; found under rocks, in gravel, or among aquatic vascular plants & algae, as available; feeds primarily on amphipods | LE | E |
| Jollyville Plateau Salamander | *Eurycea tonkawae* | known from springs and waters of some caves of Travis and Williamson counties north of the Colorado River | C | |
| Pedernales River Springs Salamander | *Eurycea sp. 6* | endemic; known only from springs | | |
| ******ARACHNIDS****** | | | | |
| Bandit Cave Spider | *Cicurina bandida* | very small, subterrestrial, subterranean obligate | | |
| Bone Cave Harvestman | *Texella reyesi* | small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties; weakly differentiated from *Texella reddelli* | LE | |
| Reddell harvestman | *Texella reddelli* | small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties | LE | |
| Tooth Cave Pseudoscorpion | *Tartarocreagris texana* | small, cave-adapted pseudoscorpion known from small limestone caves of the Edwards Plateau | LE | |
| Tooth Cave Spider | *Neoleptoneta myopica* | very small, cave-adapted, sedentary spider | LE | |
| Warton's cave meshweaver | *Cicurina wartoni* | very small, cave-adapted spider | C | |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Interior Least Tern | *Sterna antillarum athalassos* | subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| ******CRUSTACEANS****** | | | | |
| An Amphipod | *Stygobromus russelli* | subterranean waters, usually in caves & limestone aquifers; resident of numerous caves in ca. 10 counties of the Edwards Plateau | | |
| Balcones Cave amphipod | *Stygobromus balconis* | subaquatic, subterranean obligate amphipod | | |
| Bifurcated Cave Amphipod | *Stygobromus bifurcatus* | found in cave pools | | |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| Smalleye shiner | *Notropis buccula* | endemic to upper Brazos River system and its tributaries; apparently introduced into adjacent Colorado River drainage; medium to large prairie streams with sandy substrate and turbid to clear warm water; presumably eats small aquatic invertebrates | C | |
| ******INSECTS****** | | | | |
| Kretschmarr Cave Mold Beetle | *Texamaurops reddelli* | small, cave-adapted beetle found under rocks buried in silt; small, Edwards Limestone caves in of the Jollyville Plateau, a division of the Edwards Plateau | LE | |
| Leonora's dancer damselfly | *Argia leonorae* | south central and western Texas; small streams and seepages | | |
| Rawson's metalmark | *Calephelis rawsoni* | moist areas in shaded limestone outcrops in central Texas, desert scrub or oak woodland in foothills, or along rivers elsehwere; larval hosts are Eupatorium havanense, E. greggi. | | |
| Tooth Cave Blind Rove Beetle | *Cylindropsis sp. 1* | one specimen collected from Tooth Cave; only known North American collection of this genus | | |
| Tooth Cave Ground Beetle | *Rhadine persephone* | resident, small, cave-adapted beetle found in small Edwards Limestone caves in Travis and Williamson counties | LE | |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red Wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| | | brushy and forested areas, as well as coastal prairies | | |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fatmucket | *Lampsilis bracteata* | streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Spot-tailed Earless Lizard | *Holbrookia lacerata* | central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| ******VASCULAR PLANTS****** | | | | |
| Basin bellflower | *Campanula reverchonii* | Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July | | |
| Bracted twistflower | *Streptanthus bracteatus* | endemic; shallow clay soils over limestone, mostly on rocky slopes, in openings in juniper-oak woodlands; flowering April-May | | |
| Canyon mock-orange | *Philadelphus ernestii* | endemic; solution-pitted outcrops of Cretaceous limestone in mesic canyons, usually in shade of mostly deciduous slope forest; flowering April-May | | |
| Correll's false dragon-head | *Physostegia correllii* | wet soils including riverbanks, streamsides, creekbeds, roadside ditches and irrigation channels; flowering June-July | | |
| Texabama croton | *Croton alabamensis var. texensis* | Texas endemic; in duff-covered loamy clay soils on rocky slopes in forested, mesic limestone canyons; locally abundant on deeper soils on small terraces in canyon bottoms, often forming large colonies and dominating the shrub layer; scattered individuals are occasionally on sunny margins of such forests; also found in contrasting habitat of deep, friable soils of limestone uplands, mostly in the shade of evergreen woodland mottes; flowering late February-March; fruit maturing and dehiscing by early June | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| Warnock's coral-root | *Hexalectris warnockii* | leaf litter and humus in oak-juniper woodlands in mountain canyons in the Trans Pecos but at lower elevations to the east, often on narrow terraces along creekbeds | | |

## TABLE 1A-13: THREATENED OR ENDANGERED SPECIES OF WHARTON COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Attwater's Greater Prairie-chicken | *Tympanuchus cupido attwateri* | this county within historic range; endemic; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July | LE | E |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Henslow's Sparrow | *Ammodramus henslowii* | wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking | | |
| Interior Least Tern | *Sterna antillarum athalassos* | subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony | LE | E |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| White-faced Ibis | *Plegadis chihi* | prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats | | T |
| White-tailed Hawk | *Buteo albicaudatus* | near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May | | T |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| Wood Stork | *Mycteria americana* | forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960 | | T |
| ******CRUSTACEANS****** | | | | |
| A crayfish | *Cambarellus texanus* | shallow water; benthic, burrowing in or using soil; apparently tolerant of warmer waters; prefers standing water of ditches in which there is emergent vegetation; wll burrow in dry periods; detritivore | | |
| ******FISHES****** | | | | |
| American Eel | *Anguilla rostrata* | coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| | | waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally | | |
| ******MAMMALS****** | | | | |
| Louisiana Black Bear | *Ursus americanus luteolus* | possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas | LT | T |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |
| ******REPTILES****** | | | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| Timber/Canebrake Rattlesnake | *Crotalus horridus* | swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto | | T |

## TABLE 1A-14: THREATENED OR ENDANGERED SPECIES OF WILLIAMSON COUNTY

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******AMPHIBIANS****** | | | | |
| Georgetown Salamander | *Eurycea naufragia* | endemic; known from springs and waters in/around town of Georgetown in Williamson County | C | |
| Jollyville Plateau Salamander | *Eurycea tonkawae* | known from springs and waters of some caves north of the Colorado River | C | |
| ******ARACHNIDS****** | | | | |
| Bandit Cave spider | *Cicurina bandida* | very small, subterrestrial, subterranean obligate | | |
| Bone Cave Harvestman | *Texella reyesi* | small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties; weakly differentiated from Texella reddelli | LE | |
| ******BIRDS****** | | | | |
| American Peregrine Falcon | *Falco peregrinus anatum* | year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | E |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands. | DL | T |
| Bald Eagle | *Haliaeetus leucocephalus* | found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds | DL | T |
| Black-capped Vireo | *Vireo atricapillus* | oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer | LE | E |
| Golden-cheeked Warbler | *Dendroica chrysoparia* | juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer | LE | E |
| Mountain Plover | *Charadrius montanus* | breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous | | |
| Peregrine Falcon | *Falco peregrinus* | both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, thus the species level shows this dual listing status; because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat. | DL | ET |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows | | |
| Whooping Crane | *Grus americana* | potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties | LE | E |
| ******CRUSTACEANS****** | | | | |
| An amphipod | *Stygobromus russelli* | subterranean waters, usually in caves and limestone aquifers; resident of numerous caves in ca. 10 counties of the Edwards Plateau | | |
| Bifurcated cave | *Stygobromus* | found in cave pools | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| amphipod | *bifurcatus* | | | |
| Ezell's cave amphipod | *Stygobromus flagellatus* | known only from artesian wells | | |
| ******FISHES****** | | | | |
| Guadalupe Bass | *Micropterus treculi* | endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system | | |
| Sharpnose Shiner | *Notropis oxyrhynchus* | endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud | C | |
| Smalleye Shiner | *Notropis buccula* | endemic to upper Brazos River system and its tributaries; apparently introduced into adjacent Colorado River drainage; medium to large prairie streams with sandy substrate and turbid to clear warm water; presumably eats small aquatic invertebrates | C | |
| ******INSECTS****** | | | | |
| A mayfly | *Procloeon distinctum* | mayflies distinguished by aquatic larval stage; adult stage generally found in shoreline vegetation | | |
| A mayfly | *Pseudocentroptiloides morihari* | mayflies distinguished by aquatic larval stage; adult stage generally found in shoreline vegetation | | |
| Leonora's dancer damselfly | *Argia leonorae* | south central and western Texas; small streams and seepages | | |
| Tooth Cave Ground Beetle | *Rhadine persephone* | resident, small, cave-adapted beetle found in small Edwards Limestone caves in Travis and Williamson counties | LE | |
| Coffin Cave Mold Beetle | *Batrisodes texanus* | resident, small, cave-adapted beetle found in small Edwards limestone caves in Travis and Williamson counties | LE | |
| ******MAMMALS****** | | | | |
| Cave Myotis Bat | *Myotis velifer* | colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Hirundo pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore | | |
| Plains Spotted Skunk | *Spilogale putorius interrupta* | catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie | | |
| Red wolf | *Canis rufus* | extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies | LE | E |
| ******MOLLUSKS****** | | | | |
| Creeper (squawfoot) | *Strophitus undulatus* | small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Neches (historic), and Trinity (historic) River basins | | |
| False spike mussel | *Quincuncina mitchelli* | substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins | | |
| Pistolgrip | *Tritogonia verrucosa* | stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins | | |
| Rock pocketbook | *Arcidens confragosus* | mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins | | |
| Smooth pimpleback | *Quadrula houstonensis* | small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins | | |
| Texas fawnsfoot | *Truncilla macrodon* | little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins | | |
| Texas pimpleback | *Quadrula petrina* | mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins | | |

| Common Name | Scientific Name | Description | Federal Status | State Status |
|---|---|---|---|---|
| ******REPTILES****** | | | | |
| Spot-tailed Earless Lizard | *Holbrookia lacerata* | central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground | | |
| Texas Garter Snake | *Thamnophis sirtalis annectens* | wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August | | |
| Texas Horned Lizard | *Phrynosoma cornutum* | open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September | | T |
| Timber/Canebrake Rattlesnake | *Crotalus horridus* | swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto | | T |
| ******VASCULAR PLANTS****** | | | | |
| Elmendorf's onion | *Allium elmendorfii* | Texas endemic; grassland openings in oak woodlands on deep, loose, well-drained sands; in Coastal Bend, on Pleistocene barrier island ridges and Holocene Sand Sheet that support live oak woodlands; to the north it occurs in post oak-black hickory-live oak woodlands over Queen City and similar Eocene formations; one anomalous specimen found on Llano Uplift in wet pockets of granitic loam; flowering March-April, May | | |

# *APPENDIX 1B*

## *LOWER COLORADO REGION INDUSTRY ECONOMIC VALUE ESTIMATES (LCRA Community and Economic Development, IMPLAN 2004 - base year 2001)*

**Appendix 1B: Lower Colorado Region Industry Economic Value Estimates***

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 1 | Oilseed farming | 809 | 24.605 | 1.256 | 1.691 | 12.787 | 0.943 | 16.678 |
| 2 | Grain farming | 5,651 | 134.524 | 5.115 | 32.465 | 59.578 | 5.098 | 102.256 |
| 3 | Vegetable and melon farming | 113 | 4.501 | 0.322 | 0.044 | 0.911 | 0.024 | 1.301 |
| 4 | Tree nut farming | 170 | 7.397 | 0.829 | 0.205 | 1.231 | 0.121 | 2.386 |
| 5 | Fruit farming | 317 | 12.732 | 1.684 | 0.039 | 2.095 | 0.209 | 4.027 |
| 6 | Greenhouse and nursery production | 1,378 | 94.944 | 31.658 | 1.208 | 34.689 | 0.947 | 68.502 |
| 8 | Cotton farming | 137 | 15.928 | 0.957 | 0.474 | 2.126 | 0.108 | 3.665 |
| 10 | All other crop farming | 1,297 | 39.581 | 1.166 | 0.931 | 10.221 | 0.678 | 12.996 |
| 11 | Cattle ranching and farming | 9,744 | 128.936 | 6.483 | 40.432 | -70.772 | 4.213 | -19.645 |
| 12 | Poultry and egg production | 493 | 61.811 | 2.589 | 0.158 | 3.351 | 0.06 | 6.159 |
| 13 | Animal production, except cattle and poultry | 697 | 17.54 | 0.726 | 1.724 | -0.429 | 0.223 | 2.243 |
| 14 | Logging | 28 | 4.096 | 0.531 | 0.468 | 1.017 | 0.089 | 2.105 |
| 15 | Forest nurseries, forest products, and timber | 18 | 6.18 | 0.267 | 0.274 | 1.863 | 0.444 | 2.848 |
| 16 | Fishing | 336 | 16.445 | 2.509 | 2.921 | 3.82 | 0.446 | 9.695 |
| 17 | Hunting and trapping | 739 | 54.368 | 2.618 | 3.118 | 14.869 | 5.753 | 26.358 |
| 18 | Agriculture and forestry support activities | 1,924 | 53.85 | 26.491 | 8.478 | -4.271 | 1.12 | 31.817 |
| 19 | Oil and gas extraction | 2,740 | 790.508 | 72.436 | 65.876 | 93.938 | 52.513 | 284.763 |
| 24 | Stone mining and quarrying | 346 | 40.11 | 10.483 | 2.747 | 6.317 | 1.045 | 20.593 |
| 25 | Sand, gravel, clay, and refractory mining | 308 | 25.576 | 8.306 | 2.299 | 4.42 | 0.737 | 15.763 |
| 26 | Other nonmetallic mineral mining | 66 | 8.496 | 1.439 | 0.543 | 1.133 | 0.187 | 3.302 |
| 27 | Drilling oil and gas wells | 222 | 26.49 | 3.96 | 0.107 | 1.599 | 0.755 | 6.421 |
| 28 | Support activities for oil and gas operation | 2,111 | 470.785 | 78.958 | 2.193 | 15.879 | 21.384 | 118.414 |
| 30 | Power generation and supply | 3,058 | 1,081.38 | 105.685 | 151.652 | 319.214 | 121.877 | 698.427 |
| 31 | Natural gas distribution | 324 | 137.003 | 9.34 | 8.979 | 9.504 | 13.47 | 41.293 |
| 32 | Water, sewage and other systems | 276 | 15.02 | 2.508 | 3.297 | 3.905 | 0.559 | 10.27 |
| 33 | New residential 1-unit structures, nonfarm | 10,654 | 1,326.65 | 325.528 | 103.458 | 28.047 | 10.7 | 467.734 |
| 34 | New multifamily housing structures, nonfarm | 1,956 | 170.485 | 59.605 | 19.527 | -8.142 | 0.739 | 71.729 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 35 | New residential additions and alterations, nonfarm | 3,717 | 430.314 | 110.862 | 35.094 | -6.69 | 3.626 | 142.893 |
| 36 | New farm housing units and additions and alterations | 266 | 33.063 | 8.08 | 2.562 | -0.044 | 0.279 | 10.878 |
| 37 | Manufacturing and industrial buildings | 1,566 | 116.53 | 48.247 | 14.868 | -10.522 | 1.028 | 53.621 |
| 38 | Commercial and institutional buildings | 15,276 | 1,254.28 | 464.009 | 146.659 | -82.988 | 12.181 | 539.861 |
| 39 | Highway, street, bridge, and tunnel construction | 2,707 | 250.382 | 83.788 | 26.202 | -8.524 | 2.498 | 103.964 |
| 40 | Water, sewer, and pipeline construction | 1,011 | 99.377 | 31.069 | 9.769 | -5.958 | 1.009 | 35.89 |
| 41 | Other new construction | 16,746 | 1,040.17 | 524.402 | 162.316 | -93.68 | 6.869 | 599.907 |
| 42 | Maintenance and repair of farm and nonfarm residential buildings | 1,750 | 200.758 | 52.762 | 16.719 | -6.055 | 1.433 | 64.859 |
| 43 | Maintenance and repair of nonresidential buildings | 4,214 | 358.882 | 127.425 | 40.618 | -18.747 | 3.926 | 153.222 |
| 44 | Maintenance and repair of highways, streets, and bridges | 584 | 63.48 | 17.874 | 5.579 | -3.657 | 0.694 | 20.49 |
| 45 | Other maintenance and repair construction | 4,953 | 355.547 | 156.943 | 48.481 | -18.865 | 3.181 | 189.739 |
| 47 | Other animal food manufacturing | 28 | 13.329 | 0.851 | 0.049 | 0.296 | 0.071 | 1.266 |
| 49 | Rice milling | 3 | 1.221 | 0.094 | 0.005 | 0.065 | 0.007 | 0.171 |
| 51 | Wet corn milling | 6 | 4.518 | 0.212 | 0.015 | 0.34 | 0.021 | 0.588 |
| 53 | Other oilseed processing | 7 | 3.307 | 0.125 | 0.004 | 0.022 | 0.012 | 0.163 |
| 58 | Confectionery manufacturing from purchased chocolate | 34 | 7.675 | 1.374 | 0.065 | 2.142 | 0.059 | 3.64 |
| 59 | Nonchocolate confectionery manufacturing | 57 | 7.596 | 0.766 | 0.038 | 1.159 | 0.03 | 1.993 |
| 60 | Frozen food manufacturing | 583 | 120.067 | 17.227 | 0.91 | 20.946 | 0.845 | 39.928 |
| 61 | Fruit and vegetable canning and drying | 51 | 15.168 | 1.924 | 0.089 | 2.56 | 0.112 | 4.684 |
| 62 | Fluid milk manufacturing | 157 | 68.377 | 8.193 | 0.377 | 1.706 | 0.598 | 10.873 |
| 64 | Cheese manufacturing | 16 | 9.168 | 0.504 | 0.027 | 0.164 | 0.055 | 0.75 |
| 65 | Dry, condensed, and evaporated dairy product | 6 | 2.45 | 0.114 | 0.008 | 0.337 | 0.01 | 0.469 |
| 66 | Ice cream and frozen dessert manufacturing | 6 | 1.682 | 0.188 | 0.01 | 0.208 | 0.011 | 0.418 |
| 67 | Animal, except poultry, slaughtering | 179 | 68.025 | 4.629 | 0.245 | 0.543 | 0.431 | 5.848 |
| 68 | Meat processed from carcasses | 467 | 111.614 | 11.776 | 0.621 | 2.216 | 0.605 | 15.218 |
| 69 | Rendering and meat byproduct processing | 82 | 18.579 | 2.868 | 0.145 | 3.457 | 0.128 | 6.599 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 71 | Seafood product preparation and packaging | 29 | 5.368 | 0.767 | 0.049 | -0.034 | 0.02 | 0.802 |
| 73 | Bread and bakery product, except frozen, manufacturing | 340 | 44.426 | 10.741 | 0.515 | 10.038 | 0.321 | 21.616 |
| 75 | Mixes and dough made from purchased flour | 1 | 0.214 | 0.019 | 0.001 | 0.029 | 0.001 | 0.049 |
| 77 | Tortilla manufacturing | 80 | 8.386 | 2.652 | 0.096 | 1.383 | 0.071 | 4.201 |
| 78 | Roasted nuts and peanut butter manufacturing | 18 | 5.398 | 0.202 | 0.009 | 0.364 | 0.016 | 0.591 |
| 79 | Other snack food manufacturing | 53 | 21.413 | 3.292 | 0.176 | 6.447 | 0.185 | 10.1 |
| 80 | Coffee and tea manufacturing | 2 | 0.598 | 0.027 | 0.001 | 0.012 | 0.002 | 0.043 |
| 82 | Mayonnaise, dressing, and sauce manufacturing | 9 | 3.595 | 0.309 | 0.017 | 0.717 | 0.012 | 1.055 |
| 83 | Spice and extract manufacturing | 42 | 15.658 | 2.954 | 0.153 | 5.057 | 0.128 | 8.292 |
| 84 | All other food manufacturing | 53 | 11.15 | 1.362 | 0.068 | 0.688 | 0.057 | 2.175 |
| 85 | Soft drink and ice manufacturing | 229 | 73.319 | 12.249 | 0.162 | 8.856 | 0.605 | 21.871 |
| 86 | Breweries | 20 | 15.198 | 1.875 | 0.034 | 4.099 | 2.478 | 8.487 |
| 87 | Wineries | 40 | 9.314 | 0.751 | 0.002 | 0.345 | 0.495 | 1.593 |
| 89 | Tobacco stemming and redrying | 0 | 0.092 | 0.002 | 0 | 0 | 0 | 0.002 |
| 92 | Fiber, yarn, and thread mills | 1 | 0.073 | 0.012 | 0 | 0.001 | 0 | 0.014 |
| 93 | Broadwoven fabric mills | 3 | 0.372 | 0.076 | 0 | 0.008 | 0.002 | 0.087 |
| 100 | Curtain and linen mills | 58 | 7.627 | 1.497 | -0.012 | 1.054 | 0.026 | 2.566 |
| 101 | Textile bag and canvas mills | 23 | 1.525 | 0.434 | -0.003 | 0.028 | 0.004 | 0.462 |
| 103 | Other miscellaneous textile product mills | 82 | 11.83 | 2.53 | -0.014 | 0.502 | 0.055 | 3.073 |
| 107 | Cut and sew apparel manufacturing | 176 | 21.556 | 4.427 | 0.038 | 2.565 | 0.08 | 7.11 |
| 108 | Accessories and other apparel manufacturing | 83 | 9.931 | 1.676 | 0.014 | 0.664 | 0.03 | 2.383 |
| 109 | Leather and hide tanning and finishing | 2 | 0.486 | 0.033 | 0.002 | 0.013 | 0.001 | 0.05 |
| 110 | Footwear manufacturing | 19 | 2.469 | 0.641 | 0.038 | 0.046 | 0.015 | 0.74 |
| 111 | Other leather product manufacturing | 18 | 1.305 | 0.304 | 0.017 | 0.244 | 0.006 | 0.57 |
| 112 | Sawmills | 6 | 0.979 | 0.17 | 0.011 | 0.047 | 0.013 | 0.24 |
| 116 | Engineered wood member and truss manufacturing | 181 | 20.645 | 5.245 | 0.317 | 1.903 | 0.294 | 7.758 |
| 117 | Wood windows and door manufacturing | 6 | 0.729 | 0.111 | 0.011 | 0.039 | 0.007 | 0.169 |
| 119 | Other millwork, | 96 | 6.817 | 2.912 | 0.178 | 0.023 | 0.094 | 3.207 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| | including flooring | | | | | | | |
| 120 | Wood container and pallet manufacturing | 228 | 16.567 | 6.785 | 0.422 | 0.945 | 0.254 | 8.406 |
| 121 | Manufactured home, mobile home, manufacturing | 816 | 109.502 | 31.112 | 2.197 | 11.753 | 1.7 | 46.762 |
| 122 | Prefabricated wood building manufacturing | 8 | 0.89 | 0.141 | 0.007 | 0.013 | 0.008 | 0.169 |
| 123 | Miscellaneous wood product manufacturing | 33 | 3.752 | 0.795 | 0.051 | 0.241 | 0.052 | 1.138 |
| 125 | Paper and paperboard mills | 12 | 5.703 | 1.092 | 0.022 | 1.053 | 0.055 | 2.222 |
| 126 | Paperboard container manufacturing | 23 | 4.936 | 0.99 | 0.015 | 0.193 | 0.048 | 1.246 |
| 128 | Surface-coated paperboard manufacturing | 3 | 0.79 | 0.062 | 0.001 | 0.003 | 0.005 | 0.07 |
| 131 | Die-cut paper office supplies manufacturing | 9 | 1.874 | 0.392 | 0.008 | 0.117 | 0.02 | 0.537 |
| 132 | Envelope manufacturing | 5 | 0.691 | 0.138 | 0.002 | 0.004 | 0.005 | 0.149 |
| 135 | All other converted paper product manufacturing | 4 | 0.761 | 0.109 | 0.002 | 0.094 | 0.006 | 0.212 |
| 136 | Manifold business forms printing | 66 | 12.014 | 2.978 | 0.082 | 2.789 | 0.124 | 5.974 |
| 137 | Books printing | 171 | 28.869 | 8.878 | 0.274 | 3.438 | 0.318 | 12.909 |
| 139 | Commercial printing | 2,585 | 305.308 | 94.364 | 2.081 | 24.709 | 2.66 | 123.814 |
| 140 | Tradebinding and related work | 116 | 9.506 | 4.301 | 0.094 | 1.054 | 0.098 | 5.547 |
| 141 | Prepress services | 187 | 14.536 | 7.636 | 0.153 | 1.393 | 0.129 | 9.311 |
| 142 | Petroleum refineries | 31 | 79.69 | 1.564 | 3.477 | 1.091 | 0.76 | 6.892 |
| 143 | Asphalt paving mixture and block manufacturing | 198 | 99.272 | 12.82 | 25.902 | -11.995 | 1.552 | 28.278 |
| 144 | Asphalt shingle and coating materials manufacturing | 13 | 5.151 | 0.447 | 1.495 | 0.182 | 0.065 | 2.189 |
| 147 | Petrochemical manufacturing | 311 | 180.057 | 42.806 | 5.676 | 21.661 | 4.538 | 74.68 |
| 148 | Industrial gas manufacturing | 33 | 10.571 | 4.183 | 0.696 | 3.546 | 0.193 | 8.618 |
| 150 | Other basic inorganic chemical manufacturing | 8 | 4.181 | 0.859 | 0.175 | 1.043 | 0.054 | 2.132 |
| 151 | Other basic organic chemical manufacturing | 344 | 423.615 | 24.138 | 3.676 | 29.536 | 7.946 | 65.295 |
| 152 | Plastics material and resin manufacturing | 2 | 1.257 | 0.115 | 0.023 | 0.132 | 0.02 | 0.29 |
| 153 | Synthetic rubber manufacturing | 2 | 0.857 | 0.141 | 0.03 | 0.153 | 0.016 | 0.34 |
| 158 | Fertilizer, mixing only, manufacturing | 12 | 3.429 | 0.159 | 0.04 | 0.213 | 0.03 | 0.442 |
| 160 | Pharmaceutical and medicine manufacturing | 1,303 | 551.013 | 85.375 | 21.594 | 121.265 | 10.582 | 238.816 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 161 | Paint and coating manufacturing | 3 | 1.165 | 0.118 | 0.023 | 0.136 | 0.017 | 0.294 |
| 163 | Soap and other detergent manufacturing | 31 | 10.854 | 0.857 | 0.196 | 1.899 | 0.144 | 3.095 |
| 164 | Polish and other sanitation good manufacturing | 38 | 10.342 | 1.773 | 0.438 | 3.133 | 0.203 | 5.547 |
| 165 | Surface active agent manufacturing | 6 | 3.137 | 0.091 | 0.026 | 0.046 | 0.028 | 0.191 |
| 166 | Toilet preparation manufacturing | 47 | 22.51 | 1.953 | 0.52 | 8.003 | 0.195 | 10.672 |
| 169 | Custom compounding of purchased resins | 29 | 10.063 | 1.854 | 0.461 | 1.234 | 0.079 | 3.628 |
| 170 | Photographic film and chemical manufacturing | 6 | 2.023 | 0.347 | 0.092 | 0.51 | 0.015 | 0.964 |
| 171 | Other miscellaneous chemical product manufacturing | 209 | 75.583 | 13.841 | 2.421 | 9.87 | 1.509 | 27.642 |
| 172 | Plastics packaging materials, film and sheet | 503 | 128.538 | 18.102 | 0.695 | 15.202 | 0.882 | 34.88 |
| 173 | Plastics pipe, fittings, and profile shapes | 126 | 17.316 | 4.503 | 0.127 | 1.558 | 0.095 | 6.283 |
| 175 | Plastics bottle manufacturing | 103 | 18.882 | 2.389 | 0.059 | 2.079 | 0.077 | 4.605 |
| 177 | Plastics plumbing fixtures and all other plastics | 659 | 115.571 | 21.895 | 0.748 | 13.587 | 0.658 | 36.887 |
| 178 | Foam product manufacturing | 438 | 99.501 | 18.528 | 0.598 | 14.606 | 0.64 | 34.372 |
| 179 | Tire manufacturing | 4 | 0.624 | 0.148 | 0.011 | 0.021 | 0.013 | 0.192 |
| 180 | Rubber and plastics hose and belting manufacturing | 30 | 4.486 | 1.474 | 0.052 | 0.704 | 0.029 | 2.259 |
| 181 | Other rubber product manufacturing | 11 | 1.818 | 0.408 | 0.014 | 0.191 | 0.011 | 0.624 |
| 183 | Vitreous china and earthenware articles manufacturing | 64 | 4.414 | 1.783 | 0.074 | 0.49 | 0.053 | 2.4 |
| 185 | Brick and structural clay tile manufacturing | 261 | 32.867 | 9.363 | 0.376 | 5.113 | 0.38 | 15.232 |
| 188 | Clay refractory and other structural clay products | 134 | 15.552 | 6.663 | 0.163 | 1.678 | 0.19 | 8.693 |
| 190 | Glass and glass products, except glass containers | 219 | 45.274 | 13.875 | 0.444 | 10.481 | 0.594 | 25.395 |
| 191 | Cement manufacturing | 171 | 78.462 | 10.815 | 0.318 | 26.129 | 0.947 | 38.209 |
| 192 | Ready-mix concrete manufacturing | 1,110 | 191.453 | 45.99 | 1.744 | 23.055 | 2.079 | 72.867 |
| 193 | Concrete block and brick manufacturing | 89 | 14.458 | 2.996 | 0.115 | 1.683 | 0.173 | 4.967 |
| 194 | Concrete pipe manufacturing | 91 | 16.86 | 3.405 | 0.118 | 2.296 | 0.194 | 6.012 |
| 195 | Other concrete product manufacturing | 197 | 21.551 | 5.664 | 0.219 | 2.512 | 0.224 | 8.618 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 196 | Lime manufacturing | 86 | 22.834 | 4.508 | 0.123 | 3.389 | 0.282 | 8.302 |
| 197 | Gypsum product manufacturing | 3 | 0.482 | 0.054 | 0.003 | 0.053 | 0.003 | 0.113 |
| 199 | Cut stone and stone product manufacturing | 365 | 29.62 | 12.293 | 0.513 | 2.267 | 0.342 | 15.416 |
| 200 | Ground or treated minerals and earths manufacturing | 35 | 8.093 | 0.787 | 0.024 | 2.862 | 0.084 | 3.757 |
| 201 | Mineral wool manufacturing | 3 | 0.313 | 0.044 | 0.001 | 0.044 | 0.002 | 0.092 |
| 202 | Miscellaneous nonmetallic mineral products | 62 | 7.024 | 1.629 | 0.059 | 1.513 | 0.074 | 3.276 |
| 203 | Iron and steel mills | 9 | 3.234 | 0.372 | 0.008 | 0.066 | 0.019 | 0.464 |
| 209 | Primary aluminum production | 10 | 2.738 | 0.437 | 0.013 | 0.042 | 0.017 | 0.509 |
| 212 | Aluminum extruded product manufacturing | 151 | 24.91 | 6.567 | 0.143 | 0.421 | 0.2 | 7.33 |
| 217 | Copper wire, except mechanical, drawing | 123 | 13.741 | 10.706 | 0.233 | -0.292 | 0.048 | 10.695 |
| 218 | Secondary processing of copper | 4 | 1.008 | 0.115 | 0.002 | 0.004 | 0.005 | 0.127 |
| 221 | Ferrous metal foundries | 234 | 33.019 | 10.687 | 0.235 | 1.434 | 0.281 | 12.637 |
| 223 | Nonferrous foundries, except aluminum | 45 | 5.224 | 1.47 | 0.023 | 0.198 | 0.039 | 1.73 |
| 227 | All other forging and stamping | 97 | 17.115 | 4.249 | 0.069 | 1.951 | 0.114 | 6.383 |
| 228 | Cutlery and flatware, except precious, manufacturing | 7 | 1.438 | 0.387 | 0.028 | 0.49 | 0.009 | 0.914 |
| 229 | Hand and edge tool manufacturing | 43 | 5.85 | 1.798 | 0.034 | 0.953 | 0.042 | 2.827 |
| 231 | Kitchen utensil, pot, and pan manufacturing | 0 | 0.012 | 0.002 | 0 | 0.001 | 0 | 0.004 |
| 232 | Prefabricated metal buildings and components | 123 | 17.633 | 4.481 | 0.096 | 0.562 | 0.114 | 5.253 |
| 233 | Fabricated structural metal manufacturing | 169 | 28.576 | 6.476 | 0.132 | 4.739 | 0.187 | 11.534 |
| 234 | Plate work manufacturing | 212 | 10.436 | 8.043 | 0.138 | 1.406 | 0.068 | 9.656 |
| 235 | Metal window and door manufacturing | 28 | 4.138 | 1.179 | 0.02 | 0.726 | 0.03 | 1.955 |
| 236 | Sheet metal work manufacturing | 367 | 61.071 | 15.236 | 0.293 | 9.626 | 0.406 | 25.562 |
| 237 | Ornamental and architectural metal work manufacturing | 133 | 17.212 | 5.707 | 0.135 | 2.452 | 0.121 | 8.416 |
| 238 | Power boiler and heat exchanger manufacturing | 19 | 4.131 | 1.318 | 0.031 | 0.834 | 0.031 | 2.215 |
| 239 | Metal tank, heavy gauge, manufacturing | 28 | 5.097 | 1.379 | 0.02 | 0.744 | 0.035 | 2.179 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 240 | Metal can, box, and other container manufacturing | 14 | 3.058 | 0.398 | 0.009 | 0.123 | 0.013 | 0.543 |
| 241 | Hardware manufacturing | 15 | 2.869 | 0.378 | 0.006 | 0.391 | 0.014 | 0.789 |
| 242 | Spring and wire product manufacturing | 67 | 6.953 | 2.402 | 0.038 | 1.049 | 0.048 | 3.537 |
| 243 | Machine shops | 784 | 89.324 | 31.737 | 0.566 | 4.948 | 0.737 | 37.988 |
| 244 | Turned product and screw, nut, and bolt manufacturing | 12 | 1.809 | 0.514 | 0.006 | 0.284 | 0.012 | 0.816 |
| 246 | Metal coating and nonprecious engraving | 76 | 11.221 | 2.468 | 0.031 | 2.043 | 0.068 | 4.611 |
| 247 | Electroplating, anodizing, and coloring metal | 69 | 3.864 | 2.207 | 0.032 | 0.409 | 0.024 | 2.671 |
| 248 | Metal valve manufacturing | 346 | 56.546 | 13.996 | 0.221 | 12.85 | 0.358 | 27.424 |
| 252 | Fabricated pipe and pipe fitting manufacturing | 19 | 2.742 | 0.848 | 0.01 | 0.504 | 0.019 | 1.381 |
| 253 | Industrial pattern manufacturing | 3 | 0.168 | 0.084 | 0.001 | 0.014 | 0.001 | 0.099 |
| 255 | Miscellaneous fabricated metal product manufacturing | 18 | 2.821 | 0.769 | 0.012 | 0.388 | 0.02 | 1.189 |
| 256 | Ammunition manufacturing | 85 | 11.872 | 6.234 | 0.152 | 0.337 | 0.22 | 6.943 |
| 257 | Farm machinery and equipment manufacturing | 53 | 9.272 | 1.133 | 0.066 | 0.97 | 0.024 | 2.193 |
| 258 | Lawn and garden equipment manufacturing | 7 | 2.154 | 0.188 | 0.014 | 0.225 | 0.015 | 0.442 |
| 259 | Construction machinery manufacturing | 34 | 8.557 | 1.092 | 0.072 | 0.437 | 0.052 | 1.653 |
| 260 | Mining machinery and equipment manufacturing | 20 | 1.829 | 0.301 | 0.011 | 0.138 | 0.008 | 0.459 |
| 261 | Oil and gas field machinery and equipment | 448 | 54.381 | 22.753 | 0.735 | 3.099 | 0.425 | 27.012 |
| 263 | Plastics and rubber industry machinery | 3,418 | 827.295 | 270.103 | 11.42 | 191.746 | 7.896 | 481.166 |
| 266 | Printing machinery and equipment manufacturing | 1 | 0.2 | 0.052 | 0.004 | 0.006 | 0.001 | 0.062 |
| 267 | Food product machinery manufacturing | 2 | 0.179 | 0.071 | 0.004 | 0.019 | 0.001 | 0.096 |
| 268 | Semiconductor machinery manufacturing | 99 | 46.933 | 6.869 | 0.694 | 5.352 | 0.329 | 13.244 |
| 269 | All other industrial machinery manufacturing | 11 | 2.765 | 0.399 | 0.023 | 0.165 | 0.008 | 0.596 |
| 270 | Office machinery manufacturing | 18 | 2.234 | 0.291 | 0.02 | 0.101 | 0.008 | 0.42 |
| 271 | Optical instrument and lens manufacturing | 59 | 3.62 | 2.504 | 0.22 | 0.401 | 0.026 | 3.151 |
| 272 | Photographic and photocopying equipment | 19 | 2.77 | 1.038 | 0.14 | 0.34 | 0.02 | 1.539 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| | manufacturing | | | | | | | |
| 273 | Other commercial and service industry machine manufacturing | 63 | 10.851 | 2.984 | 0.136 | 0.048 | 0.054 | 3.222 |
| 275 | Air purification equipment manufacturing | 99 | 9.746 | 3.786 | 0.178 | 1.42 | 0.082 | 5.466 |
| 278 | AC, refrigeration, and forced air heating | 4 | 0.818 | 0.147 | 0.008 | 0.037 | 0.006 | 0.198 |
| 279 | Industrial mold manufacturing | 77 | 6.34 | 2.846 | 0.128 | 0.242 | 0.046 | 3.262 |
| 280 | Metal cutting machine tool manufacturing | 51 | 4.342 | 1.741 | 0.088 | 0.384 | 0.033 | 2.246 |
| 282 | Special tool, die, jig, and fixture manufacturing | 36 | 2.05 | 1.106 | 0.047 | 0.038 | 0.015 | 1.206 |
| 283 | Cutting tool and machine tool accessory manufacturing | 16 | 1.582 | 0.337 | 0.016 | 0.085 | 0.009 | 0.446 |
| 285 | Turbine and turbine generator set units manufacturing | 3 | 1.662 | 0.201 | 0.017 | 0.39 | 0.014 | 0.621 |
| 286 | Other engine equipment manufacturing | 4 | 1.138 | 0.074 | 0.004 | 0.068 | 0.002 | 0.147 |
| 287 | Speed changers and mechanical power transmission manufacturing | 94 | 13.681 | 3.628 | 0.205 | 1.813 | 0.076 | 5.723 |
| 288 | Pump and pumping equipment manufacturing | 62 | 16.768 | 4.48 | 0.268 | 2.323 | 0.169 | 7.24 |
| 289 | Air and gas compressor manufacturing | 75 | 14.504 | 2.771 | 0.144 | 2.224 | 0.108 | 5.248 |
| 293 | Overhead cranes, hoists, and monorail system | 9 | 1.77 | 0.176 | 0.009 | 0.101 | 0.007 | 0.293 |
| 294 | Industrial truck, trailer, and stacker manufacturing | 24 | 3.864 | 0.471 | 0.024 | -0.052 | 0.018 | 0.461 |
| 298 | Industrial process furnace and oven manufacturing | 12 | 0.978 | 0.207 | 0.009 | 0.097 | 0.005 | 0.319 |
| 301 | Scales, balances, and miscellaneous general | 97 | 19.678 | 6.055 | 0.305 | 2.722 | 0.196 | 9.279 |
| 302 | Electronic computer manufacturing | 11,731 | 4,388.82 | 1,452.72 | 53.387 | 86.82 | 42.306 | 1,635.23 |
| 303 | Computer storage device manufacturing | 17 | 6.104 | 1.246 | 0.211 | 0.7 | 0.044 | 2.201 |
| 304 | Computer terminal manufacturing | 247 | 30.43 | 22.433 | 0.487 | -0.18 | 0.084 | 22.824 |
| 305 | Other computer peripheral equipment manufacturing | 2,010 | 509.185 | 112.902 | 2.537 | -1.245 | 3.627 | 117.821 |
| 306 | Telephone apparatus manufacturing | 1,930 | 1,104.72 | 190.368 | 5.005 | 267.807 | 9.361 | 472.541 |
| 307 | Broadcast and wireless communications equipment manufacturing | 359 | 152.598 | 24.603 | 0.402 | 18.201 | 1.137 | 44.343 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 308 | Other communications equipment manufacturing | 471 | 79.273 | 31.808 | 0.515 | 8.799 | 0.633 | 41.755 |
| 309 | Audio and video equipment manufacturing | 48 | 7.708 | 1.301 | 0.022 | -0.013 | 0.035 | 1.345 |
| 311 | Semiconductors and related device manufacturing | 17,626 | 3,533.68 | 1,473.23 | 54.458 | 1,468.66 | 27.325 | 3,023.67 |
| 312 | All other electronic component manufacturing | 5,448 | 901.335 | 228.844 | 5.205 | 45.081 | 6.507 | 285.637 |
| 313 | Electromedical apparatus manufacturing | 513 | 114.494 | 24.817 | 0.734 | 6.827 | 0.672 | 33.05 |
| 314 | Search, detection, and navigation instrument | 169 | 35.272 | 10.392 | 0.227 | 3.001 | 0.227 | 13.848 |
| 316 | Industrial process variable instruments | 852 | 107.81 | 61.824 | 1.517 | 10.048 | 0.845 | 74.233 |
| 317 | Totalizing fluid meters and counting devices | 12 | 2.277 | 0.19 | 0.005 | 0.091 | 0.007 | 0.292 |
| 318 | Electricity and signal testing instruments | 548 | 84.198 | 31.606 | 1.328 | 16.365 | 0.576 | 49.876 |
| 321 | Watch, clock, and other measuring and controlling | 186 | 32.429 | 8.688 | 0.144 | 2.148 | 0.213 | 11.193 |
| 322 | Software reproducing | 261 | 27.534 | 22.866 | 0.654 | 0.518 | 0.015 | 24.053 |
| 323 | Audio and video media reproduction | 26 | 3.476 | 0.803 | 0.01 | 0.973 | 0.015 | 1.801 |
| 324 | Magnetic and optical recording media manufacturing | 5 | 1.639 | 0.163 | 0.004 | 0.018 | 0.008 | 0.193 |
| 325 | Electric lamp bulb and part manufacturing | 40 | 9.194 | 4.156 | 0.274 | 1.846 | 0.08 | 6.355 |
| 326 | Lighting fixture manufacturing | 447 | 74.766 | 16.676 | 1.908 | 7.884 | 0.604 | 27.072 |
| 330 | Household refrigerator and home freezer manufacturing | 4 | 0.801 | 0.115 | 0.009 | 0.004 | 0.005 | 0.132 |
| 333 | Electric power and specialty transformer manufacturing | 10 | 1.218 | 0.331 | 0.047 | 0.113 | 0.009 | 0.5 |
| 334 | Motor and generator manufacturing | 77 | 11.492 | 3.277 | 0.359 | 1.224 | 0.091 | 4.951 |
| 335 | Switchgear and switchboard apparatus manufacturing | 32 | 5.793 | 1.244 | 0.129 | 1.05 | 0.042 | 2.464 |
| 336 | Relay and industrial control manufacturing | 100 | 22.701 | 7.19 | 0.707 | 0.651 | 0.231 | 8.78 |
| 337 | Storage battery manufacturing | 1 | 0.222 | 0.059 | 0.009 | 0.019 | 0.002 | 0.089 |
| 340 | Other communication and energy wire manufacturing | 1 | 0.944 | 0.055 | 0.005 | 0.151 | 0.01 | 0.222 |
| 341 | Wiring device manufacturing | 298 | 46.212 | 12.22 | 1.347 | 8.725 | 0.35 | 22.643 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 343 | Miscellaneous electrical equipment manufacturing | 110 | 30.113 | 4.796 | 0.457 | 0.27 | 0.203 | 5.725 |
| 346 | Motor vehicle body manufacturing | 12 | 1.331 | 0.217 | 0.006 | 0.008 | 0.004 | 0.234 |
| 349 | Travel trailer and camper manufacturing | 23 | 4.289 | 1.042 | 0.047 | 0.352 | 0.027 | 1.469 |
| 350 | Motor vehicle parts manufacturing | 61 | 14.783 | 3.179 | 0.012 | 0.644 | 0.084 | 3.918 |
| 351 | Aircraft manufacturing | 84 | 23.909 | 6.424 | 0.011 | -0.234 | 0.153 | 6.353 |
| 352 | Aircraft engine and engine parts manufacturing | 191 | 45.535 | 9.616 | 0.001 | 6.305 | 0.192 | 16.115 |
| 353 | Other aircraft parts and equipment | 343 | 78.957 | 18.111 | 0.009 | 5.078 | 0.395 | 23.593 |
| 357 | Ship building and repairing | 1 | 0.12 | 0.04 | 0 | 0.003 | 0.001 | 0.044 |
| 358 | Boat building | 15 | 2.059 | 0.62 | 0 | 0.32 | 0.011 | 0.952 |
| 361 | All other transportation equipment manufacturing | 2 | 0.997 | 0.056 | 0 | 0.101 | 0.003 | 0.16 |
| 362 | Wood kitchen cabinet and countertop manufacturing | 995 | 75.01 | 30.788 | 0.264 | 7.648 | 0.913 | 39.613 |
| 363 | Upholstered household furniture manufacturing | 161 | 13.515 | 3.624 | 0.027 | 0.022 | 0.055 | 3.728 |
| 364 | Nonupholstered wood household furniture manufacturing | 58 | 5.08 | 1.355 | 0.012 | 0.481 | 0.024 | 1.871 |
| 365 | Metal household furniture manufacturing | 59 | 12.351 | 1.832 | 0.018 | 2.285 | 0.067 | 4.203 |
| 366 | Institutional furniture manufacturing | 119 | 18.638 | 5.207 | 0.04 | 3.755 | 0.105 | 9.107 |
| 367 | Other household and institutional furniture | 2 | 0.105 | 0.026 | 0 | 0.005 | 0 | 0.031 |
| 369 | Custom architectural woodwork and millwork | 14 | 2.175 | 0.422 | 0.004 | 0.266 | 0.009 | 0.7 |
| 371 | Showcases, partitions, shelving, and lockers | 164 | 13.224 | 4.476 | 0.033 | 1.798 | 0.068 | 6.375 |
| 372 | Mattress manufacturing | 86 | 11.82 | 2.756 | 0.013 | 1.46 | 0.056 | 4.285 |
| 373 | Blind and shade manufacturing | 223 | 21.537 | 5.729 | 0.063 | 2.871 | 0.104 | 8.767 |
| 374 | Laboratory apparatus and furniture manufacturing | 14 | 1.637 | 0.222 | 0.02 | 0.018 | 0.006 | 0.266 |
| 375 | Surgical and medical instrument manufacturing | 155 | 30.706 | 8.032 | 0.958 | 6.637 | 0.231 | 15.857 |
| 376 | Surgical appliance and supplies manufacturing | 1,449 | 358.673 | 87.722 | 7.032 | 90.089 | 3.081 | 187.925 |
| 378 | Ophthalmic goods manufacturing | 51 | 4.591 | 1.448 | 0.17 | 0.95 | 0.033 | 2.6 |
| 379 | Dental laboratories | 86 | 4.669 | 2.352 | 0.235 | 0.234 | 0.033 | 2.853 |
| 380 | Jewelry and silverware | 1,969 | 283.614 | 52.606 | 8.427 | 15.101 | 2.143 | 78.277 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| | manufacturing | | | | | | | |
| 381 | Sporting and athletic goods manufacturing | 88 | 14.306 | 2.859 | 0.381 | 0.809 | 0.277 | 4.326 |
| 382 | Doll, toy, and game manufacturing | 77 | 6.261 | 2.162 | 0.27 | 0.977 | 0.069 | 3.478 |
| 383 | Office supplies, except paper, manufacturing | 9 | 0.649 | 0.191 | 0.017 | 0.154 | 0.007 | 0.369 |
| 384 | Sign manufacturing | 319 | 34.573 | 8.216 | 0.756 | 1.024 | 0.289 | 10.284 |
| 385 | Gasket, packing, and sealing device manufacturing | 248 | 25.926 | 5.943 | 0.429 | 2.701 | 0.122 | 9.195 |
| 386 | Musical instrument manufacturing | 50 | 4.174 | 1.17 | 0.12 | 0.29 | 0.041 | 1.621 |
| 389 | Buttons, pins, and all other miscellaneous manufacturing | 166 | 16.379 | 3.444 | 0.384 | 1.751 | 0.135 | 5.714 |
| 390 | Wholesale trade | 29,741 | 5,433.95 | 1,955.68 | 138.583 | 518.513 | 1,057.03 | 3,669.81 |
| 391 | Air transportation | 698 | 138.136 | 47.058 | 0.735 | 1.929 | 7.781 | 57.503 |
| 393 | Water transportation | 10 | 5.791 | 0.494 | 0.064 | 0.344 | 0.148 | 1.05 |
| 394 | Truck transportation | 3,744 | 444.358 | 121.265 | 10.012 | 73.653 | 4.219 | 209.149 |
| 395 | Transit and ground passenger transportation | 4,189 | 157.974 | 54.323 | 30.098 | 3.099 | 7.918 | 95.438 |
| 396 | Pipeline transportation | 99 | 62.303 | 14.164 | 11.179 | -2.005 | 3.356 | 26.694 |
| 397 | Scenic and sightseeing transportation and support | 795 | 80.46 | 31.982 | 4.81 | 4.714 | 2.359 | 43.865 |
| 398 | Postal service | 2,553 | 190.265 | 156.712 | 0 | -5.093 | 0 | 151.618 |
| 399 | Couriers and messengers | 3,125 | 213.471 | 70.884 | 6.781 | 38.251 | 0.754 | 116.67 |
| 400 | Warehousing and storage | 313 | 21.752 | 11.745 | 1.097 | 3.031 | 0.727 | 16.6 |
| 401 | Motor vehicle and parts dealers | 10,217 | 929.565 | 415.922 | 73.885 | 30.602 | 92.222 | 612.631 |
| 402 | Furniture and home furnishings stores | 4,011 | 267.68 | 113.695 | 6.096 | 19.357 | 30.736 | 169.884 |
| 403 | Electronics and appliance stores | 3,086 | 184.826 | 116.497 | 25.204 | -10.136 | 13.106 | 144.671 |
| 404 | Building material and garden supply stores | 6,584 | 427.778 | 191.267 | 8.838 | 38.126 | 53.712 | 291.945 |
| 405 | Food and beverage stores | 15,355 | 796.195 | 311.84 | 39.682 | 37.126 | 80.841 | 469.489 |
| 406 | Health and personal care stores | 3,204 | 154.446 | 81.215 | 4.231 | 11.515 | 17.471 | 114.433 |
| 407 | Gasoline stations | 4,739 | 283.068 | 97.844 | 25.114 | 3.669 | 33.18 | 159.808 |
| 408 | Clothing and clothing accessories stores | 7,141 | 300.752 | 123.653 | 10.057 | 23.805 | 37.848 | 195.362 |
| 409 | Sporting goods, hobby, book and music stores | 3,730 | 167.86 | 57.555 | 7.845 | 8.38 | 16.019 | 89.8 |
| 410 | General merchandise stores | 8,905 | 394.801 | 192.765 | 1.778 | 33.241 | 44.041 | 271.824 |
| 411 | Miscellaneous store retailers | 7,728 | 356.231 | 107.128 | 20.731 | 4.634 | 23.997 | 156.49 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 412 | Nonstore retailers | 8,780 | 290.181 | 61.149 | 33.301 | 5.384 | 33.348 | 133.181 |
| 413 | Newspaper publishers | 1,869 | 203.308 | 72.267 | 16.397 | 38.775 | 1.9 | 129.338 |
| 414 | Periodical publishers | 535 | 91.294 | 26.338 | 5.314 | 20.664 | 0.822 | 53.138 |
| 415 | Book publishers | 847 | 232.097 | 45.867 | 9.697 | 51.321 | 2.202 | 109.087 |
| 416 | Database, directory, and other publishers | 170 | 37.866 | 6.236 | 1.311 | 14.645 | 0.367 | 22.559 |
| 417 | Software publishers | 5,987 | 1,501.98 | 513.248 | 155.685 | 374.342 | 16.892 | 1,060.17 |
| 418 | Motion picture and video industries | 1,009 | 117.455 | 31.194 | 6.986 | 7.336 | 2.971 | 48.487 |
| 419 | Sound recording industries | 608 | 156.399 | 27.202 | 5.387 | 63.747 | 1.35 | 97.685 |
| 420 | Radio and television broadcasting | 1,815 | 282.383 | 80.426 | 18.224 | -5.088 | 1.753 | 95.315 |
| 421 | Cable networks and program distribution | 1,102 | 589.926 | 37.759 | 7.588 | 109.145 | 14.4 | 168.893 |
| 422 | Telecommunications | 7,816 | 1,932.19 | 455.795 | 100.419 | 430.051 | 202.727 | 1,188.99 |
| 423 | Information services | 1,299 | 188.783 | 82.329 | 22.033 | 23.518 | 3.28 | 131.16 |
| 424 | Data processing services | 2,660 | 361.414 | 157.444 | 34.919 | 55.497 | 4.015 | 251.874 |
| 425 | Nondepository credit intermediation and related activities | 4,854 | 654.309 | 252.379 | 15.309 | 212.989 | 37.056 | 517.734 |
| 426 | Securities, commodity contracts, investments | 12,528 | 973.68 | 304.792 | 268.272 | -34.635 | 22.445 | 560.873 |
| 427 | Insurance carriers | 7,350 | 1,287.35 | 355.201 | 33.674 | 21.868 | 65.991 | 476.734 |
| 428 | Insurance agencies, brokerages, and related | 7,143 | 661.255 | 294.597 | 26.237 | 248.441 | 3.984 | 573.26 |
| 429 | Funds, trusts, and other financial vehicles | 995 | 257.79 | 16.272 | 2.881 | -0.326 | 3.116 | 21.943 |
| 430 | Monetary authorities and depository credit intermediary | 6,790 | 1,276.05 | 250.988 | 15.098 | 583.997 | 19.894 | 869.977 |
| 431 | Real estate | 31,266 | 4,659.99 | 333.472 | 212.543 | 2,099.52 | 603.103 | 3,248.64 |
| 432 | Automotive equipment rental and leasing | 1,233 | 134.048 | 27.612 | 3.901 | 58.094 | 6.791 | 96.398 |
| 433 | Video tape and disc rental | 833 | 38.963 | 10.353 | 1.474 | 11.578 | 3.003 | 26.409 |
| 434 | Machinery and equipment rental and leasing | 710 | 162.119 | 21.627 | 3.042 | 77.148 | 5.342 | 107.158 |
| 435 | General and consumer goods rental except video rentals | 1,682 | 102.858 | 51.229 | 7.362 | 29.676 | 2.531 | 90.798 |
| 436 | Lessors of nonfinancial intangible assets | 145 | 594.271 | 7.174 | 0.348 | 484.563 | 53.691 | 545.776 |
| 437 | Legal services | 10,132 | 1,127.62 | 513.647 | 118.64 | 216.812 | 6.499 | 855.599 |
| 438 | Accounting and bookkeeping services | 4,127 | 253.443 | 145.679 | 33.634 | 32.049 | 1.602 | 212.964 |
| 439 | Architectural and engineering services | 15,050 | 1,303.78 | 625.592 | 150.007 | 188.355 | 8.461 | 972.416 |
| 440 | Specialized design | 818 | 90.225 | 27.336 | 6.284 | 22.606 | 1.577 | 57.803 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| | services | | | | | | | |
| 441 | Custom computer programming services | 24,243 | 2,004.29 | 1,536.74 | 367.4 | -122.965 | 11.335 | 1,792.51 |
| 442 | Computer systems design services | 4,463 | 530.019 | 286.339 | 71.588 | -54.372 | 12.491 | 316.046 |
| 443 | Other computer related services, including computer facilities management | 1,312 | 143.979 | 75.172 | 18.111 | 29.834 | 1.41 | 124.526 |
| 444 | Management consulting services | 5,081 | 477.538 | 246.894 | 59.209 | 92.302 | 2.88 | 401.285 |
| 445 | Environmental and other technical consulting | 1,678 | 186.571 | 63.89 | 14.509 | 59.663 | 0.892 | 138.954 |
| 446 | Scientific research and development services | 5,830 | 370.536 | 275.003 | 65.917 | -37.966 | 2.438 | 305.392 |
| 447 | Advertising and related services | 4,415 | 451.718 | 192.398 | 44.657 | 81.388 | 5.043 | 323.487 |
| 448 | Photographic services | 536 | 28.524 | 7.218 | 1.611 | 8.563 | 1.214 | 18.606 |
| 449 | Veterinary services | 1,653 | 84.42 | 30.264 | 6.924 | 0.071 | 2.654 | 39.914 |
| 450 | All other miscellaneous professional and technical | 1,840 | 215.637 | 41.341 | 9.471 | 126.126 | 2.48 | 179.418 |
| 451 | Management of companies and enterprises | 2,279 | 179.248 | 89.625 | 21.706 | 7.039 | 3.294 | 121.664 |
| 452 | Office administrative services | 3,187 | 506.53 | 150.142 | 20.079 | 98.878 | 4.615 | 273.715 |
| 453 | Facilities support services | 1,407 | 124.458 | 53.012 | 7.754 | 29.796 | 0.395 | 90.957 |
| 454 | Employment services | 17,631 | 470.084 | 347.444 | 47.089 | 10.479 | 2.199 | 407.211 |
| 455 | Business support services | 9,939 | 626.651 | 274.046 | 37.258 | 164.932 | 13.383 | 489.619 |
| 456 | Travel arrangement and reservation services | 1,546 | 106.168 | 36.903 | 4.813 | 9.147 | 1.622 | 52.485 |
| 457 | Investigation and security services | 3,936 | 137.784 | 84.57 | 11.043 | 18.566 | 2.23 | 116.409 |
| 458 | Services to buildings and dwellings | 9,721 | 327.576 | 173.776 | 22.712 | 27.633 | 4.396 | 228.517 |
| 459 | Other support services | 1,108 | 150.003 | 38.178 | 4.809 | 51.333 | 1.831 | 96.151 |
| 460 | Waste management and remediation services | 955 | 152.073 | 47.113 | 9.87 | 22.976 | 7.222 | 87.181 |
| 461 | Elementary and secondary schools | 1,459 | 48.82 | 29.719 | 1.203 | -0.985 | 0 | 29.937 |
| 462 | Colleges, universities, and junior colleges | 2,166 | 68.814 | 35.161 | 1.666 | -2.279 | 0 | 34.547 |
| 463 | Other educational services | 5,924 | 273.872 | 115.473 | 4.25 | 61.686 | 3.108 | 184.517 |
| 464 | Home health care services | 7,013 | 227.113 | 91.963 | 16.098 | -1.066 | 0.683 | 107.678 |
| 465 | Offices of physicians, dentists, and other healthcare | 16,782 | 1,557.62 | 822.568 | 145.47 | 201.126 | 8.804 | 1,177.97 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 466 | Other ambulatory health care services | 3,024 | 465.983 | 116.536 | 20.346 | 30.38 | 3.294 | 170.555 |
| 467 | Hospitals | 11,682 | 1,384.94 | 522.654 | 89.919 | 4.35 | 5.469 | 622.392 |
| 468 | Nursing and residential care facilities | 9,288 | 369.082 | 214.692 | 13.155 | 7.157 | 2.823 | 237.826 |
| 469 | Child day care services | 5,660 | 186.158 | 60.214 | 5.917 | 27.988 | 1.719 | 95.838 |
| 470 | Social assistance, except child day care service | 7,164 | 177.284 | 112.74 | 11.164 | -7.487 | 0.895 | 117.312 |
| 471 | Performing arts companies | 5,275 | 77.945 | 33.83 | 10.888 | -5.11 | 2.708 | 42.314 |
| 472 | Spectator sports | 752 | 5.52 | 4.07 | 1.563 | -1.609 | 0.595 | 4.618 |
| 473 | Independent artists, writers, and performers | 1,055 | 83.635 | 17.862 | 6.202 | 4.541 | 0.708 | 29.313 |
| 474 | Promoters of performing arts and sports and agents | 950 | 30.064 | 9.462 | 3.087 | 4.262 | 1.233 | 18.044 |
| 475 | Museums, historical sites, zoos, and parks | 479 | 27.685 | 6.501 | 0.048 | -0.144 | 0.234 | 6.64 |
| 476 | Fitness and recreational sports centers | 3,053 | 39.956 | 30.129 | 10.445 | -6.423 | 1.737 | 35.889 |
| 477 | Bowling centers | 370 | 6.344 | 3.288 | 1.137 | 0.399 | 0.399 | 5.223 |
| 478 | Other amusement, gambling, and recreation industry | 5,266 | 221.303 | 59.387 | 21.386 | 42.887 | 11.729 | 135.389 |
| 479 | Hotels and motels, including casino hotels | 5,239 | 301.033 | 101.482 | 29.829 | 55.19 | 26.687 | 213.188 |
| 480 | Other accommodations | 1,233 | 168.849 | 18.224 | 4.488 | 26.387 | 5.276 | 54.375 |
| 481 | Food services and drinking places | 56,194 | 2,298.21 | 761.895 | 263.359 | -9.237 | 140.636 | 1,156.65 |
| 482 | Car washes | 1,048 | 41.336 | 11.415 | 3.718 | 12.887 | 1.278 | 29.298 |
| 483 | Automotive repair and maintenance, except car wash | 11,164 | 1,671.39 | 268.165 | 90.187 | 391.921 | 72.086 | 822.359 |
| 484 | Electronic equipment repair and maintenance | 1,622 | 196.685 | 58.831 | 20.241 | 28.9 | 3.729 | 111.701 |
| 485 | Commercial machinery repair and maintenance | 1,778 | 168.122 | 48.224 | 16.215 | 36.34 | 3.042 | 103.821 |
| 486 | Household goods repair and maintenance | 720 | 81.457 | 11.256 | 3.952 | 23.252 | 1.474 | 39.934 |
| 487 | Personal care services | 3,077 | 147.3 | 50.911 | 10.829 | 31.067 | 2.893 | 95.7 |
| 488 | Death care services | 704 | 42.985 | 13.999 | 2.888 | 7.295 | 1.652 | 25.834 |
| 489 | Dry-cleaning and laundry services | 3,067 | 139.467 | 53.953 | 10.891 | 23.433 | 4.63 | 92.906 |
| 490 | Other personal services | 1,686 | 176.584 | 29.953 | 6.147 | 60.875 | 4.039 | 101.014 |
| 491 | Religious organizations | 382 | 44.81 | 28.399 | 0 | 0 | 0 | 28.399 |
| 492 | Grant making and giving and social advocacy organizations | 5,071 | 124.338 | 39.043 | 0 | 0 | 0.113 | 39.156 |
| 493 | Civic, social, professional and similar organizations | 11,790 | 361.835 | 163.887 | 0 | 0 | 0.714 | 164.601 |

| IMPLAN modeling code | Industry | Employment | Millions of dollars | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Industry Output | Employee Compensation | Proprietor Income | Other Property Income | Indirect Business Tax | Total Value Added |
| 494 | Private households | 8,486 | 85.716 | 66.688 | 0 | 19.028 | 0 | 85.716 |
| 495 | Federal electric utilities | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 496 | Other Federal Government enterprises | 103 | 8.664 | 7.986 | 0 | -0.283 | 0 | 7.703 |
| 497 | State and local government passenger transit | 752 | 67.425 | 33.026 | 0 | -27.335 | 0 | 5.692 |
| 498 | State and local government electric utilities | 2,484 | 1,110.86 | 161.637 | 0 | 463.838 | 45.144 | 670.618 |
| 499 | Other State and local government enterprises | 2,129 | 295.214 | 94.138 | 0 | 60.698 | 0.598 | 155.434 |
| 503 | State & Local Education | 34,407 | 1,625.30 | 1,419.64 | 0 | 205.66 | 0 | 1,625.30 |
| 504 | State & Local Non-Education | 85,200 | 3,921.24 | 3,342.56 | 0 | 578.684 | 0 | 3,921.24 |
| 505 | Federal Military | 3,212 | 80.291 | 68.455 | 0 | 11.836 | 0 | 80.291 |
| 506 | Federal Non-Military | 11,225 | 721.553 | 615.155 | 0 | 106.398 | 0 | 721.553 |
| 508 | Inventory valuation adjustment | 0 | 11.749 | 0 | 0 | 11.934 | 0 | 11.934 |
| 509 | Owner-occupied dwellings | 0 | 2,892.04 | 0 | 0 | 1,802.80 | 443.957 | 2,246.76 |
| | Totals | 875,818 | 86,477.33 | 30,454.95 | 4,633.24 | 14,304.03 | 3,994.27 | 53,386.49 |

*Source: LCRA Community and Economic Development, IMPLAN 2004 - base year 2001, data is for the 14 Region K counties (includes all of Hays, Williamson, and Wharton Counties).

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## APPENDICES

# CHAPTER 2.0: POPULATION PROJECTIONS AND WATER DEMAND PROJECTIONS

A key task in the preparation of the regional water plan for the Lower Colorado Regional Water Planning Area (Region K) is to estimate current and future water demands within the region. In subsequent chapters of this plan, these projections are compared with estimates of currently available water supplies to identify the location, extent, and timing of future water shortages.

*Table 2.1* below is a summary of regional population and water demand projections for Region K.

**Table 2.1 Population and Water Demand Projections for the Lower Colorado Region**

| Regional Projections | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **POPULATION** | **1,132,228** | **1,412,834** | **1,714,282** | **2,008,142** | **2,295,627** | **2,580,533** | **2,831,937** |
| | | | | | | | |
| Municipal Water Demand (ac-ft/yr) | 213,303 | 268,643 | 321,972 | 373,430 | 423,051 | 472,778 | 516,348 |
| Manufacturing Water Demand (ac-ft/yr) | 28,887 | 38,162 | 44,916 | 56,233 | 69,264 | 77,374 | 85,698 |
| Irrigation Water Demand (ac-ft/yr) | 620,930 | 589,705 | 567,272 | 545,634 | 524,809 | 504,695 | 468,763 |
| Steam-Electric Water Demand (ac-ft/yr) | 103,875 | 146,167 | 201,353 | 210,713 | 258,126 | 263,715 | 270,732 |
| Mining Water Demand (ac-ft/yr) | 23,945 | 30,620 | 31,252 | 31,613 | 26,964 | 27,304 | 27,598 |
| Livestock Water Demand (ac-ft/yr) | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 |
| **TOTAL WATER DEMAND** | **1,004,335** | **1,086,692** | **1,180,160** | **1,231,018** | **1,315,609** | **1,359,261** | **1,382,534** |

As indicated, the population in Region K is projected to more than double over the next 60 years. This projected increase in population is the principal "driver" underlying the projected increase in total water demand from approximately 1,004,000 acre-feet (ac-ft) in the year 2000 to 1,383,000 ac-ft in the year 2060.

The following sections of this chapter describe the methodology used to develop regional population and water demand projections. This chapter also presents projections of population and water demand for cities, wholesale water providers of municipal and manufacturing water, and for categories of water use including municipal, manufacturing, irrigation, steam-electric power generation, mining, and livestock watering. Projected demands are also provided for each of the four river basins and two coastal basins that are partially located within Region K.

## 2.1 TWDB GUIDELINES FOR REVISIONS TO POPULATION AND WATER DEMAND PROJECTIONS

A memo from the Texas Water Development Board (TWDB), dated December 2, 2008, provided guidance on and discussed the process of determining whether or not changed conditions in a regional planning area warranted revisions to the population and water demand projections as part of the 2007-2012 Regional Water Planning Cycle. The memo also described the steps a regional planning area must take if it determined revisions were warranted. TWDB agreed that growth in Region K exceeded the projected growth in the 2006 Region K Water Plan, thus warranting revisions to the population and water demand projections. Desired revisions to the population and water demand projections must be determined by Region K and submitted as a request for approval to TWDB. Once submitted to TWDB, the projections are to be reviewed by the Texas Commission on Environmental Quality (TCEQ), Texas

Parks and Wildlife Department (TPWD), and the Texas Department of Agriculture (TDA) prior to being approved.

The Region K Population and Water Demand Committee was initially organized at the January 14, 2009, Region K meeting. The committee's purpose and primary objective was to review all population and water demand projections in the 2006 Region K Water Plan and recommend any appropriate changes. The committee reviewed the various water use categories and recommended that only the municipal and steam-electric use projections be revised. The committee recommended that the projections for the other categories (irrigation, livestock, manufacturing, and mining) remain the same as identified in the 2006 Region K Water Plan.

TWDB rules require that an analysis of current and future water demands be performed for each WUG within Region K. To be considered a WUG within the municipal category, one of the following must apply.

- Each city with a population of 500 or more
- Individual utilities providing more than 280 acre feet per year (ac-ft/yr) of water for municipal use (for counties having four or less of these utilities)
- Collective Reporting Units (CRUs) consisting of grouped utilities having a common association

All smaller communities and rural areas, aggregated at the county level, are considered a WUG and are referred to as "County-Other" for each county. Additionally, for each county, the categories of manufacturing, irrigation, steam-electric power generation, mining, and livestock water use are each considered a WUG. Furthermore, TWDB rules require the determination of demands associated with each of the wholesale water providers designated by the Regional Water Planning Group (RWPG). There are currently two wholesale water providers in Region K: Lower Colorado River Authority (LCRA) and the City of Austin (COA).

## 2.2 POPULATION PROJECTIONS

The population and water demand projections presented in this chapter were developed by revising the 2006 Region K Water Plan projections to reflect more current information, in accordance with TWDB guidelines. This section describes the methodology applied by the planning group to develop the TWDB-approved population projections for Region K.

### 2.2.1 Methodology

Municipal water demand projections are calculated as the product of three variables: current and projected population, per capita water use rates, and assumptions regarding the effects of certain water conservation measures.

The following describes the procedures followed in the development of the population projections presented in this chapter:

Region K appointed a Population and Water Demand Committee to review the population projections in the 2006 Regional Plan, evaluate the latest available data, studies and information on population for the Region K area and to recommend any appropriate changes. The committee reviewed information from the

LCRA's Water Supply Resource Plan (WSRP) planning effort and the data from 2006 Region K Plan, Texas State Data Center (TSDC), U. S. Census Bureau, the State Demographer, Capitol Area Planning Council of Governments (CAPCOG), Houston-Galveston Area Council (H-GAC), and other specific data that counties had on county population changes . Each county in Region K was evaluated separately and the committee used, on a near-term projection basis (2010-2040), the population projections that best correlated with data from the U. S. Census Bureau and/or substantiated county data. The committee extended the projections from 2040 to 2060 using the TSDC's half migration rate for 1990-2000.

The revised county population totals were distributed by Region K among the individual water user groups (WUGs) in the region. The TSDC provided population data from January 2007 for the cities in Region K. This data was extrapolated to determine the 2010 population projection. If the extrapolated population was less than the 2010 projection in the 2006 Region K Water Plan, in most cases the 2006 Region K Water Plan projection was not changed. After the cities were adjusted, the remaining increased county population was distributed proportionally to the non-city WUGs.

Region K has two new WUGs for this round of planning which are The Village of San Leanna in Travis County and East Bernard in Wharton County. Anderson Mill MUD in Travis County and Williamson County has been annexed by the City of Austin, and is no longer considered a separate WUG.

Upon review, the TWDB staff informed Region K that its initially submitted planning group projections were too high. Subsequently, Region K revised their originally requested population projections based on the TWDB's recommended regional totals as well as certain county totals. For Blanco County, Matagorda County, San Saba County, and Wharton County, TWDB staff stated that their analysis indicated the counties were currently over-projected according to data from the Texas State Data Center and that population increases could therefore not be justified for these counties. In general, Region K reluctantly agreed to reduce those counties back to their original 2006 Plan projections.

Because the recommended regional totals from TWDB staff were based on increases to cities only and not to non-city WUGs, the general methodology for revising the remaining counties (that Region K had originally requested increases for) was to decrease the decadal rates of growth for the cities within each county to allow a portion of the population to be distributed to some of the non-city WUGs. Two WUGs, Travis County WCID #17 (Travis County) and Cottonwood Shores (Burnet County), provided comments containing projection data which Region K used as guidance for their revised population projections.

The Region K planning group was disappointed with the TWDB staff recommended population projections and adopted a Resolution regarding the issue on June 10, 2009. The Resolution was included with Region K's revised population and water demand submittal to the TWDB on June 26, 2009. A copy of the Resolution is located in *Appendix 2D*. In order to prepare for future population projection increases, the Region K planning group will consider adding alternative strategies in the 2011 Region K Water Plan that will cover the demand differences between the planning group's originally requested (higher) projections and the reduced projections the TWDB staff recommended revisions created. The TWDB Board adopted Region K's revised population and water demand projections for municipal and steam electric in August and November 2009.

These population projections are summarized in the following section.

### 2.2.2 Regional Population Projections

Projections of population growth for Region K indicate more than a doubling of the region's population from approximately 1.1 million in 2000 to 2.8 million in the year 2060 (*Figure 2.1*). *Table 2.2* presents these projections by county for each decade from 2000 through 2060. Each of the 14 counties in the region are projected to grow over the planning period, with Travis County continuing to account for nearly 75 percent of the total population for the region, as shown in *Table 2.2*.

**Figure 2.1: Lower Colorado Region Population Projections**

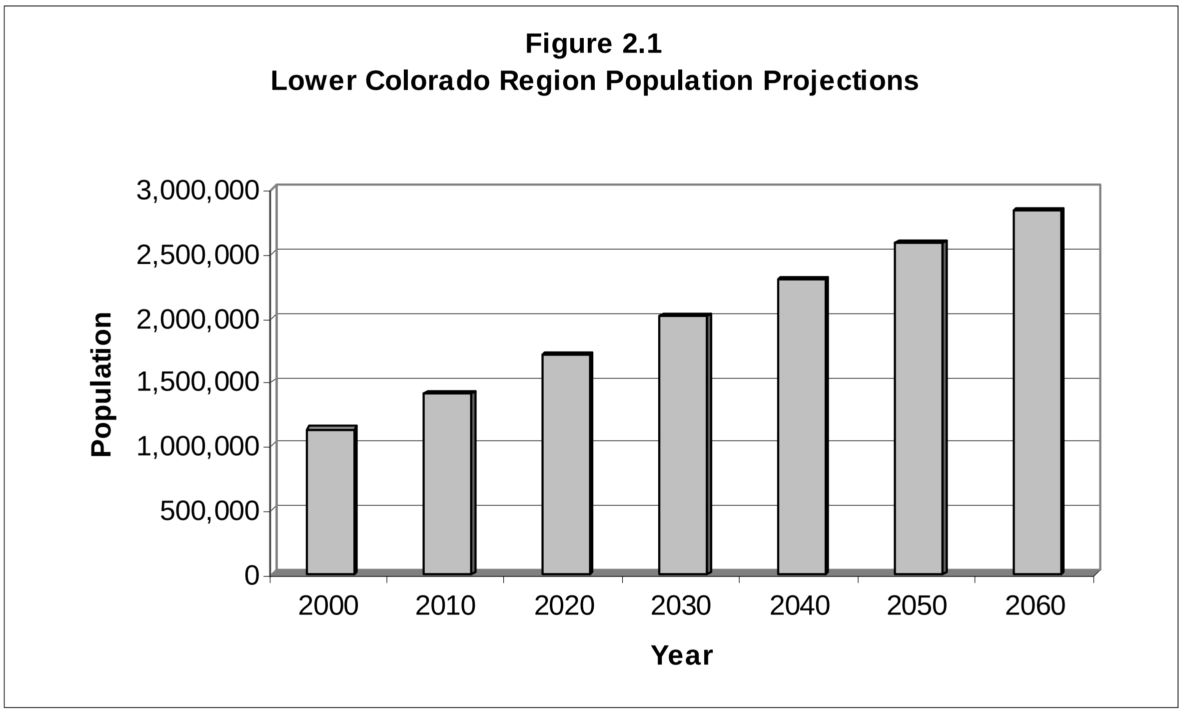


**Table 2.2 Population Projection by County**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 57,733 | 84,449 | 120,740 | 151,364 | 199,548 | 239,588 | 288,683 |
| Blanco | 8,418 | 9,946 | 11,756 | 13,487 | 15,002 | 16,641 | 18,544 |
| Burnet | 34,147 | 47,160 | 61,191 | 78,133 | 94,716 | 105,095 | 115,056 |
| Colorado | 20,390 | 21,239 | 22,591 | 23,311 | 23,424 | 23,900 | 24,324 |
| Fayette | 21,804 | 24,826 | 28,808 | 32,363 | 35,259 | 38,933 | 44,120 |
| Gillespie | 20,814 | 25,258 | 29,117 | 30,861 | 30,861 | 30,861 | 30,861 |
| Hays (p) | 25,090 | 46,143 | 69,377 | 88,887 | 108,495 | 132,051 | 150,574 |
| Llano | 17,044 | 21,284 | 23,007 | 23,471 | 23,932 | 24,393 | 24,855 |
| Matagorda | 37,957 | 40,506 | 43,295 | 44,991 | 45,925 | 45,925 | 45,925 |
| Mills | 5,151 | 5,466 | 5,815 | 6,107 | 5,930 | 6,329 | 6,497 |
| San Saba | 6,186 | 6,387 | 6,746 | 7,059 | 7,332 | 7,365 | 7,409 |
| Travis | 812,280 | 1,003,253 | 1,201,256 | 1,402,153 | 1,583,068 | 1,770,347 | 1,918,135 |
| Wharton (p) | 26,721 | 28,260 | 29,872 | 30,912 | 31,508 | 31,523 | 31,188 |
| Williamson (p) | 38,493 | 48,657 | 60,711 | 75,043 | 90,627 | 107,582 | 125,766 |
| **TOTAL** | **1,132,228** | **1,412,834** | **1,714,282** | **2,008,142** | **2,295,627** | **2,580,533** | **2,831,937** |

(p) Denotes that only the portion of the county in Region K is considered.
* Population projections by city, county, and portion of a river basin within a county for each of the 14 counties in the Lower Colorado Region are provided in *Appendix 2A*.

As discussed in Chapter 1, Region K covers a portion of four major river basins and two coastal basins. Of these, the Colorado River Basin is projected to contain approximately 91 percent of the region's population in the year 2060. *Table 2.3* presents the population projections by river basin for Region K.

**Table 2.3 Population Projection by River Basin**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 46,602 | 59,230 | 73,975 | 91,579 | 110,338 | 129,520 | 149,742 |
| Brazos-Colorado | 45,827 | 49,560 | 52,736 | 54,698 | 55,763 | 55,828 | 55,649 |
| Colorado | 1,011,523 | 1,273,597 | 1,554,282 | 1,826,196 | 2,091,913 | 2,355,744 | 2,584,855 |
| Colorado-Lavaca | 12,525 | 13,035 | 13,908 | 14,443 | 14,739 | 14,741 | 14,716 |
| Guadalupe | 5,610 | 7,065 | 8,470 | 9,801 | 11,050 | 12,318 | 13,817 |
| Lavaca | 10,141 | 10,346 | 10,911 | 11,425 | 11,824 | 12,382 | 13,158 |
| **TOTAL** | **1,132,228** | **1,412,833** | **1,714,282** | **2,008,142** | **2,295,627** | **2,580,533** | **2,831,937** |

The complete population projections for Region K by water user group are provided in *Appendix 2A*. *Appendix 2B* provides a comparison of the 2006 Region K Water Plan population projections versus the 2011 projections (the projections presented in this report). *Appendix 2C* provides the gallons per capita per day (gpcd) for each WUG.

## 2.3 WATER DEMAND PROJECTIONS

Total water demand for Region K is projected to increase by approximately 378,000 ac-ft from the year 2000 to the year 2060. This increase (approximately 38 percent) is less than the percent increase in population due to a projected decrease in irrigation water demand countering the increase in municipal, manufacturing, and steam-electric water demands. The following figures (*Figures 2.2* and *2.3*) show the relative portion of projected water demand by type of use for the year 2000 through the year 2060.

**Figure 2.2: Lower Colorado Region Total Water Demand Projections**

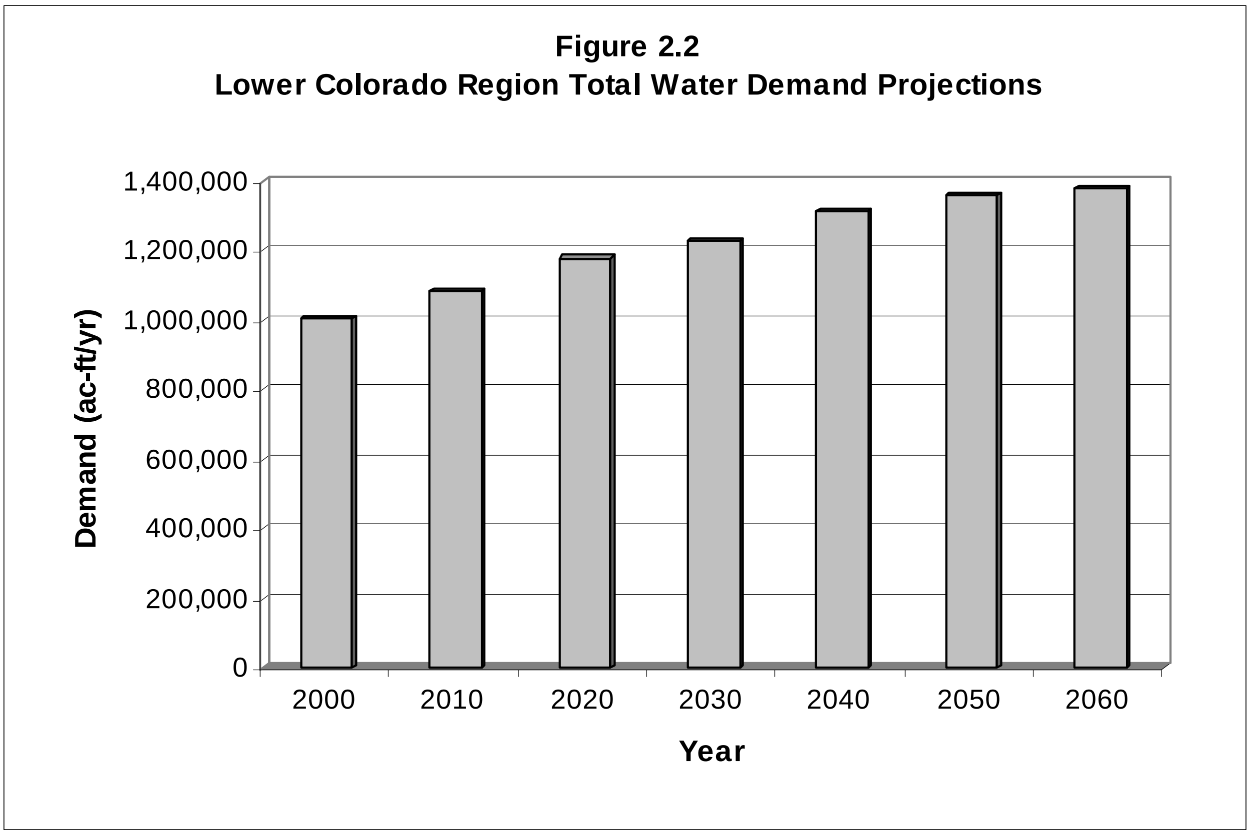
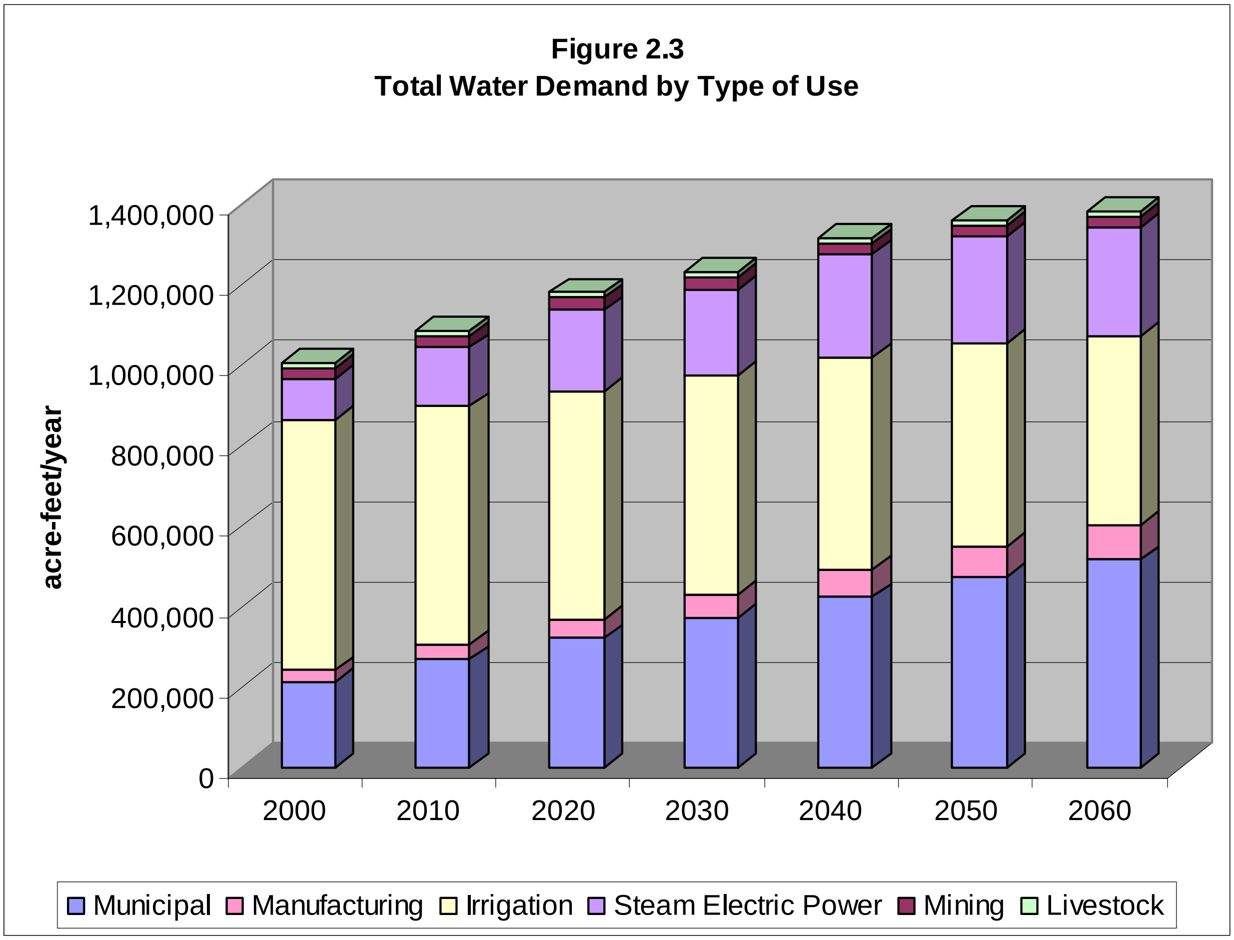


**Figure 2.3: Total Water Demand by Type of Use**




### 2.3.1 Municipal Water Demand Projections

#### *2.3.1.1 Methodology*

As with the population projections, the planning group generated the proposed municipal water demand projections by starting with the 2006 Region K Water Plan projections and making updates on the basis of better, more current information. The following procedure describes the methodology used for generating these projections:

1. ***Identify TWDB Projected Per Capita Use Rate:*** After population, the second key variable in the TWDB's municipal water demand projections is per capita use, expressed as gallons of water used per person per day (gpcd). The GPCD numbers used to calculate the municipal demands were not changed from the ones used in the 2006 Region K Water Plan. Therefore, for the majority of the WUGs, the changes in municipal demand are directly correlated to the changes in population. There is one exception to this general statement which impacts three County-Other WUG totals in this submittal.

LCRA performed a detailed study during the last regional water planning cycle that estimated domestic use around the Highland Lakes that is not accounted for within any WUG. This previously unaccounted domestic use is generated by direct pumpage from the Highland Lakes to individual properties by individual property owners primarily for landscape irrigation. The regional planning group discussed the inclusion of this additional Highland Lake domestic use in their water demand request and approved the inclusion at the May 5, 2009 Region K meeting. The information provided by LCRA showed an annual demand per lake, with a total current demand of approximately 5,000 ac-ft. A total increase of 1,000 ac-ft per decade was anticipated for this additional domestic use. The total usage per lake was allocated by county for those lakes that have shorelines in more than one county. The allocations were made based on the approximate percentage of shoreline in each county.

Three counties (Burnet County, Llano County, and Travis County) are affected by this unaccounted for domestic use. Because these demands cannot be attributed to a specific municipality or utility, it was determined that County-Other would be the appropriate WUG category to use for these demands; therefore, the respective amounts have been added to the County-Other WUG demands in Burnet County, Llano County, and Travis County, with a note included which describes the amounts attributed to the unaccounted domestic lake use.

2. ***Municipal Water Demand:*** The municipal water demand projections are the product of the proposed population projections and the proposed per capita usage projections described above. These projections were approved by the TWDB for use in the 2011 Region K Water Plan and are presented for each municipal WUG by county, river basin, and decade in *Appendix 2A.*

### *2.3.1.2 Regional Municipal Water Demand Projections*

Municipal water demand for Region K is projected to increase by approximately 303,000 ac-ft/yr from 2000 through 2060. While this is a significant increase in municipal water use over that time period, this increase (approximately 142 percent) is less than the increase in population over the same period (approximately 150 percent). This is due to projected reductions in per capita water use associated with the adoption of various water conservation measures. *Figure 2.4* presents the total municipal water demand projections, and *Table 2.4* presents the projected municipal water demand by county for each of the 14 counties in Region K.

**Figure 2.4: Lower Colorado Region Municipal Water Demand Projections**

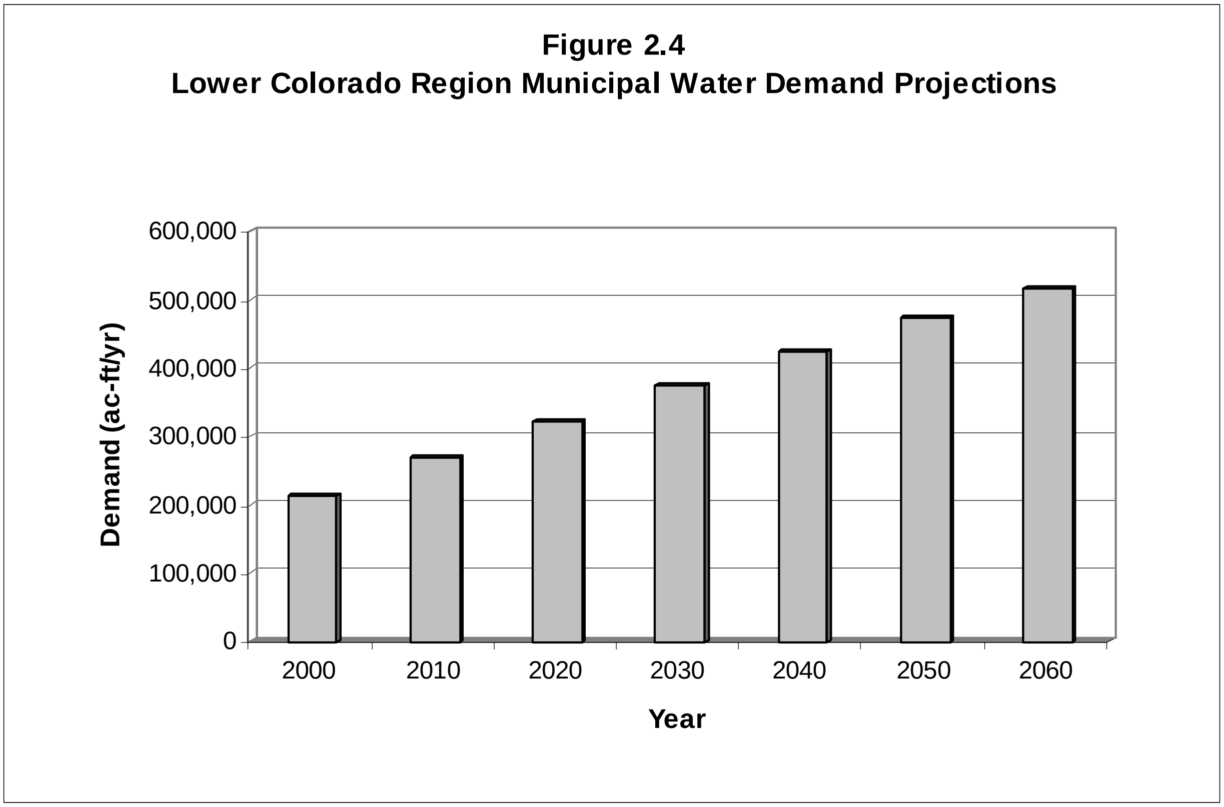



**Table 2.4 Municipal Water Demand Projections by County (ac-ft/yr)**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 9,315 | 13,275 | 18,620 | 22,964 | 30,040 | 35,860 | 43,208 |
| Blanco | 1,205 | 1,467 | 1,712 | 1,947 | 2,143 | 2,360 | 2,626 |
| Burnet | 5,752 | 8,990 | 11,437 | 14,166 | 16,867 | 18,626 | 20,550 |
| Colorado | 3,100 | 3,155 | 3,292 | 3,328 | 3,259 | 3,320 | 3,409 |
| Fayette | 3,522 | 3,890 | 4,417 | 4,879 | 5,244 | 5,751 | 6,495 |
| Gillespie | 3,921 | 4,749 | 5,398 | 5,646 | 5,576 | 5,541 | 5,541 |
| Hays (p) | 3,955 | 7,202 | 10,656 | 13,446 | 16,266 | 19,742 | 22,498 |
| Llano | 4,042 | 5,722 | 6,235 | 6,446 | 6,647 | 6,875 | 7,139 |
| Matagorda | 5,423 | 5,590 | 5,830 | 5,906 | 5,883 | 5,831 | 5,831 |
| Mills | 992 | 1010 | 1070 | 1093 | 1053 | 1086 | 1104 |
| San Saba | 1,296 | 1,299 | 1,316 | 1,328 | 1,339 | 1,331 | 1,336 |
| Travis | 160,151 | 199,677 | 237,014 | 274,610 | 308,229 | 342,865 | 369,723 |
| Wharton (p) | 3,680 | 3,776 | 3,880 | 3,910 | 3,880 | 3,847 | 3,806 |
| Williamson (p) | 6,949 | 8,841 | 11,095 | 13,761 | 16,625 | 19,743 | 23,082 |
| **TOTAL** | **213,303** | **268,643** | **321,972** | **373,430** | **423,051** | **472,778** | **516,348** |

(p) Denotes that only the portion of the county in Region K is considered.
* Municipal water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in Region K are provided in *Appendix 2A.*

As with population, the large majority of current and projected municipal water demand occurs in the Colorado River Basin (approximately 92 percent in the year 2060). *Table 2.5* presents these municipal water demand projections by river basin.

**Table 2.5 Municipal Water Demand Projections by River Basin (ac-ft/yr)**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 8,080 | 10,276 | 12,880 | 15,939 | 19,196 | 22,609 | 26,270 |
| Brazos-Colorado | 6,684 | 6,971 | 7,236 | 7,323 | 7,278 | 7,225 | 7,205 |
| Colorado | 194,550 | 247,147 | 297,283 | 345,329 | 391,541 | 437,658 | 477,232 |
| Colorado-Lavaca | 1,550 | 1,563 | 1,621 | 1,634 | 1,625 | 1,609 | 1,607 |
| Guadalupe | 829 | 1055 | 1,243 | 1,426 | 1,589 | 1,763 | 1,978 |
| Lavaca | 1,610 | 1,631 | 1,709 | 1,779 | 1,822 | 1,914 | 2,056 |
| **TOTAL** | **213,303** | **268,643** | **321,972** | **373,430** | **423,051** | **472,778** | **516,348** |

## 2.3.2 Manufacturing Water Demand Projections

### *2.3.2.1 Methodology*

For regional water planning purposes, manufacturing water use is considered to be the cumulative water demand by county and river basin for all industries within specified industrial classifications (SIC) determined by the TWDB. Manufacturing water use projections that were developed by the TWDB were used as the default projections except where new information warranted a revision. Current TWDB rules protect manufacturing users from disclosure of their usage information on an individual basis, so there was little information available to verify this projection.

### *2.3.2.2 Regional Manufacturing Water Demand Projections*

Annual manufacturing water demand for Region K is projected to increase from 28,887 ac-ft in the year 2000 to 85,698 ac-ft/yr in the year 2060. These demands are predominately from existing and future industries in Travis and Matagorda Counties. The expected usage of water for manufacturing purposes in Matagorda County that has already been contracted is responsible for the large increase in manufacturing demand from the year 2000 to the year 2010. *Figure 2.5* presents the projected regional manufacturing demand, and *Table 2.6* present the projected manufacturing water demand for each of the counties in Region K.

**Figure 2.5: Lower Colorado Region Manufacturing Water Demand Projections**

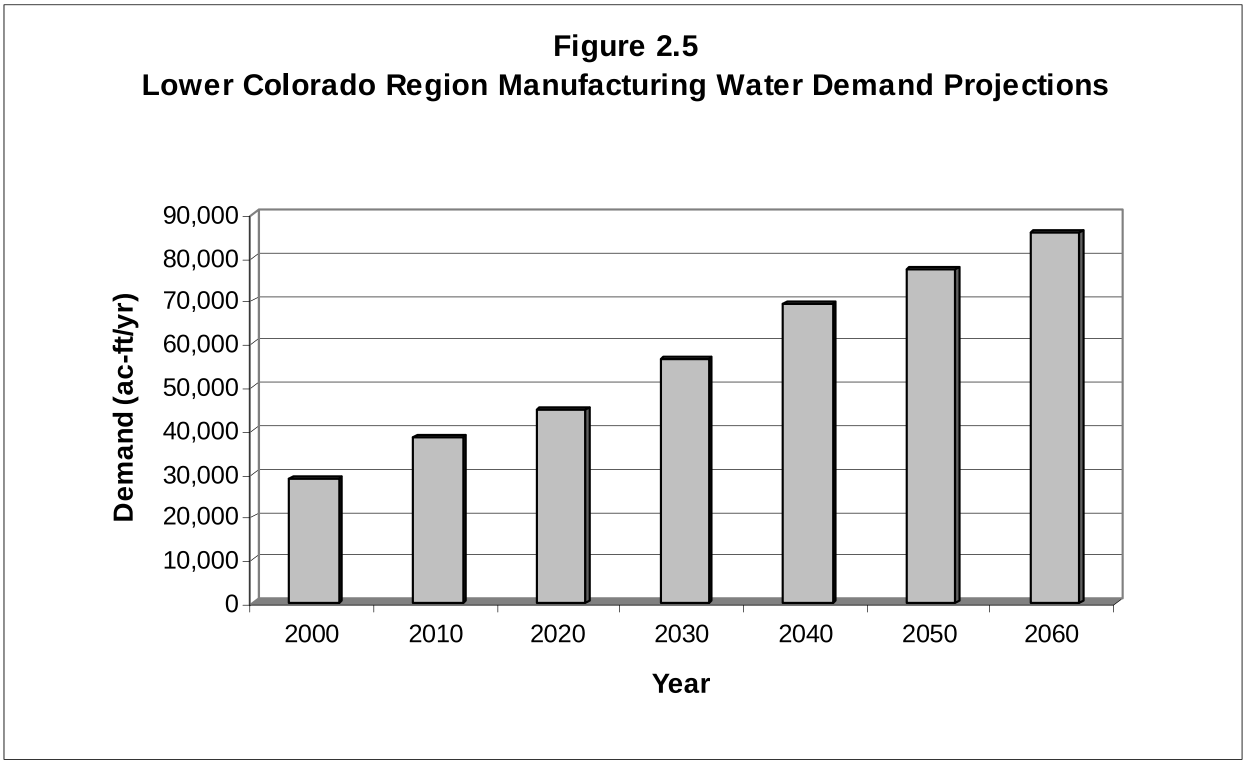



**Table 2.6 Manufacturing Water Demand Projections by County (ac-ft/yr)**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 70 | 92 | 111 | 130 | 150 | 169 | 183 |
| Blanco | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Burnet | 743 | 963 | 1,109 | 1,248 | 1,384 | 1,502 | 1,636 |
| Colorado | 144 | 176 | 192 | 205 | 217 | 227 | 245 |
| Fayette | 162 | 205 | 230 | 254 | 277 | 297 | 322 |
| Gillespie | 440 | 506 | 539 | 566 | 591 | 612 | 655 |
| Hays (p) | 509 | 691 | 809 | 928 | 1,048 | 1,156 | 1,255 |
| Llano | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| Matagorda | 10,355 | 12,180 | 13,253 | 13,991 | 14,686 | 15,259 | 16,267 |
| Mills | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| San Saba | 24 | 28 | 30 | 31 | 32 | 33 | 35 |
| Travis | 16,179 | 23,002 | 28,294 | 38,508 | 50,483 | 57,703 | 64,652 |
| Wharton (p) | 256 | 313 | 343 | 366 | 390 | 410 | 442 |
| Williamson (p) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **28,887** | **38,162** | **44,916** | **56,233** | **69,264** | **77,374** | **85,698** |

(p) Denotes that only the portion of the county in Region K was considered.
* Manufacturing water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in Region K are provided in *Appendix 2A*.

Manufacturing water demand in Region K is predominately in the Colorado and Brazos-Colorado River Basins. *Table 2.7* presents these demands by river basin for Region K.

**Table 2.7 Manufacturing Water Demand Projections by River Basin (ac-ft/yr)**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brazos-Colorado | 5,466 | 6,431 | 6,998 | 7,389 | 7,758 | 8,061 | 8,595 |
| Colorado | 23,152 | 31,395 | 37,543 | 48,435 | 61,063 | 68,841 | 76,591 |
| Colorado-Lavaca | 100 | 122 | 134 | 143 | 152 | 160 | 173 |
| Guadalupe | 7 | 9 | 11 | 12 | 14 | 15 | 17 |
| Lavaca | 162 | 205 | 230 | 254 | 277 | 297 | 322 |
| **TOTAL** | **28,887** | **38,162** | **44,916** | **56,233** | **69,264** | **77,374** | **85,698** |

### 2.3.3 Irrigation Water Demand Projections

#### *2.3.3.1 Methodology*

The irrigation water use projections that were developed by TWDB were used as the default projections except in cases where more effective and current information was submitted. The TWDB projections were determined with assistance from the Texas Agricultural Extension Service, and they assume expected case water conservation practices with no reduction in Federal farm program subsidies. In recognition of the variation of irrigation usage with commodity prices, the TWDB guidance allowed the use of a single year (1995-2000), a composite of all of the years, and either the largest acreage or the largest water demand based on their data for use in determining the irrigation demands. The largest year acreage planted was used for Colorado and Wharton Counties, and the largest water demand year was used for Matagorda County.

#### *2.3.3.2 Regional Irrigation Water Demand Projections*

Irrigation water demand for Region K is projected to decrease from 620,930 ac-ft/yr in 2000 to 468,763 ac-ft/yr in the year 2060. Irrigation water demand in Region K is concentrated in Colorado, Matagorda, and Wharton Counties and is largely used to meet irrigation needs for rice farming. Over the next 50 years, a decrease in irrigation water demand is projected due to improvements in irrigation efficiency and reductions in irrigated acres due to forecasted unfavorable farming economics. *Figure 2.6* presents the projected regional irrigation demands, and *Table 2.8* present the projected irrigation water demands by county for Region K.

**Figure 2.6: Lower Colorado Region Irrigation Water Demand Projections**

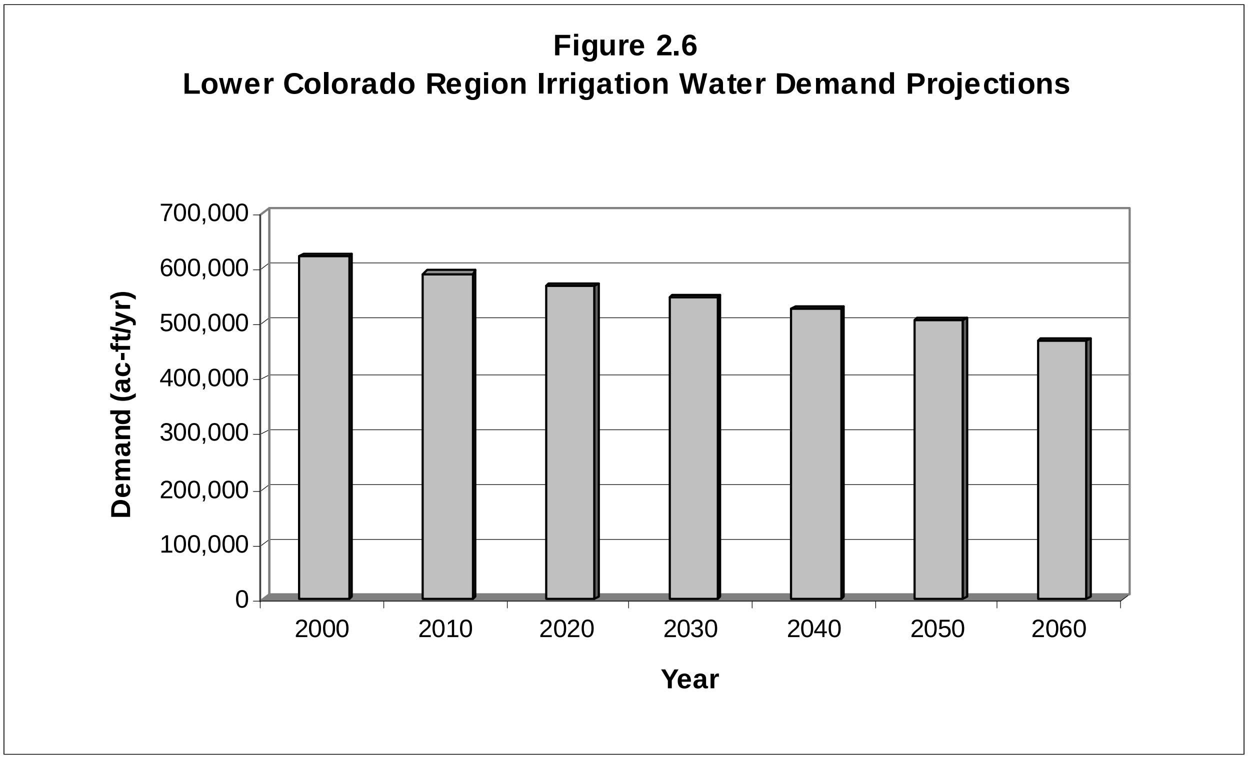



**Table 2.8 Irrigation Water Demand Projections by County (ac-ft/yr)**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 1,846 | 1,610 | 1,407 | 1,226 | 1,072 | 934 | 814 |
| Blanco | 73 | 69 | 66 | 62 | 58 | 56 | 55 |
| Burnet | 103 | 101 | 100 | 98 | 96 | 95 | 93 |
| Colorado | 210,242 | 200,822 | 192,465 | 184,380 | 176,555 | 168,946 | 161,663 |
| Fayette | 789 | 739 | 692 | 648 | 606 | 568 | 533 |
| Gillespie | 2,065 | 2,039 | 2,013 | 1,987 | 1,960 | 1,936 | 1,912 |
| Hays (p) | 12 | 11 | 11 | 11 | 11 | 11 | 11 |
| Llano | 995 | 979 | 963 | 946 | 930 | 915 | 900 |
| Matagorda | 205,990 | 193,048 | 186,072 | 179,353 | 172,916 | 166,722 | 160,750 |
| Mills | 3,001 | 2,936 | 2,872 | 2,810 | 2,749 | 2,689 | 2,631 |
| San Saba | 3,349 | 3,240 | 3,136 | 3,035 | 2,937 | 2,841 | 2,749 |
| Travis | 1,224 | 1,126 | 1,034 | 951 | 875 | 805 | 741 |
| Wharton (p) | 191,241 | 182,985 | 176,441 | 170,127 | 164,044 | 158,177 | 135,911 |
| Williamson (p) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **620,930** | **589,705** | **567,272** | **545,634** | **524,809** | **504,695** | **468,763** |

(p) Denotes that only the portion of the county in Region K was considered.

* Irrigation water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in Region K are provided in *Appendix 2A.*

Because irrigation water demand is concentrated in Region K's lower three counties, projected demand is greatest in the Brazos-Colorado and Colorado-Lavaca Coastal Basins. The Colorado and Lavaca River Basins also constitute a significant portion of irrigation water demand. *Table 2.9* presents these projected irrigation water demands for Region K.

**Table 2.9 Irrigation Water Demand Projections by River Basin (ac-ft/yr)**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 432 | 412 | 394 | 377 | 361 | 348 | 334 |
| Brazos-Colorado | 259,052 | 245,871 | 236,718 | 227,888 | 219,390 | 211,181 | 194,231 |
| Colorado | 107,473 | 102,527 | 98,613 | 94,848 | 91,239 | 87,767 | 79,746 |
| Colorado-Lavaca | 129,739 | 122,234 | 117,830 | 113,585 | 109,511 | 105,591 | 98,950 |
| Guadalupe | 151 | 139 | 128 | 119 | 110 | 101 | 94 |
| Lavaca | 124,083 | 118,522 | 113,589 | 108,817 | 107,198 | 99,707 | 95,408 |
| **TOTAL** | **620,930** | **589,705** | **567,272** | **545,634** | **524,809** | **504,695** | **468,763** |

### 2.3.4 Steam-Electric Water Demand Projections

#### *2.3.4.1 Methodology*

For the steam-electric water demands, the TWDB provided information and alternative projections from a recent study by the University of Texas Bureau of Economic Geology[1]. TWDB allowed Region K to choose whether to use these projections or select other projections for submittal to TWDB. The Region K Population and Water Demand Committee evaluated and considered the recent report-generated demands, but determined that some of the numbers were below actual current and projected usage of existing facilities in the planning area. The committee decided to use the Region K Planning Group members' knowledge of usage in this category to determine updates to the steam-electric water demands. Projected demands for Navasota Energy in Wharton County (2,300 ac-ft/yr) and the current proposed White Stallion facility in Matagorda County (30,000 ac-ft/yr) were subsequently added as new demands in this category. In May 2009, Region K approved the updated steam-electric water demands for submittal to the TWDB.

#### *2.3.4.2 Regional Steam-Electric Water Demand Projections*

Steam-electric water demand is projected to increase from 103,875 ac-ft/yr in the year 2000 to 270,732 ac-ft/yr in the year 2060. Of the 14 counties in Region K, only Bastrop, Fayette, Llano, Matagorda, Travis, and Wharton Counties have or are projected to have any steam-electric water demand. *Figure 2.7* presents the projected regional steam-electric demands and *Table 2.10* present the projected steam-electric water demand by county for each county in Region K.

[1] *Water Demand Projections for Power Generation in Texas*

**Figure 2.7: Lower Colorado Region Steam Electric Water Demand Projections**

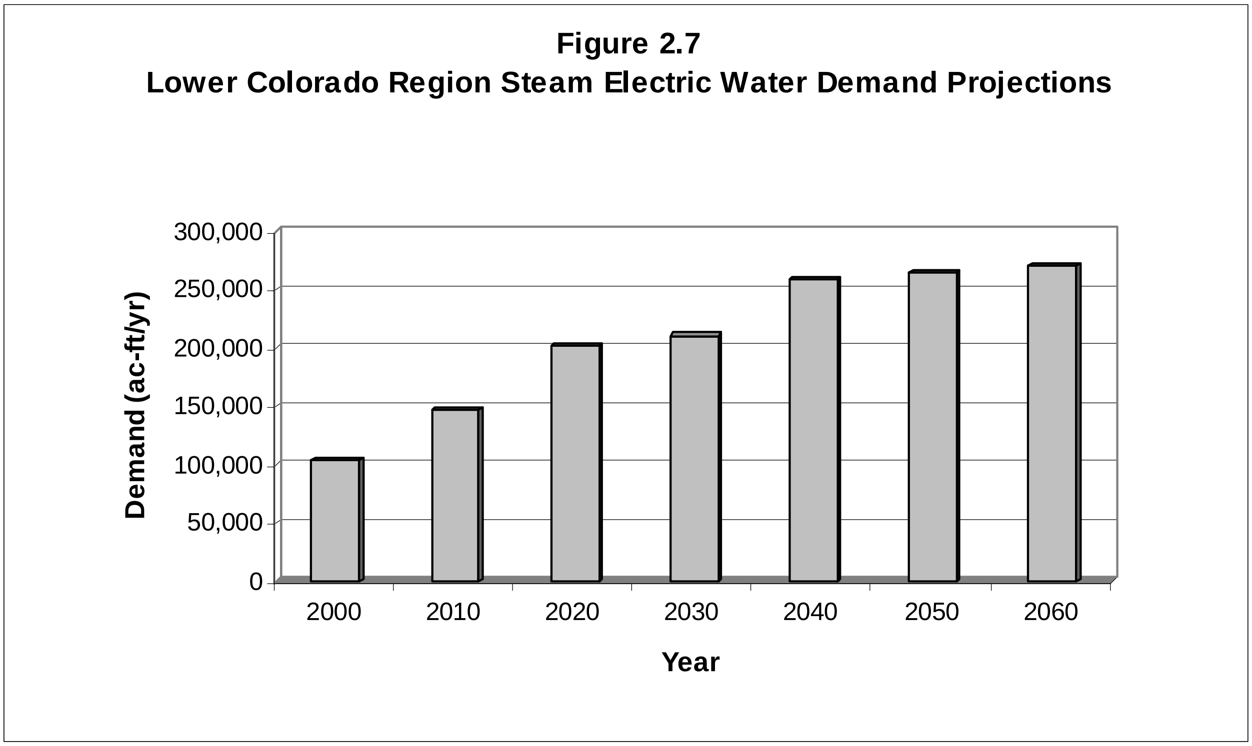



**Table 2.10 Steam-Electric Water Demand Projections by County (ac-ft/yr)**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 7,846 | 12,000 | 14,000 | 16,000 | 18,000 | 19,500 | 19,500 |
| Blanco | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Burnet | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Colorado | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fayette | 21,306 | 29,622 | 29,702 | 33,002 | 63,843 | 63,843 | 69,753 |
| Gillespie | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hays (p) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Llano | 1,271 | 1,500 | 1500 | 1500 | 15,000 | 15,000 | 15,000 |
| Matagorda | 65,948 | 83,000 | 135,000 | 135,000 | 135,000 | 135,000 | 135,000 |
| Mills | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Saba | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Travis | 7,494 | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| Wharton (p) | 10 | 2,545 | 2,651 | 2,711 | 2,783 | 2,872 | 2,979 |
| Williamson (p) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **103,875** | **146,167** | **201,353** | **210,713** | **258,126** | **263,715** | **270,732** |

(p) Denotes that only the portion of the county in Region K was considered.

* Steam-electric water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in Region K are provided in *Appendix 2A.*

The majority of Region K's steam-electric power generation facilities are located along the Colorado River, and all but one of the projected steam-electric water demand are located within the Colorado River Basin. *Table 2.11* shows the projected steam-electric water demand by basin.

**Table 2.11 Steam-Electric Water Demand Projections by River Basin (ac-ft/yr)**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brazos-Colorado | 10 | 245 | 351 | 411 | 483 | 572 | 679 |
| Colorado | 103,865 | 145,922 | 201,002 | 210,302 | 257,643 | 263,143 | 270,053 |
| Colorado-Lavaca | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Guadalupe | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lavaca | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **103,875** | **146,167** | **201,353** | **210,713** | **258,126** | **263,715** | **270,732** |

### 2.3.5 Mining Water Demand Projections

#### *2.3.5.1 Methodology*

TWDB mining water usage projections were developed based on projected future production levels by mineral category and expected water use rates. These production projections were derived from state and national historic rates and were constrained by accessible mineral reserves in each region. TWDB's mining water demand projections were used except where more effective and current information was available.

#### *2.3.5.2 Regional Mining Water Demand Projections*

Mining water demand for Region K is projected to experience a 5,000 ac-ft increase in Bastrop County for the Alcoa Three Oaks Mine in 2010, which is expected to close before 2040. Without the Three Oaks Mine, the overall mining water demand increases slightly from 2000 through 2060. *Figure 2.8* presents the total projected regional mining water demand, and *Table 2.12* presents the projected mining water demand by county for each county in Region K.

Mining water demand in Region K is predominately in the Colorado River Basin. *Table 2.13* presents these demands by river basin for Region K.

**Figure 2.8: Lower Colorado Region Mining Water Demand Projections**

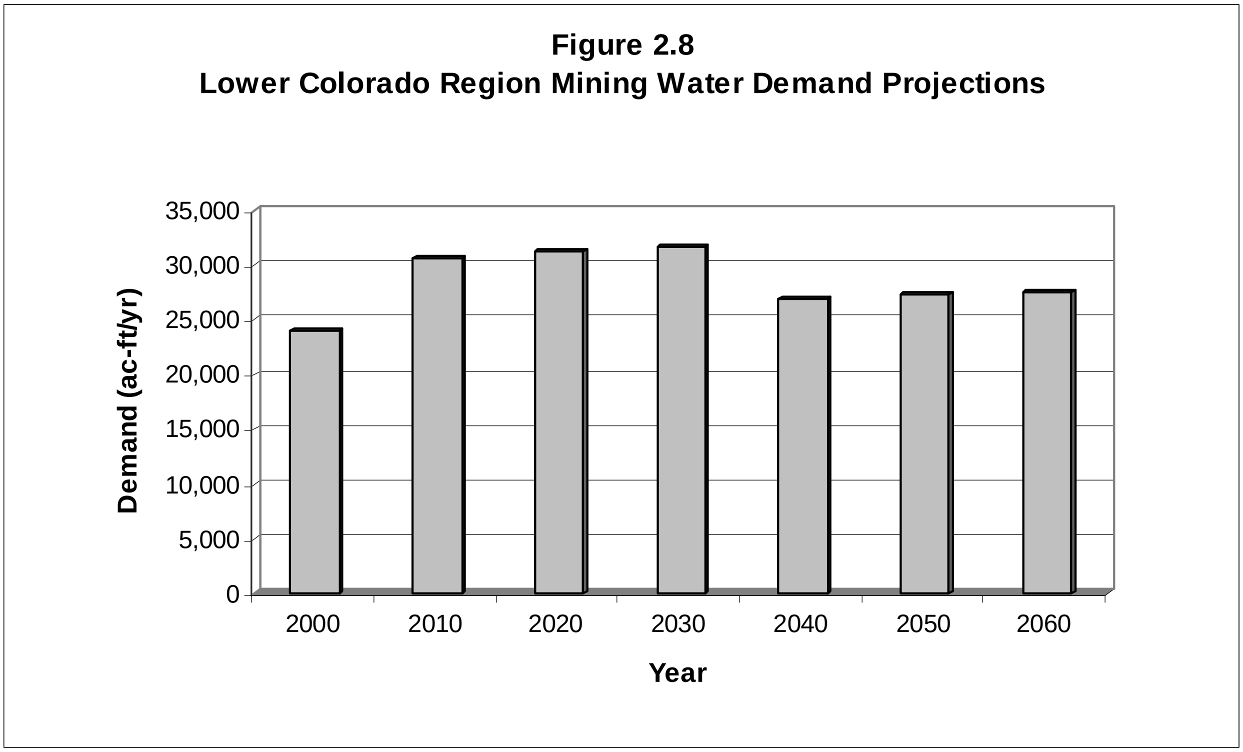



**Table 2.12 Mining Water Demand Projections by County**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 28 | 5,033 | 5,035 | 5,036 | 37 | 38 | 39 |
| Blanco | 6 | 5 | 5 | 5 | 5 | 5 | 5 |
| Burnet | 1,725 | 1,956 | 2,049 | 2,098 | 2,145 | 2,190 | 2,235 |
| Colorado | 19,674 | 20,804 | 21,197 | 21,416 | 21,623 | 21,821 | 21,996 |
| Fayette | 43 | 42 | 42 | 42 | 42 | 42 | 42 |
| Gillespie | 9 | 8 | 8 | 8 | 8 | 8 | 8 |
| Hays (p) | 18 | 12 | 6 | 2 | 0 | 0 | 0 |
| Llano | 152 | 149 | 148 | 148 | 148 | 148 | 148 |
| Matagorda | 196 | 177 | 172 | 169 | 167 | 165 | 163 |
| Mills | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Saba | 163 | 163 | 163 | 163 | 163 | 163 | 163 |
| Travis | 1,285 | 1,531 | 1,649 | 1,727 | 1,804 | 1,880 | 1,935 |
| Wharton (p) | 633 | 731 | 773 | 798 | 822 | 844 | 864 |
| Williamson (p) | 13 | 9 | 5 | 1 | 0 | 0 | 0 |
| **TOTAL** | **23,945** | **30,620** | **31,252** | **31,613** | **26,964** | **27,304** | **27,598** |

(p) Denotes that only the portion of the county in the Region K was considered.
* Mining water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in Region K are provided in *Appendix 2A.*

**Table 2.13 Mining Water Demand Projections by River Basin (ac-ft/yr)**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 105 | 109 | 107 | 106 | 107 | 109 | 110 |
| Brazos-Colorado | 746 | 848 | 893 | 919 | 944 | 966 | 987 |
| Colorado | 21,251 | 27,742 | 28,303 | 28,623 | 23,933 | 24,234 | 24,493 |
| Colorado-Lavaca | 195 | 178 | 173 | 170 | 168 | 167 | 165 |
| Guadalupe | 13 | 14 | 15 | 15 | 15 | 15 | 15 |
| Lavaca | 1,635 | 1,729 | 1,761 | 1,780 | 1,797 | 1,813 | 1,828 |
| **TOTAL** | **23,945** | **30,620** | **31,252** | **31,613** | **26,964** | **27,304** | **27,598** |

## 2.3.6 Livestock Water Demand Projections

### *2.3.6.1 Methodology*

For all 14 counties in Region K, the livestock water use projections developed by TWDB were used as the default projections. These projections were developed using Texas Agricultural Statistics Service projections of number of livestock by type and county and Texas Agricultural Extension Service estimates of water use rates by type of livestock.

### *2.3.6.2 Regional Livestock Water Demand Projections*

Livestock water demand for Region K represents approximately 1.0 percent of the total regional water demand. Livestock water demand is projected to remain constant over the 50-year planning period. This constant projected demand of 13,395 ac-ft is approximately 20 percent less than the value reported by TWDB for 1996. *Figure 2.9* presents the total projected regional livestock water demands, and *Table 2.14* presents the projected livestock water demand by county for each of the 14 counties in Region K.

**Figure 2.9: Lower Colorado Region Livestock Water Demand Projections**

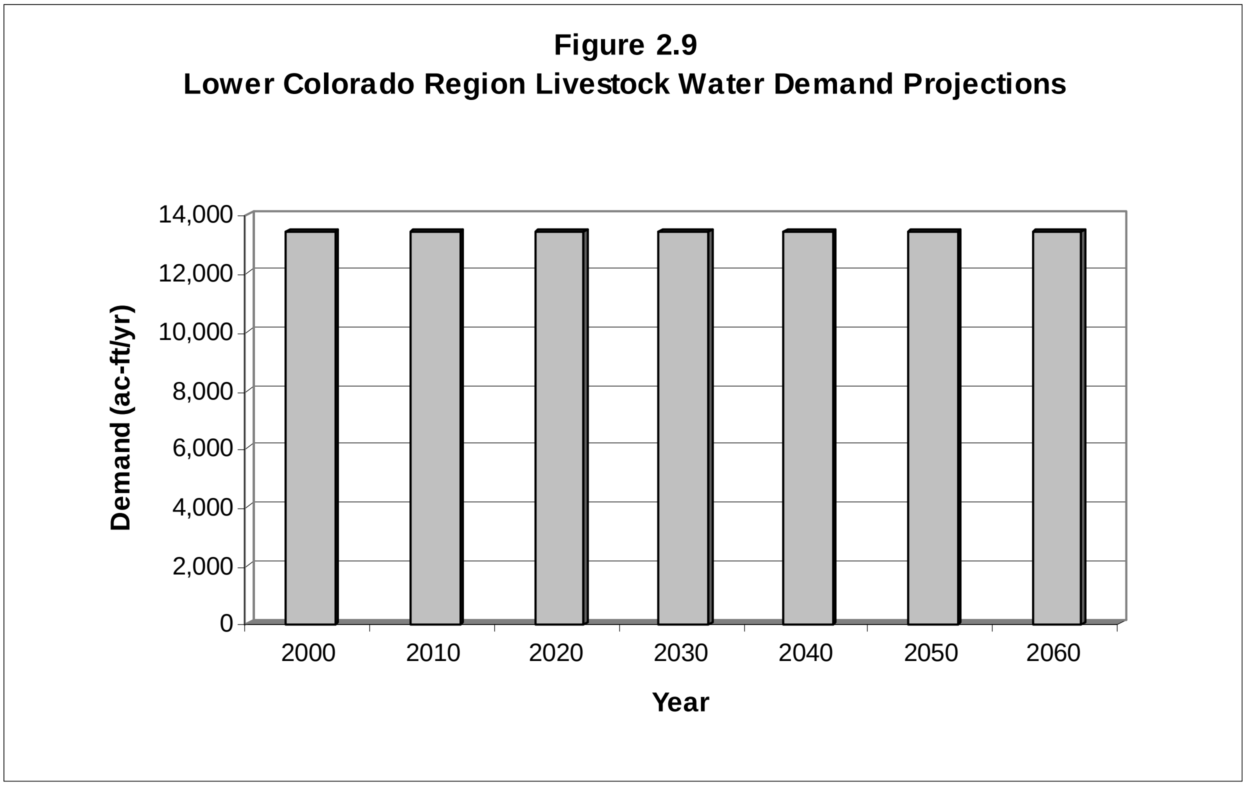



**Table 2.14 Livestock Water Demand Projections by County (ac-ft/yr)**

| County | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 |
| Blanco | 443 | 443 | 443 | 443 | 443 | 443 | 443 |
| Burnet | 835 | 835 | 835 | 835 | 835 | 835 | 835 |
| Colorado | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 |
| Fayette | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 |
| Gillespie | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 |
| Hays (p) | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Llano | 751 | 751 | 751 | 751 | 751 | 751 | 751 |
| Matagorda | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 |
| Mills | 918 | 918 | 918 | 918 | 918 | 918 | 918 |
| San Saba | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 |
| Travis | 704 | 704 | 704 | 704 | 704 | 704 | 704 |
| Wharton (p) | 728 | 728 | 728 | 728 | 728 | 728 | 728 |
| Williamson (p) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **13,395** | **13,395** | **13,395** | **13,395** | **13,395** | **13,395** | **13,395** |

(p) Denotes that only the portion of the county in Region K was considered.

* Livestock water demand projections by city, county, and portion of a river basin within a county for each of the 14 counties in Region K are provided in *Appendix 2A.*

Livestock water demand in Region K is located predominately in the Colorado River Basin. *Table 2.15* presents these demands by river basin for Region K.

**Table 2.15 Livestock Water Demand Projections by River Basin (ac-ft/yr)**

| River Basin | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Brazos | 1,059 | 1,059 | 1,059 | 1,059 | 1,059 | 1,059 | 1,059 |
| Brazos-Colorado | 953 | 953 | 953 | 953 | 953 | 953 | 953 |
| Colorado | 9,455 | 9,455 | 9,455 | 9,455 | 9,455 | 9,455 | 9,455 |
| Colorado-Lavaca | 646 | 646 | 646 | 646 | 646 | 646 | 646 |
| Guadalupe | 356 | 356 | 356 | 356 | 356 | 356 | 356 |
| Lavaca | 926 | 926 | 926 | 926 | 926 | 926 | 926 |
| **TOTAL** | **13,395** | **13,395** | **13,395** | **13,395** | **13,395** | **13,395** | **13,395** |

## 2.4 ENVIRONMENTAL WATER DEMANDS

A use category that is recognized by the LCRWPG is environmental water demands. These demands are considered necessary to preserve the aquatic ecosystem within the region. In particular, planning for and meeting environmental water demands have been determined necessary to protect the habitat associated with the Lower Colorado River and Matagorda Bay.

### 2.4.1 The Story/History of Matagorda Bay [2, 3, 4, 5, 6]

Matagorda Bay has an interesting and varied history. The earliest map that contained the Texas Gulf Coast was by Alonzo Alvarez de Pineda in 1513. The next explorer was probably Cabeza de Vaca in 1528 followed by Don Luis de Moscoso de Alverado in 1542. The ill fated LaSalle expedition in 1685 resulted in an active renewal of interest by the Spanish government. In a subsequent expedition by Alonzo de Leon in 1689, the first recorded description of the "Raft" in the Colorado River was described, refer to *Figure 2.10* for a map of Matagorda Bay in 1705.

The raft was a vast accumulation of drift logs, snags, whole trees, and brush in sections miles in length and 40 to 50 feet thick growing at a rate of about 500 feet per year. In the years after the establishment of Matagorda by Stephen F. Austin's initial colony (Austin 300) the raft continued to grow, refer to *Figure 2.11* for a map of Austin's Colony and Matagorda Bay. The U.S. Army Corps of Engineers (USACE) was enrolled to clear the raft to enable river navigation from Matagorda, the number two port in Texas, inland to central Texas. In 1853 the decision was made to bypass the raft by digging a canal parallel to the river. This allowed riverboat traffic for about six years, but by 1860 the growing raft again prevented navigation. The intervention of the civil war prevented any additional work on the raft. While the periodic floods had always been a problem, the restoration of the raft, which grew to an estimated 40 miles in length and extended into Wharton County, greatly exacerbated flooding damage.

In 1923 Governor Pat Neff approved legislation that resulted in the retaining of General George W. Goethus, who built the Panama Canal. His plan was to clear a path along the East Bank, removing key

[2] *Bay City and Matagorda County – A History*, Pages 4, 8, 16, 165, 166
[3] *Corralling the Colorado*, Page 7
[4] *Historic Matagorda County*, Pages 135, 139
[5] Originally authored by Haskell Simon, Vice Chairman Region K, modified for this report
[6] Additional information from *Flood to Faucet* and interviews with Earl Eidelbach, LCRA from *The Daily Tribune*

logs and allowing the force of the river to clear the raft. Not much was accomplished until a major flood came in 1929. In one massive flushing action the huge mass was washed into Matagorda Bay.

The delta formed by this enormous conglomeration of sediment and debris that had been washed into Matagorda Bay and continued to grow outward into the Bay until it connected the mainland to Matagorda Peninsula, forming a five mile long land bridge, land locking the Seaport of Matagorda and dividing Matagorda Bay into East Matagorda Bay and West Matagorda Bay.

In 1935 the Drainage District cut a channel through the peninsula connecting the Colorado River to the Gulf of Mexico. This caused most of the natural flow of the river to go directly into the Gulf of Mexico, refer to *Figure 2.12* for a map of the development of the Colorado River Delta.

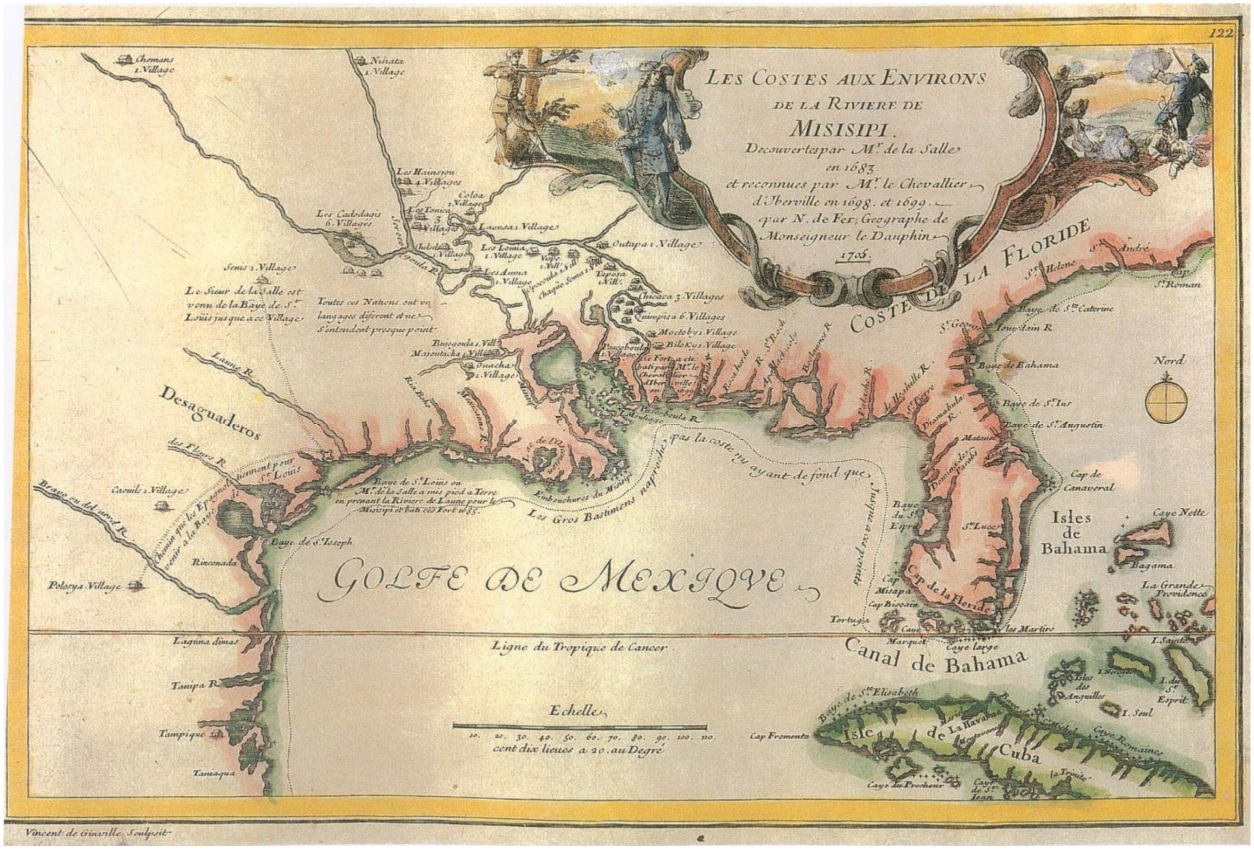
In 1990 the USACE agreed to the next major alteration affecting Matagorda Bay. In order to construct a jetty system at the mouth of the Colorado River in the Gulf of Mexico, a diversion channel was added to the overall design as recommended by the resource agencies. This would divert essentially 100 percent of the river flow into the east end of West Matagorda Bay. This project was completed in 1991. The USACE also closed Parker's Cut (Tiger Island Cut), the channel connecting the Colorado River to West Matagorda Bay, refer to *Figures 2.13* and *2.14*.

Recently, efforts were made to reopen Parker's Cut to accommodate recreational fishing by shortening travel time to the fishing areas. The resource agencies oppose the reopening believing it would be detrimental to fisheries production. Finally a compromise was reached that would open a channel into the Bay just North of the diversion dam. This would allow access to the Bay without going through the locks, but with minimal diversion of freshwater.

In less than 75 years major alterations have been made that dramatically and dynamically changed the characteristics of the Bay. The river flow into Matagorda Bay was reduced significantly, and then it was back to almost 100 percent discharge into West Matagorda Bay by the early 1990s. There are other sources that contribute to the freshwater inflows of Matagorda Bay in addition to the contributions by the Colorado River, but these flows have not been measured and are occasionally overlooked.

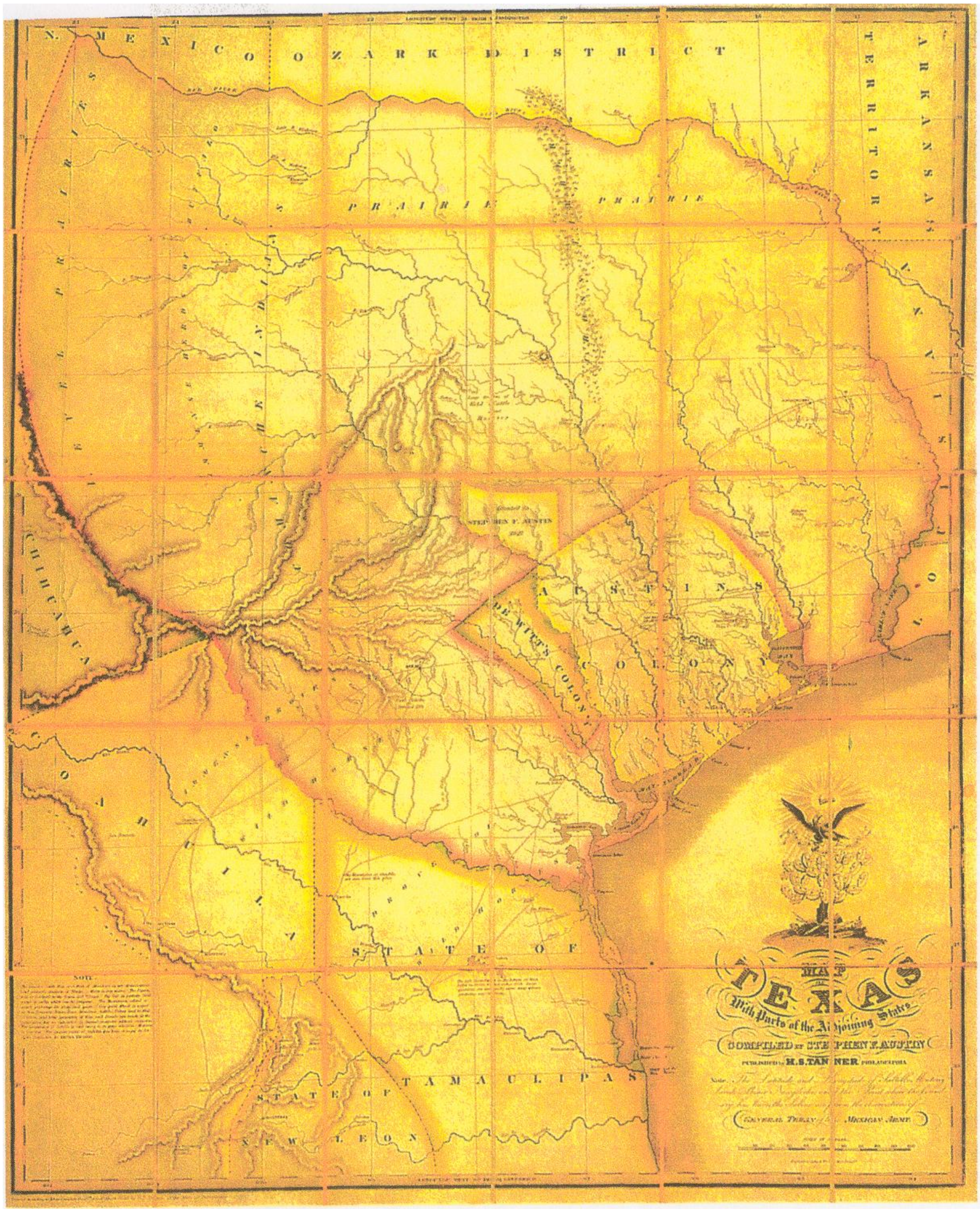
It is difficult to determine the effect of these changes on the Bay's performance. Most entities seem to agree that short-term analysis or comparisons will not yield significant "cause and effects." Certainly with the major changes in the geography and hydrology of the Bay, it is questionable how useful older data may be. One thing is certain; Matagorda Bay, unlike other Texas Bays, has seen major changes in the last 75 years.

**Figure 2.10: Matagorda Bay in 1705**



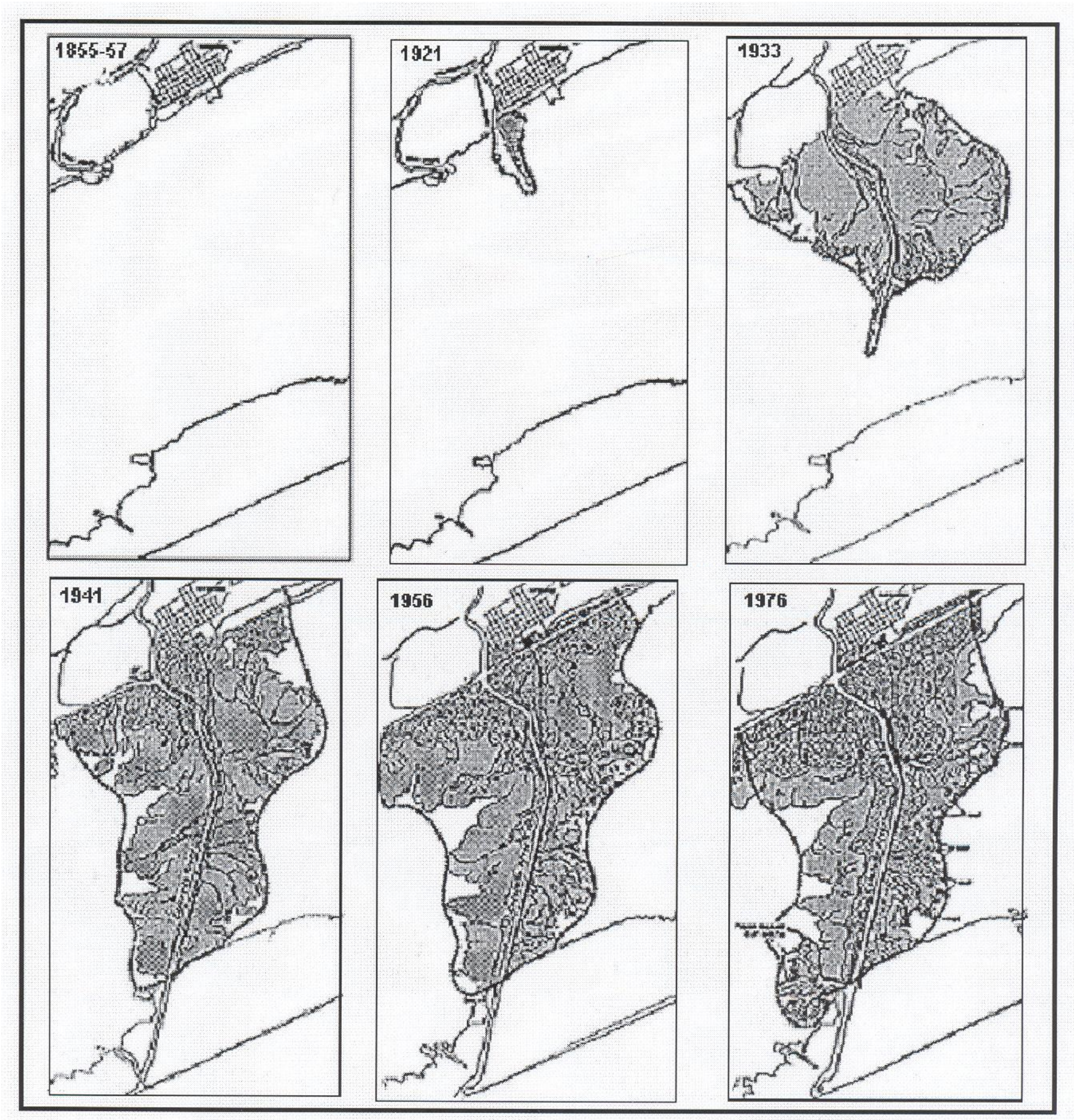

Nicolas de Fer 1705 – Collection of F. Carrington Weems Houston, Texas as shown in *Maps of Texas and the Southwest 1513-1900* by James C. Martin and Robert Sidney Martin, Page 49.

**Figure 2.11: Austin's Colony and Matagorda Bay**



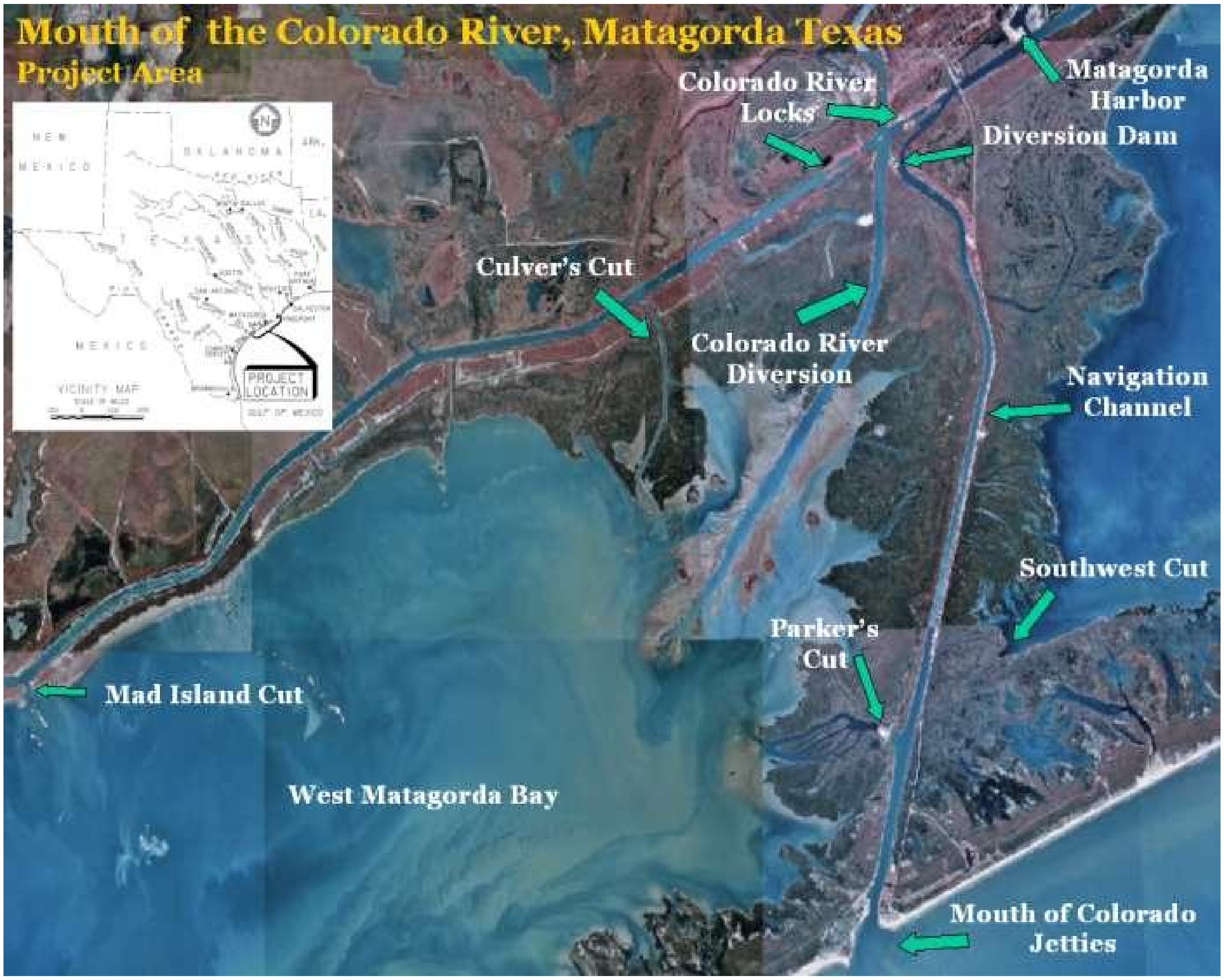

Stephen F. Austin, 1830 – The San Jacinto Museum of History as shown in *Maps of Texas and the Southwest 1513-1900* by James C. Martin and Robert Sidney Martin, Page 52.

**Figure 2.12: Development of Colorado River Delta**



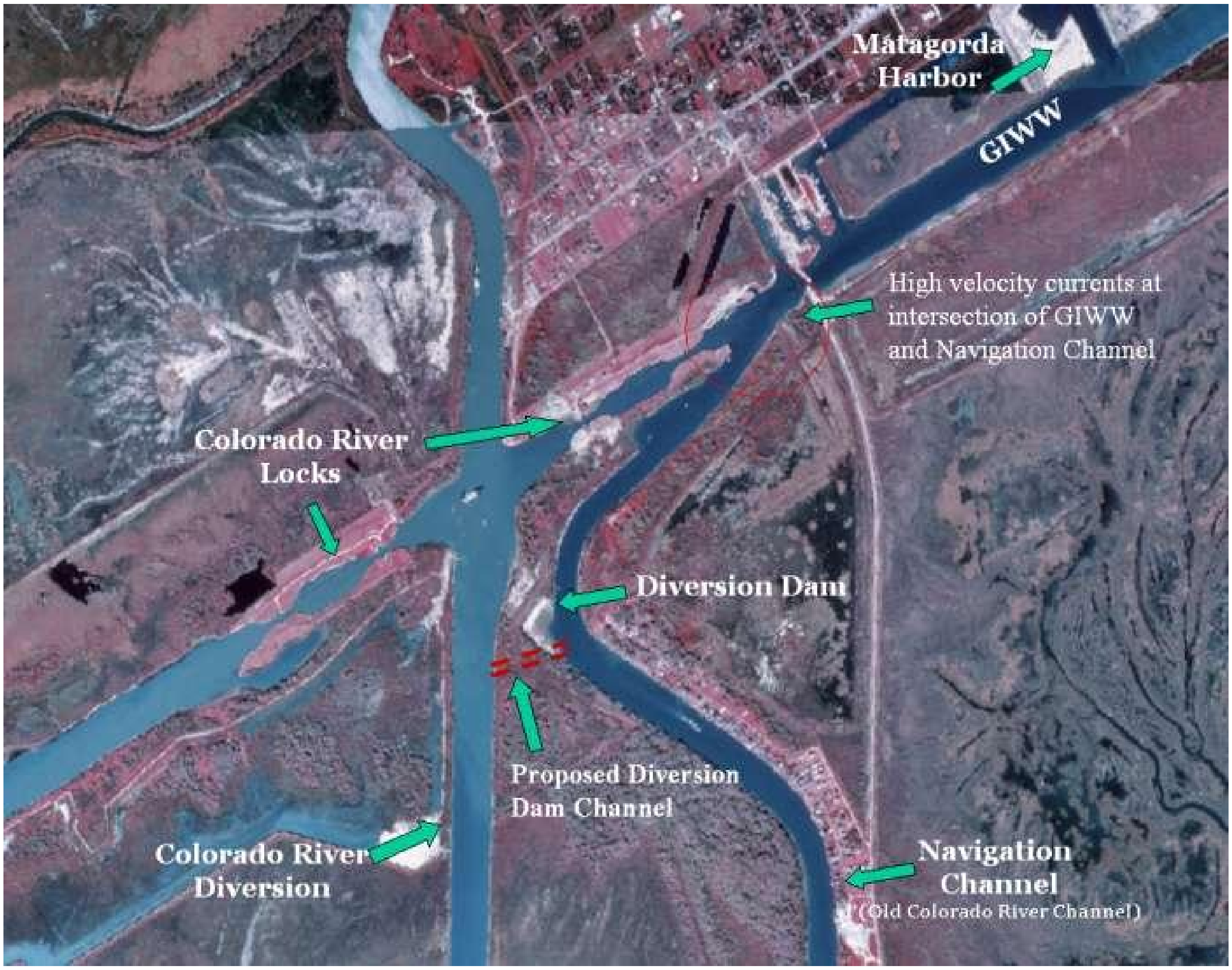

Delta Development – Mouth of Colorado River Project Assessment Report Coastal Technology Corporation (Adapted from USGS, Tobin & Kargl)

**Figure 2.13: Mouth of the Colorado River, Matagorda Texas**




USACE Galveston District webpage:
http://www.swg.usace.army.mil/items/ColoradoRiver/MOC.asp

**Figure 2.14: Colorado River Diversion Channel and Navigation Channel**




USACE Galveston District webpage:
http://www.swg.usace.army.mil/items/ColoradoRiver/MOC.asp

### 2.4.2 Current Instream Flow Requirements for the Colorado River[7]

The LCRWPG does not have the resources to perform the studies to determine appropriate instream flow requirements for the Colorado River. Therefore, data that has been previously developed by the LCRA is presented here.

LCRA operates under a Water Management Plan (WMP) that defines its water management programs and policies. The WMP is developed by LCRA, reviewed and approved by TCEQ, and has evolved over the years in response to changing conditions and new information.

LCRA completed an analysis of instream flow needs for the Colorado River in June 1992. Based on those studies, LCRA generated instream flow recommendations for critical and target flows.

Critical flow requirements are those necessary to maintain species population during severe drought conditions. From the LCRA analysis, it is recommended that a flow of at least 46 cfs be maintained at the Austin gage at all times. If this flow should occur for an extended period of time, then operational releases will be made by LCRA to temporarily alleviate these low flow conditions. Specifically, if flow at the Austin gage is less than 65 cfs daily average for 21 consecutive days, the LCRA will make operational releases from storage sufficient to maintain daily average flow at the Austin gage of at least 200 cfs for two consecutive days. If this operational release condition persists for three consecutive cycles (69 days), then a minimum average daily flow of at least 75 cfs will be maintained for the next 30 days. A mean daily flow of 100 cfs is also maintained at the Austin gage to the extent of inflows to Lakes Buchanan and Travis, except during times of drought, when a minimum mean daily flow of 75 cfs is maintained to the extent inflows are available. In addition to the flow requirements at the Austin gage, a mean daily discharge of 120 cfs will be maintained at the Bastrop gage. This minimum flow will be maintained in order to provide adequate water quality conditions in the Colorado River. During a six-week period within the months of March, April, and May, a minimum flow of 500 cfs will be maintained at the Bastrop gage.

Target flows, provided on a mean daily basis, are those necessary to provide an optimal range of habitat complexity for the support of a well-balanced native aquatic community. These flow regimes (described in *Table 2.16*) are considered optimal ranges and should be maintained whenever water resources are adequate. However, these flows should be classified as interruptible demand subject to curtailment during drought conditions. Since native fish species are adapted to normal seasonal variations in flow regimes, target flows were adjusted monthly to emulate the annual cycle.

In addition to critical and target flow requirements, periodic high flow conditions (or scouring flood flows) are needed to prevent siltation and dense macrophytic growth from occurring in the Colorado River.

New instream flow studies have recently been concluded on the Colorado River below Austin as a part of the LCRA-SAWS Water Project (LSWP)[8]. The approach for these studies is consistent with the Texas Instream Flow Program (TIFP) objectives to conserve biodiversity and maintain biological integrity, the project team followed the recommendations of the National Research Council (2005) which has subsequently been endorsed by the TIFP (TIFP Draft 2006). The integration process involves four

[7]Taken from information provided by the LCRA.
[8] For further description of the LSWP and its current status, please see Chapter 4

components of the hydrologic regime: subsistence flows, base flows, high flow pulses, and overbank flows. Although these studies have been completed they have not been incorporated into or applied in any pending permitting action of the TCEQ. So, for this round of planning Region K will continue to use the instream flows from LCRA's 1999 WMP as its default criteria.

Total commitments of the Combined Firm Yield from the Highland Lakes for instream flow maintenance will be an average of 12,800 ac-ft/yr, with a maximum of 36,720 ac-ft in any one year; 58,700 ac-ft in any two consecutive years; 76,800 ac-ft in any three or four consecutive years; 106,100 ac-ft in any 5 consecutive years, and 128,600 ac-ft in any 6 to 10 consecutive years.

**Table 2.16 Instream Flow Requirements for the Colorado River**

| Month | Critical Flows (cfs) | | Target Flows (cfs) | | |
|---|---|---|---|---|---|
| | Austin Gage [c] | Bastrop Gage | Bastrop Gage | Eagle Lake | Egypt |
| January | 46 | 120 | 370 | 300 | 240 |
| February | 46 | 120 | 430 | 340 | 280 |
| March | 46 | 500 [b] | 560 | 500 [a] | 360 |
| April | 46 | 500 [b] | 600 | 500 [a] | 390 |
| May | 46 | 500 [b] | 1,030 | 820 | 670 |
| June | 46 | 120 | 830 | 660 | 540 |
| July | 46 | 120 | 370 | 300 | 240 |
| August | 46 | 120 | 240 | 200 | 160 |
| September | 46 | 120 | 400 | 320 | 260 |
| October | 46 | 120 | 470 | 380 | 310 |
| November | 46 | 120 | 370 | 290 | 240 |
| December | 46 | 120 | 340 | 270 | 220 |

Source: LCRA, March 1999, *Water Management Plan*.

[a] Since target flow at Eagle Lake (based on overall community habitat availability) were insufficient to meet Blue Sucker (Cycleptus elongatus) spawning requirements during March and April, target flows were superseded by critical flow recommendations for this reach.

[b] This flow should be maintained for a continuous period of not less than six weeks during these months. A flow of 120 cfs will be maintained on all days not within the six week period.

[c] LCRA will maintain a mean daily flow of 100 cfs at the Austin gage at all times, to the extent of inflows each day to the Highland Lakes as measured by upstream gages, until the combined storage of Lakes Buchanan and Travis reaches 1.1 million acre-feet of water. A mean daily flow of 75 cfs, to the extent of inflows each day to the Highland Lakes as measured by upstream gages, will then be maintained until the combined storage of Lakes Buchanan and Travis reaches 1.0 million acre-feet of water, then a subsistence/critical flow of 46 cfs will be maintained at all times, regardless of inflows.

In addition, if the subsistence/critical flow of 46 cfs should occur for an extended period of time, then operational releases will be made by LCRA to temporarily alleviate the subsistence/critical flow conditions. Specifically, should the flow at the Austin gage be below a 65 cfs daily average for a period of 21 consecutive days, LCRA will make operational releases from storage sufficient to maintain daily average flow at the Austin gage of at least 200 cfs for two consecutive days. If this operational release conditions persists for three consecutive cycles (69 days), then a minimum average daily flow of at least 75 cfs will be maintained for the next 30 days.

### 2.4.3 Current Bay and Estuary Requirements

The LCRWPG does not have the resources to perform the studies to determine appropriate freshwater inflow needs requirements for the Colorado-Lavaca estuary. Therefore, we present data that has been developed by LCRA and the state resource agencies, TPWD, TWDB, and TCEQ.

The Colorado-Lavaca estuary is the second largest estuary on the Texas Gulf Coast. This estuary, also known as the Matagorda Bay system, covers 352 sq mi. While Matagorda Bay is the largest body of water, other major bays in the estuary system are Lavaca, East Matagorda, Keller, Carancahua, and Tres Palacios Bay.

In 1985 the Texas Legislature directed TPWD and TWDB to continue studies of the estuaries to determine freshwater inflow requirements to be considered in the allocation of the State's water resources. These studies were to have been completed by December 31, 1989. However, due to a lack of funding, changes in priorities, and other factors, they have been delayed. To expedite the completion of this study, LCRA entered into a cooperative agreement with TPWD, TWDB, and TNRCC (now TCEQ) in 1993. The LCRA agreed to modify existing methods used by TPWD and TWDB and to apply those methods to compute alternative freshwater needs for the estuary. This study is currently being updated again and should be completed mid-2005 (see Section 2.4.4 for more information).

The freshwater inflow needs were estimated by a methodology developed in conjunction with the TPWD and TWDB, and is similar to methodologies used for other Texas estuaries. The first major element in this process is the development of statistical relationships for the interactions between freshwater inflows and important indicators of estuarine ecosystem conditions. The parameters that were considered in this analysis are: salinity, species productivity, and nutrient inflows. The next major step in this process involves using the statistical functions to compute optimal monthly and seasonal freshwater inflow needs. This is accomplished using TWDB's Texas Estuarine Mathematical Programming (TxEMP) Model. The TxEMP model estimates the freshwater inflow needs of an estuary by representing mathematically the varied and complex interactions between freshwater inflows and salinity, species productivity, and nutrient inflows. The third major element in the process of developing inflow needs is the simulation of the salinity conditions throughout the estuary using the TxBLEND model developed by TWDB and modified by the LCRA. The application of the TWDB methodology and the resulting estimates of freshwater inflow needs are documented in "Freshwater Inflow Needs of the Matagorda Bay System" (LCRA 1997).

The freshwater inflow needs for the estuarine ecosystem associated with the Matagorda Bay system were estimated for two levels: target and critical. Target inflow needs were determined as the monthly and seasonal inflows that produced 98 percent of the maximum normalized population biomass for nine key estuarine finfish and shellfish species while maintaining specified salinity, population density, and nutrient inflow conditions. The critical inflow needs were determined by finding the minimum total annual inflow needed to keep salinity at or below 25 parts per thousand near the mouths of the Colorado and Lavaca Rivers. These inflow needs are termed critical since they provide a fishery sanctuary habitat during droughts.

Results of the 1997 needs analysis indicate that target inflows need to be approximately 2.0 million ac-ft/yr. Of this, it is estimated that the Colorado River will need to contribute 1,033,100 ac-ft annually. For critical inflow needs, approximately 171,000 ac-ft of the total required 287,400 ac-ft/yr must come from the Colorado River. A revised freshwater inflow needs study was completed in 2006 and the results of that study indicate higher levels of flow for both critical and target needs. Both the 1997 and the more recent 2006 target and critical monthly freshwater inflow needs from the Colorado River are indicated in *Table 2.17*.

LCRA's total commitments of the Combined Firm Yield from lakes Buchanan and Travis for bays and estuaries (estuarine inflows), reflected for this planning effort include an average of 3,090 ac-ft/yr, with a maximum of 11,200 ac-ft in any one year; 19,700 ac-ft in any two consecutive years; 24,200 ac-ft in any three or four consecutive years; 28,200 ac-ft in any 5 consecutive years, and 30,900 ac-ft in any 6 to 10 consecutive years (LCRA's bay and estuary commitments are in accordance with LCRA's 1999 water management plan).

**Table 2.17 Colorado River Critical and Target Freshwater Inflow Needs for the Matagorda Bay System**

| Month | 1997 FINS Freshwater Inflows (1,000 ac-ft)[1] | | 2006 FINS Freshwater Inflows (1,000 ac-ft)[1] | |
|---|---|---|---|---|
| | Critical | Target | Critical | Target |
| January | 14.26 | 44.1 | 36.0 | 205.6 |
| February | 14.26 | 45.3 | 36 | 194.5 |
| March | 14.26 | 129.1 | 36 | 63.2 |
| April | 14.26 | 150.7 | 36 | 60.4 |
| May | 14.26 | 162.2 | 36 | 255.4 |
| June | 14.26 | 159.3 | 36 | 210.5 |
| July | 14.26 | 107.0 | 36 | 108.4 |
| August | 14.26 | 59.4 | 36 | 62.0 |
| September | 14.26 | 38.8 | 36 | 61.9 |
| October | 14.26 | 47.4 | 36 | 71.3 |
| November | 14.26 | 44.4 | 36 | 66.5 |
| December | 14.26 | 45.2 | 36 | 68.0 |
| Annual Totals | 171 | 1,033 | 432 | 1,428 |

[1] Schedule of flows is designed to optimize biodiversity/productivity under normal rainfall. Under drought conditions, target flows should be curtailed in accordance to the severity of the drought and flows should be maintained at or above critical levels based on water quality considerations.

### 2.4.4 Current Ongoing Environmental Flow Projects and Studies

There are several ongoing studies, workgroups, and legislative committees, whose findings may affect the way environmental flow needs are met, what those flow requirements will be, and other factors. The LCRWPG offers this section as a tool to water planners and suppliers to forecast future water planning and to meet environmental water needs. The following items are all in progress. They will conclude close to or after the end of this planning cycle.

- LCRA Water Management Plan
- The LCRA-SAWS Water Project Scientific Studies
- Environmental Flows Advisory Group
- Pending Large Water Rights Permits
- Colorado-Brazos Contribution

**LCRA Water Management Plan**

LCRA currently operates the lower Colorado River under provisions of the 1999 WMP. This plan is approved by TCEQ as a condition of the LCRA's water rights for Lakes Buchanan and Travis, the two major water supply reservoirs in the Highland Lakes. Recommended amendments to the plan were developed through a stakeholder process that began in early 2001. The updated WMP will provide additional water for maintaining freshwater inflows to Matagorda Bay.

General information and a copy of the recommended updates can be found on the LCRA's website at http://www.lcra.org/water/wmp.html.

**The LCRA-SAWS Water Project (LSWP) Scientific Studies**

LCRA and the San Antonio Water System (SAWS) have undertaken the study of the LSWP's (see Chapter 4 for a further description and status of this project) water supply potential, construction and operational costs, and environmental effects. During this study period, the proposal was re-examined, refined with current information, examined with public input, and expanded from the levels of previous preliminary studies. This study period started in 2004 and was scheduled for completion in 2010. Annual project viability assessments were conducted each November. The assessments as well as monthly update reports can be found at the project website at: http://www.lcra.org/lswp. At the end of the study period, if LCRA and SAWS determine the project is technically feasible, environmentally sound, and cost effective, the implementation period will follow. For answers to specific questions, contact lcrasawswaterproject@lcra.org.

**Environmental Flows Advisory Group**

The 80th Texas Legislature established the Environmental Flows Advisory Group which is composed of nine members. This group is comprised of three Senate members, three House members and three public members. The public members are representatives of TCEQ, TWDB, and TPWD. This Advisory Group is tasked with balancing the demand placed on the State's water resources by the growing population and the requirements of the riverine, bay, and estuary systems. To assist them, the Advisory Group has formed the Texas Environmental Flows Science Advisory Committee along with Basin and Bay Area Stakeholders Committees. The Advisory Group has recently been for the Colorado and Lavaca Rivers and Matagorda and Lavaca Bays Basin and Bay Area Stakeholder Committee. Additional committee information, updates and activities can be found at TCEQ's website at: http://www.tceq.state.tx.us/permitting/water_supply/water_rights/eflows/group.html

In September 2009, the Texas Environmental Flows Advisory Group appointed members of the Colorado and Lavaca Rivers and Matagorda and Lavaca Bays Stakeholder Committee. The committee will make recommendations to the TCEQ on the quantity of water needed to maintain the health of the named rivers and bays.

**Pending Large Water Rights Permits**

The TCEQ is the State's Water Rights permitting agency. TCEQ's Internet database lists 149 pending water rights applications (as of 7/06/2009) across the state. There are five large-scale pending water rights applications in the lower Colorado Basin area. Each is briefly described below:

Pending Large Water Right Permits (as of 7/06/2009):

1) LCRA Flood Flows Application (#5731):
Application was filed March 31, 1999, was declared administratively complete on February 20, 2001 and public notice was issued August 22, 2001. The application is in the technical review process. LCRA seeks authorization to divert, store and use flood waters up to 853,514 AF/year.

2) LCRA Garwood Application (#14-5434E):
The application was filed August 29, 2002, was declared administratively complete on February 5, 2003 and public notice was issued on May 22, 2003. The application is in the technical review process. LCRA seeks to add diversion locations throughout the basin, including the Highland Lakes, to LCRA's water right, which was formerly owned by the Garwood Irrigation Company. LCRA's Garwood water right is a 133,000 AF/yr water right with a priority date of 1900 and is currently permitted to be diverted in Colorado County, in the agricultural region of the basin.

3) LCRA Water Management Plan (#5838):
The amendment application was filed May 16, 2003, was declared administratively complete and public notice was issued on September 14, 2004. TCEQ staff proposed a draft order on October 15, 2009. Subsequent negotiations have produced a proposed agreed order that is pending approval by TCEQ as of January 6, 2010. The LCRA water management plan defines LCRA's water management programs and policies and charts the manner in which LCRA manages lakes Buchanan and Travis.

4) LCRA Return Flows Application (#14-5478D and 14-5482D):
The application was filed November 12, 2002, was declared administratively complete on March 10, 2003, and public notice was issued on April 30, 2004. The application is in the technical review process. LCRA seeks appropriation of the City of Austin's historical, current, and future return flows.

5) City of Austin Bed and Banks Application (#5779):
The application was filed April 5, 2002, and was declared administratively complete on July 22, 2002, and public notice was issued on August 13, 2003. The application is in the technical review process. The City seeks authorization to transport and reuse up to 103,350 AF/yr of return flows via the bed and banks of the Colorado river to transport water to downstream City of Austin locations for beneficial uses including Austin Energy power plant needs and municipal and industrial needs. The City proposes to use the bed and banks of the River to convey water (like a pipeline). A portion of the return flows (16,350 AF/year) will be dedicated to the State Water Trust with the Texas Parks and Wildlife Department as trustee.

As part of a settlement agreement between Austin and LCRA, the parties intend to seek joint ownership and rights to indirectly reuse return flows, subject to significant environmental flow conditions. No application has yet been filed with TCEQ, but it is expected to replace these pending competing applications.

## 2.5 WHOLESALE WATER PROVIDERS

LCRWPG has two entities designated as "wholesale water providers," the LCRA and the City of Austin (City). The City is also a water customer of the LCRA, and together they supply a large portion of Region K's water needs. This distinction was made to satisfy TWDB guidelines that require each RWPG to identify and designate "wholesale water providers," which is defined by TWDB as an entity "which delivers and sells a significant amount of raw or treated water for municipal and/or manufacturing use on a wholesale and/or retail basis."

The intent of TWDB requirements is to ensure that there is an adequate future supply of water for each entity that receives all or a significant portion of its current water supply from another entity. This requires an analysis of projected water demands and currently available water supplies for the primary supplier, each of its wholesale customers, and all of the suppliers in the aggregate as a "system." For example, a city that serves both retail customers within its corporate limits as well as other nearby public water systems would need to have a supply source(s) that is adequate for the combined total of future retail water sales and future wholesale water sales. If there is a "system" deficit currently or in the future, then recommendations are to be included in the regional water plan with regard to strategies for meeting the "system" deficit.

### 2.5.1 City of Austin

The City of Austin provides water for municipal, manufacturing, and steam-electric water uses. The City's existing service area covers portions of Travis, Williamson, and Hays Counties. *Table 2.18* presents the municipal and manufacturing water demands for the City. These water demands consist of the City's service area water demands and its wholesale water commitments to various communities and retail water systems primarily located within its ETJ. The wholesale commitments represent contract amounts. For a complete list of the City's wholesale water commitments refer to Chapter 3.

**Table 2.18 Projected Municipal and Manufacturing Water Demands for City of Austin service area (ac-ft/yr)**

| County/WUG | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **Hays County** | | | | | | | |
| Wholesale Commitments [1] | 992 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Travis County** | | | | | | | |
| Austin | 126,388 | 150,180 | 179,861 | 212,133 | 241,074 | 271,296 | 293,095 |
| Wholesale Commitments [2] | 25,889 | 12,070 | 5,489 | 3,200 | 3,138 | 3,113 | 3,113 |
| County-Other [3] | 7,403 | 4,477 | 4,649 | 4,243 | 4,104 | 4,268 | 4,656 |
| Manufacturing | 15,102 | 22,309 | 27,601 | 38,149 | 49,790 | 57,010 | 63,959 |
| **Williamson County** | | | | | | | |
| Austin | 2,315 | 5,457 | 7,398 | 9,691 | 12,161 | 14,834 | 17,693 |
| Wholesale Commitments [4] | 8,564 | 983 | 968 | 952 | 928 | 920 | 920 |
| County-Other [5] | 2,123 | 2,401 | 2,729 | 3,118 | 3,536 | 3,989 | 4,469 |
| **Total** | **188,776** | **197,877** | **228,695** | **271,486** | **314,731** | **355,430** | **387,905** |

[1] The wholesale commitments in Hays County include the following WUGs: a portion of Hill Country WSC.

[2] The wholesale commitments in Travis County include the following WUGs: Creedmoor-Maha WSC, Hill Country WSC, Lost Creek MUD, Manor, Manville WSC, a portion of North Austin MUD #1, Pflugerville, Rollingwood, Round Rock, Shady Hollow MUD, Wells Branch MUD, West Lake Hills, and Windermere Utility.

[3] County-Other in Travis County consists of several small communities, which are too small to be considered WUGs.

[4] The wholesale commitments in Williamson County include the following WUGs: A portion of North Austin MUD #1, and Round Rock (Region G).

[5] County-Other in Williamson County consists of several small communities, which are too small to be considered WUGs.

Travis County-Other water demands decrease due to annexations by the City, which correspondingly increase the City's water demand. The City is responsible for supplying a significant portion of the

County-Other water in Travis County. This County-Other demand consists of demand for both individual service connections that are outside the city limits and demands for other public water systems served by the City.

*Table 2.19* presents the City of Austin's proposed steam-electric water demands in Fayette and Travis Counties. The City's portion of the South Texas Project (STP) demand is included in the STP total steam-electric demand in Matagorda County.

**Table 2.19 Projected Steam-Electric Water Demands for City of Austin service area (ac-ft/yr)**

| County/WUG | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **Fayette County** | | | | | | | |
| Steam Electric [1] | 7,102 | 14,222 | 14,302 | 17,602 | 25,739 | 25,739 | 31,649 |
| **Travis County** | | | | | | | |
| Steam Electric | 7,494 | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| **Total** | **14,596** | **31,722** | **32,802** | **40,102** | **49,239** | **53,239** | **60,149** |

[1] City of Austin portion - based on estimated current supply levels and approved projections.

### 2.5.2 Lower Colorado River Authority

LCRA supplies water for municipal, agricultural (irrigation), manufacturing, steam-electric, mining, and other water uses. The LCRA currently supplies water to entities in Bastrop, Burnet, Colorado, Fayette, Hays, Lampasas (Region G), Llano, Matagorda, San Saba, Travis, Wharton, and Williamson (the portion of Williamson in Region G) Counties. *Table 2.20* presents the projected water demands for each of the WUGs supplied by LCRA. LCRA is not the sole provider for several of these WUGs, so these water demands will not all be met by water provided by LCRA.

As with the City of Austin, the municipal County-Other water demands actually consist of water that is supplied to several smaller retail water customers.

**Table 2.20 LCRA Water Commitment Summary (ac-ft/yr)**

| County/WUG | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **Bastrop County** | | | | | | | |
| Aqua WSC | 5,000 | 0 | 0 | 0 | 0 | 0 | 0 |
| County-Other | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 |
| Steam Electric | 16,720 | 16,720 | 16,720 | 16,720 | 16,720 | 16,720 | 16,720 |
| **Burnet County** | | | | | | | |
| Burnet | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 |
| Cottonwood Shores | 138 | 138 | 138 | 138 | 138 | 138 | 138 |
| Granite Shoals | 830 | 830 | 830 | 830 | 830 | 830 | 830 |
| Lake LBJ MUD | 1,789 | 1,789 | 1,789 | 1,789 | 1,789 | 1,789 | 1,789 |
| Marble Falls | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Meadowlakes | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| County-Other | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 |
| Manufacturing | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| **Colorado County** | | | | | | | |
| Irrigation [1] | 157,682 | 150,617 | 144,349 | 138,285 | 132,416 | 126,710 | 121,247 |
| **Fayette County** | | | | | | | |
| County-Other | 102 | 102 | 102 | 102 | 102 | 102 | 102 |
| Steam Electric (LCRA) | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 |
| Steam Electric (COA) | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| **Gillespie County** | | | | | | | |
| County-Other | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| **Hays County** | | | | | | | |
| Dripping Springs | 506 | 506 | 506 | 506 | 506 | 506 | 506 |
| Dripping Springs WSC | 560 | 560 | 560 | 560 | 560 | 560 | 560 |
| County-Other | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 |
| **Lampasas County (Region G)** | | | | | | | |
| County-Other | 882 | 882 | 882 | 882 | 882 | 882 | 882 |
| **Llano County** | | | | | | | |
| Kingsland WSC | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| Llano | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| Sunrise Beach Village [2] | 278 | 278 | 278 | 278 | 278 | 278 | 278 |
| County-Other | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 |
| Steam Electric [3] | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 |

[1] The Colorado Irrigation commitment represents 75 percent of the Colorado County Irrigation demand.
[2] The value for Sunrise Beach Village was estimated based upon TCEQ maximum production capacity for system.
[3] The Llano Steam Electric value is based on the authorized annual amount in the water right used by the Ferguson Power Plant, which LCRA has in the 1999 WMP.

**Table 2.20 LCRA Water Commitment Summary (ac-ft/yr) (Continued)**

| County/WUG | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **Matagorda County** | | | | | | | |
| Manufacturing County | 14,222 | 14,222 | 14,222 | 14,222 | 14,222 | 14,222 | 14,222 |
| Irrigation [4] | 179,211 | 167,952 | 161,883 | 156,037 | 150,437 | 145,048 | 139,853 |
| Steam Electric [5] | 38,060 | 27,507 | 32,480 | 32,480 | 32,480 | 32,480 | 32,360 |
| **San Saba County** | | | | | | | |
| County-Other | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| **Travis County** | | | | | | | |
| Austin - Municipal [6] | 143,947 | 112,410 | 120,534 | 120,534 | 120,534 | 120,534 | 120,521 |
| Austin - Steam Electric 7 | 30,860 | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 |
| Barton Creek West WSC | 348 | 348 | 348 | 348 | 348 | 348 | 348 |
| Bee Cave Village | 241 | 241 | 241 | 241 | 241 | 241 | 241 |
| Briar Cliff Village | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Cedar Park [8] | 594 | 670 | 772 | 866 | 925 | 988 | 1052 |
| Cedar Park [8] (Region G) | 18,141 | 18,065 | 17,963 | 17,869 | 17,810 | 17,747 | 17,683 |
| The Hills | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 |
| Jonestown WSC | 460 | 460 | 460 | 460 | 460 | 460 | 460 |
| Lago Vista | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 |
| Lakeway MUD | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 |
| Loop 360 WSC | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 |
| Pflugerville | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| River Place on Lake Austin | 900 | 900 | 900 | 900 | 900 | 900 | 900 |
| Travis County WCID #17 | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 |
| Travis County WCID #18 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| Travis County WCID #20 | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 |
| West Travis County Regional WS [9] | 10,131 | 10,131 | 10,131 | 10,131 | 10,131 | 10,131 | 10,131 |
| Williamson-Travis County MUD #1 | 482 | 482 | 482 | 482 | 482 | 482 | 482 |
| County-Other [10] | 19,548 | 19,548 | 19,548 | 19,548 | 19,548 | 19,548 | 19,548 |
| Manufacturing | 526 | 526 | 526 | 526 | 526 | 526 | 526 |
| **Williamson County (Region G)** | | | | | | | |
| Leander | 6,400 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 |
| County-Other | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| **Wharton County** | | | | | | | |
| Irrigation [11] | 105,183 | 100,642 | 97,043 | 93,570 | 90,224 | 86,997 | 74,751 |
| **TOTAL** | 878,309 | 810,268 | 807,429 | 792,046 | 777,231 | 762,909 | 739,872 |

[4] The Matagorda Irrigation commitment represents 87 percent of the Matagorda County Irrigation demand.

[5] The Matagorda Steam Electric value is based on the Region K Cutoff Model results for the average annual amount of LCRA backup supplies needed to supplement the STPNOC/LCRA water right..

[6] The Austin-Municipal value is based on the Region K Cutoff Model results for the amount of LCRA backup supplies needed to supplement Austin's municipal water rights.

[7] The Austin-Steam Electric value is based on the Region K Cutoff Model results for the amount of LCRA backup supplies needed to supplement Austin's steam-electric water rights.

[8] Cedar Park is located in both Region K and Region G, and it serves Williamson-Travis Counties MUD #1 (WUG).

[9] West Travis County Regional WS is composed of multiple water user groups including the Village of Bee Cave, Barton Creek West WSC, and Hill Country WSC.

[10] Travis County-Other contains Travis County MUD District #4 who serves Travis County WCID #19 (WUG).

[11] The Wharton Irrigation commitment represents 55 percent of the total Wharton County Irrigation demand.

# *APPENDIX 2A*

## *LCRWPG POPULATION AND WATER DEMAND PROJECTIONS*
## *(By County/River Basin and City/County)*

# *APPENDIX 2B*

# *LCRWPG POPULATION AND WATER DEMAND COMPARISONS*
## *(2006 Plan versus 2011 Plan)*

# *APPENDIX 2C*

# *LCRWPG GALLONS PER CAPITA DAY (GPCD)*

# *APPENDIX 2D*

# *RESOLUTION BY THE LOWER COLORADO REGIONAL WATER PLANNING GROUP REGARDING POPULATION PROJECTIONS FOR THE 2011 REGIONAL WATER PLANNING CYCLE*

# Region K Population Projections by Water User Group

| | | | POPULATION | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| AQUA WSC | BASTROP | COLORADO | 37,503 | 54,835 | 66,989 | 88,380 | 105,849 | 127,246 |
| BASTROP | BASTROP | COLORADO | 8,890 | 12,475 | 15,920 | 21,003 | 25,155 | 30,240 |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | 2,269 | 3,202 | 4,300 | 5,546 | 7,124 | 9,099 |
| COUNTY-OTHER | BASTROP | BRAZOS | 708 | 990 | 1,263 | 1,665 | 1,993 | 2,397 |
| COUNTY-OTHER | BASTROP | COLORADO | 17,272 | 24,178 | 30,854 | 40,708 | 48,755 | 58,609 |
| COUNTY-OTHER | BASTROP | GUADALUPE | 461 | 645 | 823 | 1,086 | 1,300 | 1,564 |
| CREEDMOOR-MAHA WSC | BASTROP | COLORADO | 181 | 263 | 336 | 443 | 530 | 637 |
| ELGIN | BASTROP | COLORADO | 9,997 | 14,028 | 17,902 | 23,619 | 28,287 | 34,005 |
| LEE COUNTY WSC | BASTROP | BRAZOS | 336 | 488 | 623 | 822 | 984 | 1,183 |
| LEE COUNTY WSC | BASTROP | COLORADO | 524 | 761 | 971 | 1,281 | 1,535 | 1,845 |
| MANVILLE WSC | BASTROP | COLORADO | 501 | 717 | 971 | 1,259 | 1,624 | 2,080 |
| POLONIA WSC | BASTROP | COLORADO | 201 | 292 | 373 | 492 | 589 | 708 |
| SMITHVILLE | BASTROP | COLORADO | 5,606 | 7,866 | 10,039 | 13,244 | 15,863 | 19,070 |
| **BASTROP COUNTY TOTAL POPULATION** | | | **84,449** | **120,740** | **151,364** | **199,548** | **239,588** | **288,683** |
| BLANCO | BLANCO | GUADALUPE | 2,430 | 2,872 | 3,295 | 3,665 | 3,990 | 4,372 |
| CANYON LAKE WSC | BLANCO | GUADALUPE | 1,254 | 1,766 | 2,256 | 2,685 | 3,149 | 3,687 |
| COUNTY-OTHER | BLANCO | COLORADO | 3,020 | 3,385 | 3,735 | 4,040 | 4,452 | 4,926 |
| COUNTY-OTHER | BLANCO | GUADALUPE | 1,626 | 1,823 | 2,010 | 2,175 | 2,397 | 2,652 |
| JOHNSON CITY | BLANCO | COLORADO | 1,616 | 1,910 | 2,191 | 2,437 | 2,653 | 2,907 |
| **BLANCO COUNTY TOTAL POPULATION** | | | **9,946** | **11,756** | **13,487** | **15,002** | **16,641** | **18,544** |
| BERTRAM | BURNET | BRAZOS | 1,430 | 1,859 | 2,327 | 2,781 | 3,048 | 3,342 |
| BURNET | BURNET | COLORADO | 6,358 | 8,263 | 10,341 | 12,360 | 13,549 | 14,856 |
| CHISHOLM TRAIL SUD | BURNET | BRAZOS | 178 | 249 | 321 | 390 | 465 | 553 |
| COTTONWOOD SHORES | BURNET | COLORADO | 1,229 | 2,585 | 4,105 | 5,830 | 7,812 | 10,114 |
| COUNTY-OTHER | BURNET | BRAZOS | 5,540 | 6,975 | 8,936 | 10,809 | 11,768 | 12,435 |
| COUNTY-OTHER | BURNET | COLORADO | 17,493 | 22,027 | 28,212 | 34,134 | 37,163 | 39,270 |
| GRANITE SHOALS | BURNET | COLORADO | 2,738 | 3,559 | 4,454 | 5,324 | 5,836 | 6,399 |
| KEMPNER WSC | BURNET | BRAZOS | 884 | 1,140 | 1,402 | 1,652 | 1,925 | 2,242 |
| KINGSLAND WSC | BURNET | COLORADO | 366 | 426 | 487 | 545 | 608 | 682 |
| LAKE LBJ MUD | BURNET | COLORADO | 817 | 946 | 1,078 | 1,204 | 1,341 | 1,500 |
| MARBLE FALLS | BURNET | COLORADO | 7,796 | 10,132 | 12,679 | 15,155 | 16,613 | 18,216 |
| MEADOWLAKES | BURNET | COLORADO | 2,331 | 3,030 | 3,791 | 4,532 | 4,967 | 5,447 |
| **BURNET COUNTY TOTAL POPULATION** | | | **47,160** | **61,191** | **78,133** | **94,716** | **105,095** | **115,056** |
| COLUMBUS | COLORADO | COLORADO | 4,053 | 4,398 | 4,578 | 4,580 | 4,763 | 4,986 |
| COUNTY-OTHER | COLORADO | BRAZOS-COLORADO | 1,067 | 1,115 | 1,141 | 1,150 | 1,154 | 1,141 |

# Region K Population Projections by Water User Group

| | | | POPULATION | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| COUNTY-OTHER | COLORADO | COLORADO | 6,801 | 7,101 | 7,268 | 7,336 | 7,349 | 7,272 |
| COUNTY-OTHER | COLORADO | LAVACA | 3,338 | 3,486 | 3,568 | 3,601 | 3,607 | 3,569 |
| EAGLE LAKE | COLORADO | BRAZOS-COLORADO | 1,147 | 1,244 | 1,295 | 1,296 | 1,348 | 1,411 |
| EAGLE LAKE | COLORADO | COLORADO | 2,645 | 2,872 | 2,989 | 2,989 | 3,108 | 3,254 |
| WEIMAR | COLORADO | COLORADO | 1,526 | 1,657 | 1,725 | 1,724 | 1,793 | 1,877 |
| WEIMAR | COLORADO | LAVACA | 662 | 718 | 747 | 748 | 778 | 814 |
| **COLORADO COUNTY TOTAL POPULATION** | | | **21,239** | **22,591** | **23,311** | **23,424** | **23,900** | **24,324** |
| AQUA WSC | FAYETTE | COLORADO | 602 | 787 | 939 | 1,057 | 1,193 | 1,372 |
| COUNTY-OTHER | FAYETTE | BRAZOS | 2 | 1 | 1 | 2 | 1 | 1 |
| COUNTY-OTHER | FAYETTE | COLORADO | 3,455 | 2,362 | 1,615 | 1,104 | 755 | 516 |
| COUNTY-OTHER | FAYETTE | GUADALUPE | 230 | 140 | 85 | 51 | 31 | 19 |
| COUNTY-OTHER | FAYETTE | LAVACA | 1,377 | 855 | 531 | 330 | 205 | 127 |
| FAYETTE WSC | FAYETTE | COLORADO | 6,570 | 9,424 | 11,773 | 13,600 | 15,691 | 18,459 |
| FAYETTE WSC | FAYETTE | LAVACA | 577 | 828 | 1,034 | 1,195 | 1,379 | 1,622 |
| FLATONIA | FAYETTE | GUADALUPE | 345 | 383 | 414 | 438 | 466 | 503 |
| FLATONIA | FAYETTE | LAVACA | 1,198 | 1,329 | 1,437 | 1,521 | 1,617 | 1,744 |
| LA GRANGE | FAYETTE | COLORADO | 5,546 | 6,629 | 7,520 | 8,213 | 9,007 | 10,057 |
| LEE COUNTY WSC | FAYETTE | COLORADO | 1,730 | 2,375 | 2,906 | 3,319 | 3,792 | 4,418 |
| SCHULENBURG | FAYETTE | LAVACA | 3,194 | 3,695 | 4,108 | 4,429 | 4,796 | 5,282 |
| **FAYETTE COUNTY TOTAL POPULATION** | | | **24,826** | **28,808** | **32,363** | **35,259** | **38,933** | **44,120** |
| COUNTY-OTHER | GILLESPIE | COLORADO | 13,314 | 15,205 | 15,943 | 15,943 | 15,943 | 15,943 |
| COUNTY-OTHER | GILLESPIE | GUADALUPE | 462 | 527 | 553 | 553 | 553 | 553 |
| FREDERICKSBURG | GILLESPIE | COLORADO | 11,482 | 13,385 | 14,365 | 14,365 | 14,365 | 14,365 |
| **GILLESPIE COUNTY TOTAL POPULATION** | | | **25,258** | **29,117** | **30,861** | **30,861** | **30,861** | **30,861** |
| BUDA | HAYS | COLORADO | 9,338 | 13,971 | 17,341 | 20,728 | 24,797 | 27,997 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | 2,417 | 3,013 | 3,631 | 4,252 | 4,998 | 5,584 |
| COUNTY-OTHER | HAYS | COLORADO | 22,722 | 33,658 | 43,641 | 53,675 | 65,729 | 75,207 |
| DRIPPING SPRINGS | HAYS | COLORADO | 5,325 | 9,308 | 11,651 | 14,005 | 16,834 | 19,058 |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | 2,487 | 3,639 | 4,832 | 6,031 | 7,471 | 8,604 |
| HILL COUNTRY WSC | HAYS | COLORADO | 3,117 | 5,051 | 7,054 | 9,067 | 11,485 | 13,387 |
| MOUNTAIN CITY | HAYS | COLORADO | 737 | 737 | 737 | 737 | 737 | 737 |
| **HAYS COUNTY TOTAL POPULATION** | | | **46,143** | **69,377** | **88,887** | **108,495** | **132,051** | **150,574** |
| COUNTY-OTHER | LLANO | COLORADO | 5,902 | 6,380 | 6,508 | 6,636 | 6,764 | 6,891 |
| KINGSLAND WSC | LLANO | COLORADO | 4,592 | 4,964 | 5,064 | 5,163 | 5,263 | 5,363 |
| LAKE LBJ MUD | LLANO | COLORADO | 5,994 | 6,479 | 6,610 | 6,740 | 6,869 | 7,000 |
| LLANO | LLANO | COLORADO | 3,967 | 4,288 | 4,375 | 4,461 | 4,547 | 4,633 |

# Region K Population Projections by Water User Group

| | | | POPULATION | | | | | |
|---|---|---|---|---|---|---|---|---|
| WUG Name | County | River Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| SUNRISE BEACH VILLAGE | LLANO | COLORADO | 829 | 896 | 914 | 932 | 950 | 968 |
| **LLANO COUNTY TOTAL POPULATION** | | | **21,284** | **23,007** | **23,471** | **23,932** | **24,393** | **24,855** |
| BAY CITY | MATAGORDA | BRAZOS-COLORADO | 19,921 | 21,292 | 22,126 | 22,586 | 22,586 | 22,586 |
| COUNTY-OTHER | MATAGORDA | BRAZOS-COLORADO | 7,400 | 7,909 | 8,219 | 8,389 | 8,389 | 8,389 |
| COUNTY-OTHER | MATAGORDA | COLORADO | 1,484 | 1,587 | 1,649 | 1,683 | 1,683 | 1,683 |
| COUNTY-OTHER | MATAGORDA | COLORADO-LAVACA | 5,456 | 5,832 | 6,061 | 6,186 | 6,186 | 6,186 |
| ORBIT SYSTEMS INC | MATAGORDA | COLORADO-LAVACA | 26 | 27 | 28 | 29 | 29 | 29 |
| PALACIOS | MATAGORDA | COLORADO-LAVACA | 5,499 | 5,878 | 6,108 | 6,235 | 6,235 | 6,235 |
| SOUTHWEST UTILITIES | MATAGORDA | BRAZOS-COLORADO | 720 | 770 | 800 | 817 | 817 | 817 |
| **MATAGORDA COUNTY TOTAL POPULATION** | | | **40,506** | **43,295** | **44,991** | **45,925** | **45,925** | **45,925** |
| BROOKSMITH SUD | MILLS | COLORADO | 39 | 45 | 46 | 47 | 46 | 44 |
| COUNTY-OTHER | MILLS | BRAZOS | 1,470 | 1,533 | 1,634 | 1,562 | 1,725 | 1,793 |
| COUNTY-OTHER | MILLS | COLORADO | 2,158 | 2,249 | 2,395 | 2,289 | 2,526 | 2,628 |
| GOLDTHWAITE | MILLS | BRAZOS | 27 | 30 | 30 | 30 | 30 | 31 |
| GOLDTHWAITE | MILLS | COLORADO | 1,772 | 1,958 | 2,002 | 2,002 | 2,002 | 2,001 |
| **MILLS COUNTY TOTAL POPULATION** | | | **5,466** | **5,815** | **6,107** | **5,930** | **6,329** | **6,497** |
| COUNTY-OTHER | SAN SABA | COLORADO | 2,697 | 2,971 | 3,210 | 3,418 | 3,444 | 3,477 |
| RICHLAND SUD | SAN SABA | COLORADO | 1,050 | 1,130 | 1,200 | 1,261 | 1,268 | 1,278 |
| SAN SABA | SAN SABA | COLORADO | 2,640 | 2,645 | 2,649 | 2,653 | 2,653 | 2,654 |
| **SAN SABA COUNTY TOTAL POPULATION** | | | **6,387** | **6,746** | **7,059** | **7,332** | **7,365** | **7,409** |
| ANDERSON MILL MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| AQUA WSC | TRAVIS | COLORADO | 9,470 | 11,131 | 12,666 | 13,625 | 14,639 | 15,683 |
| AUSTIN | TRAVIS | COLORADO | 770,529 | 928,151 | 1,101,052 | 1,258,580 | 1,424,691 | 1,548,275 |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | 2,264 | 2,727 | 3,181 | 3,592 | 3,891 | 4,191 |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | 1,289 | 1,553 | 1,811 | 2,045 | 2,215 | 2,386 |
| CEDAR PARK | TRAVIS | COLORADO | 922 | 1,432 | 1,903 | 2,197 | 2,508 | 2,828 |
| COUNTY-OTHER | TRAVIS | COLORADO | 26,994 | 25,494 | 18,394 | 13,807 | 12,120 | 12,629 |
| COUNTY-OTHER | TRAVIS | GUADALUPE | 6 | 6 | 6 | 6 | 7 | 7 |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | 5,812 | 7,117 | 8,322 | 9,075 | 9,871 | 10,691 |
| CREEDMOOR-MAHA WSC | TRAVIS | GUADALUPE | 150 | 184 | 215 | 234 | 255 | 276 |
| ELGIN | TRAVIS | COLORADO | 87 | 105 | 123 | 139 | 150 | 162 |
| GOFORTH WSC | TRAVIS | COLORADO | 288 | 383 | 471 | 526 | 584 | 644 |
| HILL COUNTRY WSC | TRAVIS | COLORADO | 1,689 | 2,623 | 3,486 | 4,025 | 4,595 | 5,182 |
| JONESTOWN | TRAVIS | COLORADO | 3,309 | 3,985 | 4,648 | 5,249 | 5,686 | 6,123 |

# Region K Population Projections by Water User Group

| WUG Name | County | River Basin | POPULATION 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| JONESTOWN WSC | TRAVIS | COLORADO | 926 | 1,123 | 1,305 | 1,419 | 1,539 | 1,663 |
| LAGO VISTA | TRAVIS | COLORADO | 6,907 | 8,320 | 9,703 | 10,959 | 11,871 | 12,784 |
| LAKEWAY | TRAVIS | COLORADO | 14,522 | 17,493 | 20,400 | 23,040 | 24,957 | 26,877 |
| LAKEWAY MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| LOOP 360 WSC | TRAVIS | COLORADO | 2,803 | 2,803 | 2,803 | 2,803 | 2,803 | 2,803 |
| LOST CREEK MUD | TRAVIS | COLORADO | 4,372 | 4,372 | 4,372 | 4,372 | 4,372 | 4,372 |
| MANOR | TRAVIS | COLORADO | 6,275 | 7,558 | 8,815 | 9,955 | 10,784 | 11,613 |
| MANVILLE WSC | TRAVIS | COLORADO | 12,987 | 17,931 | 22,498 | 25,350 | 28,367 | 31,474 |
| MUSTANG RIDGE | TRAVIS | COLORADO | 384 | 466 | 542 | 589 | 639 | 690 |
| MUSTANG RIDGE | TRAVIS | GUADALUPE | 102 | 124 | 144 | 157 | 170 | 184 |
| NORTH AUSTIN MUD #1 | TRAVIS | COLORADO | 780 | 780 | 780 | 780 | 780 | 780 |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | COLORADO | 3,615 | 5,614 | 7,460 | 8,613 | 9,833 | 11,089 |
| PFLUGERVILLE | TRAVIS | COLORADO | 39,480 | 47,557 | 55,460 | 62,638 | 67,850 | 73,069 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | 4,449 | 5,250 | 5,250 | 5,250 | 5,250 | 5,250 |
| ROLLINGWOOD | TRAVIS | COLORADO | 1,414 | 1,428 | 1,441 | 1,449 | 1,458 | 1,467 |
| ROUND ROCK | TRAVIS | COLORADO | 1,806 | 2,782 | 3,684 | 4,247 | 4,843 | 5,456 |
| SAN LEANNA | TRAVIS | COLORADO | 546 | 659 | 766 | 868 | 938 | 1,009 |
| SHADY HOLLOW MUD | TRAVIS | COLORADO | 4,732 | 4,732 | 4,732 | 4,732 | 4,732 | 4,732 |
| THE HILLS | TRAVIS | COLORADO | 2,301 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| TRAVIS COUNTY WCID #17 | TRAVIS | COLORADO | 26,130 | 32,500 | 36,000 | 40,000 | 42,000 | 44,500 |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | 6,291 | 8,133 | 9,834 | 10,896 | 12,020 | 13,177 |
| TRAVIS COUNTY WCID #19 | TRAVIS | COLORADO | 716 | 716 | 716 | 716 | 716 | 716 |
| TRAVIS COUNTY WCID #20 | TRAVIS | COLORADO | 1,140 | 1,140 | 1,140 | 1,140 | 1,140 | 1,140 |
| WELLS BRANCH MUD | TRAVIS | COLORADO | 8,211 | 8,211 | 8,211 | 8,211 | 8,211 | 8,211 |
| WEST LAKE HILLS | TRAVIS | COLORADO | 3,520 | 4,061 | 4,561 | 4,873 | 5,203 | 5,543 |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | 4,881 | 7,051 | 9,055 | 10,307 | 11,631 | 12,994 |
| WILLIAMSON-TRAVIS COUNTY MUD #1 | TRAVIS | COLORADO | 1,699 | 2,395 | 3,037 | 3,438 | 3,862 | 4,299 |
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | 17,999 | 18,710 | 18,710 | 18,710 | 18,710 | 18,710 |
| **TRAVIS COUNTY TOTAL POPULATION** | | | **1,003,253** | **1,201,256** | **1,402,153** | **1,583,068** | **1,770,347** | **1,918,135** |
| COUNTY-OTHER | WHARTON | BRAZOS-COLORADO | 10,173 | 10,752 | 11,128 | 11,343 | 11,348 | 11,226 |
| COUNTY-OTHER | WHARTON | COLORADO | 3,836 | 4,055 | 4,197 | 4,277 | 4,279 | 4,234 |
| COUNTY-OTHER | WHARTON | COLORADO-LAVACA | 2,054 | 2,171 | 2,246 | 2,289 | 2,291 | 2,266 |
| EAST BERNARD | WHARTON | BRAZOS-COLORADO | 2,428 | 2,567 | 2,656 | 2,707 | 2,708 | 2,680 |
| WHARTON | WHARTON | BRAZOS-COLORADO | 6,704 | 7,087 | 7,333 | 7,475 | 7,478 | 7,399 |
| WHARTON | WHARTON | COLORADO | 3,065 | 3,240 | 3,352 | 3,417 | 3,419 | 3,383 |
| **WHARTON COUNTY TOTAL POPULATION** | | | **28,260** | **29,872** | **30,912** | **31,508** | **31,523** | **31,188** |

# Region K Population Projections by Water User Group

| | | | POPULATION | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| ANDERSON MILL MUD | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| AUSTIN | WILLIAMSON | BRAZOS | 29,317 | 39,606 | 51,839 | 65,141 | 79,613 | 95,134 |
| COUNTY-OTHER | WILLIAMSON | BRAZOS | 12,317 | 14,082 | 16,181 | 18,463 | 20,946 | 23,609 |
| NORTH AUSTIN MUD #1 | WILLIAMSON | BRAZOS | 7,023 | 7,023 | 7,023 | 7,023 | 7,023 | 7,023 |
| **WILLIAMSON COUNTY TOTAL POPULATION** | | | **48,657** | **60,711** | **75,043** | **90,627** | **107,582** | **125,766** |
| **REGION K TOTAL POPULATION** | | | **1,412,834** | **1,714,282** | **2,008,142** | **2,295,627** | **2,580,533** | **2,831,937** |

# Region K Water Demand Projections by Water User Group

| | | | Water Demand (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| AQUA WSC | BASTROP | COLORADO | 5,629 | 8,046 | 9,604 | 12,573 | 14,939 | 17,959 |
| BASTROP | BASTROP | COLORADO | 1,992 | 2,739 | 3,459 | 4,517 | 5,382 | 6,469 |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | 341 | 473 | 626 | 801 | 1,029 | 1,315 |
| COUNTY-OTHER | BASTROP | BRAZOS | 97 | 135 | 171 | 226 | 270 | 325 |
| COUNTY-OTHER | BASTROP | COLORADO | 2,361 | 3,304 | 4,181 | 5,517 | 6,608 | 7,944 |
| COUNTY-OTHER | BASTROP | GUADALUPE | 63 | 88 | 112 | 147 | 176 | 212 |
| CREEDMOOR-MAHA WSC | BASTROP | COLORADO | 19 | 26 | 33 | 43 | 51 | 62 |
| ELGIN | BASTROP | COLORADO | 1,658 | 2,278 | 2,847 | 3,703 | 4,404 | 5,295 |
| LEE COUNTY WSC | BASTROP | BRAZOS | 49 | 70 | 87 | 115 | 135 | 163 |
| LEE COUNTY WSC | BASTROP | COLORADO | 77 | 108 | 136 | 178 | 211 | 254 |
| MANVILLE WSC | BASTROP | COLORADO | 67 | 94 | 125 | 161 | 207 | 266 |
| POLONIA WSC | BASTROP | COLORADO | 18 | 26 | 32 | 41 | 50 | 60 |
| SMITHVILLE | BASTROP | COLORADO | 904 | 1,233 | 1,551 | 2,018 | 2,398 | 2,884 |
| **Total Municipal Water Totals** | | | **13,275** | **18,620** | **22,964** | **30,040** | **35,860** | **43,208** |
| IRRIGATION | BASTROP | BRAZOS | 89 | 78 | 68 | 59 | 52 | 45 |
| IRRIGATION | BASTROP | COLORADO | 1,521 | 1,329 | 1,158 | 1,013 | 882 | 769 |
| IRRIGATION | BASTROP | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Irrigation Water Totals** | | | **1,610** | **1,407** | **1,226** | **1,072** | **934** | **814** |
| LIVESTOCK | BASTROP | BRAZOS | 259 | 259 | 259 | 259 | 259 | 259 |
| LIVESTOCK | BASTROP | COLORADO | 1,202 | 1,202 | 1,202 | 1,202 | 1,202 | 1,202 |
| LIVESTOCK | BASTROP | GUADALUPE | 61 | 61 | 61 | 61 | 61 | 61 |
| **Total Livestock Water Totals** | | | **1,522** | **1,522** | **1,522** | **1,522** | **1,522** | **1,522** |
| MANUFACTURING | BASTROP | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | BASTROP | COLORADO | 84 | 101 | 119 | 137 | 155 | 167 |
| MANUFACTURING | BASTROP | GUADALUPE | 8 | 10 | 11 | 13 | 14 | 16 |
| **Total Manufacturing Water Totals** | | | **92** | **111** | **130** | **150** | **169** | **183** |
| MINING | BASTROP | BRAZOS | 10 | 9 | 10 | 11 | 11 | 11 |
| MINING | BASTROP | COLORADO | 5,016 | 5,018 | 5,018 | 18 | 19 | 20 |
| MINING | BASTROP | GUADALUPE | 7 | 8 | 8 | 8 | 8 | 8 |
| **Total Mining Water Totals** | | | **5,033** | **5,035** | **5,036** | **37** | **38** | **39** |
| STEAM ELECTRIC POWER | BASTROP | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | BASTROP | COLORADO | 12,000 | 14,000 | 16,000 | 18,000 | 19,500 | 19,500 |
| STEAM ELECTRIC POWER | BASTROP | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **12,000** | **14,000** | **16,000** | **18,000** | **19,500** | **19,500** |
| **BASTROP COUNTY TOTALS** | | | **33,532** | **40,695** | **46,878** | **50,821** | **58,023** | **65,266** |
| BLANCO | BLANCO | GUADALUPE | 440 | 508 | 576 | 628 | 679 | 745 |
| CANYON LAKE WSC | BLANCO | GUADALUPE | 188 | 263 | 334 | 397 | 466 | 545 |
| COUNTY-OTHER | BLANCO | COLORADO | 297 | 323 | 347 | 367 | 399 | 441 |
| COUNTY-OTHER | BLANCO | GUADALUPE | 160 | 173 | 187 | 197 | 215 | 238 |
| JOHNSON CITY | BLANCO | COLORADO | 382 | 445 | 503 | 554 | 601 | 657 |
| **Total Municipal Water Totals** | | | **1,467** | **1,712** | **1,947** | **2,143** | **2,360** | **2,626** |
| IRRIGATION | BLANCO | COLORADO | 54 | 52 | 48 | 45 | 44 | 43 |
| IRRIGATION | BLANCO | GUADALUPE | 15 | 14 | 14 | 13 | 12 | 12 |
| **Total Irrigation Water Totals** | | | **69** | **66** | **62** | **58** | **56** | **55** |
| LIVESTOCK | BLANCO | COLORADO | 341 | 341 | 341 | 341 | 341 | 341 |

# Region K Water Demand Projections by Water User Group

| WUG Name | County | River Basin | Water Demand (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| LIVESTOCK | BLANCO | GUADALUPE | 102 | 102 | 102 | 102 | 102 | 102 |
| **Total Livestock Water Totals** | | | **443** | **443** | **443** | **443** | **443** | **443** |
| MANUFACTURING | BLANCO | COLORADO | 1 | 1 | 1 | 1 | 1 | 1 |
| MANUFACTURING | BLANCO | GUADALUPE | 1 | 1 | 1 | 1 | 1 | 1 |
| **Total Manufacturing Water Totals** | | | **2** | **2** | **2** | **2** | **2** | **2** |
| MINING | BLANCO | COLORADO | 5 | 5 | 5 | 5 | 5 | 5 |
| MINING | BLANCO | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Mining Water Totals** | | | **5** | **5** | **5** | **5** | **5** | **5** |
| STEAM ELECTRIC POWER | BLANCO | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | BLANCO | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **BLANCO COUNTY TOTAL WATER TOTALS** | | | **1,986** | **2,228** | **2,459** | **2,651** | **2,866** | **3,131** |
| BERTRAM | BURNET | BRAZOS | 282 | 360 | 445 | 527 | 574 | 630 |
| BURNET | BURNET | COLORADO | 1,111 | 1,416 | 1,738 | 2,063 | 2,246 | 2,463 |
| CHISHOLM TRAIL SUD | BURNET | BRAZOS | 28 | 40 | 53 | 66 | 79 | 94 |
| COTTONWOOD SHORES | BURNET | COLORADO | 164 | 336 | 524 | 739 | 978 | 1,268 |
| COUNTY-OTHER | BURNET | BRAZOS | 496 | 610 | 761 | 908 | 976 | 1,031 |
| COUNTY-OTHER [1] | BURNET | COLORADO | 2,529 | 3,087 | 3,764 | 4,430 | 4,842 | 5,217 |
| GRANITE SHOALS | BURNET | COLORADO | 424 | 535 | 658 | 775 | 844 | 925 |
| KEMPNER WSC | BURNET | BRAZOS | 298 | 381 | 466 | 548 | 636 | 741 |
| KINGSLAND WSC | BURNET | COLORADO | 55 | 63 | 70 | 77 | 85 | 95 |
| LAKE LBJ MUD | BURNET | COLORADO | 227 | 261 | 293 | 324 | 359 | 402 |
| MARBLE FALLS | BURNET | COLORADO | 2,497 | 3,211 | 3,976 | 4,719 | 5,154 | 5,653 |
| MEADOWLAKES | BURNET | COLORADO | 879 | 1,137 | 1,418 | 1,691 | 1,853 | 2,031 |
| **Total Municipal Water Totals** | | | **8,990** | **11,437** | **14,166** | **16,867** | **18,626** | **20,550** |
| IRRIGATION | BURNET | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| IRRIGATION | BURNET | COLORADO | 101 | 100 | 98 | 96 | 95 | 93 |
| **Total Irrigation Water Totals** | | | **101** | **100** | **98** | **96** | **95** | **93** |
| LIVESTOCK | BURNET | BRAZOS | 409 | 409 | 409 | 409 | 409 | 409 |
| LIVESTOCK | BURNET | COLORADO | 426 | 426 | 426 | 426 | 426 | 426 |
| **Total Livestock Water Totals** | | | **835** | **835** | **835** | **835** | **835** | **835** |
| MANUFACTURING | BURNET | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | BURNET | COLORADO | 963 | 1,109 | 1,248 | 1,384 | 1,502 | 1,636 |
| **Total Manufacturing Water Totals** | | | **963** | **1,109** | **1,248** | **1,384** | **1,502** | **1,636** |
| MINING | BURNET | BRAZOS | 61 | 64 | 66 | 67 | 69 | 70 |
| MINING | BURNET | COLORADO | 1,895 | 1,985 | 2,032 | 2,078 | 2,121 | 2,165 |
| **Total Mining Water Totals** | | | **1,956** | **2,049** | **2,098** | **2,145** | **2,190** | **2,235** |
| STEAM ELECTRIC POWER | BURNET | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | BURNET | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **BURNET COUNTY TOTAL WATER TOTALS** | | | **12,845** | **15,530** | **18,445** | **21,327** | **23,248** | **25,349** |
| COLUMBUS | COLORADO | COLORADO | 1,026 | 1,099 | 1,128 | 1,113 | 1,153 | 1,206 |
| COUNTY-OTHER | COLORADO | BRAZOS-COLORADO | 114 | 115 | 114 | 111 | 110 | 109 |
| COUNTY-OTHER | COLORADO | COLORADO | 724 | 732 | 725 | 707 | 700 | 692 |
| COUNTY-OTHER | COLORADO | LAVACA | 355 | 359 | 356 | 347 | 343 | 340 |

# Region K Water Demand Projections by Water User Group

| WUG Name | County | River Basin | Water Demand (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| EAGLE LAKE | COLORADO | BRAZOS-COLORADO | 173 | 183 | 186 | 181 | 187 | 196 |
| EAGLE LAKE | COLORADO | COLORADO | 400 | 421 | 428 | 418 | 432 | 452 |
| WEIMAR | COLORADO | COLORADO | 253 | 268 | 272 | 267 | 275 | 289 |
| WEIMAR | COLORADO | LAVACA | 110 | 115 | 119 | 115 | 120 | 125 |
| **Total Municipal Water Totals** | | | **3,155** | **3,292** | **3,328** | **3,259** | **3,320** | **3,409** |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | 55,427 | 53,120 | 50,889 | 48,729 | 46,629 | 44,619 |
| IRRIGATION | COLORADO | COLORADO | 26,910 | 25,791 | 24,707 | 23,659 | 22,639 | 21,663 |
| IRRIGATION | COLORADO | LAVACA | 118,485 | 113,554 | 108,784 | 104,167 | 99,678 | 95,381 |
| **Total Irrigation Water Totals** | | | **200,822** | **192,465** | **184,380** | **176,555** | **168,946** | **161,663** |
| LIVESTOCK | COLORADO | BRAZOS-COLORADO | 103 | 103 | 103 | 103 | 103 | 103 |
| LIVESTOCK | COLORADO | COLORADO | 899 | 899 | 899 | 899 | 899 | 899 |
| LIVESTOCK | COLORADO | LAVACA | 471 | 471 | 471 | 471 | 471 | 471 |
| **Total Livestock Water Totals** | | | **1,473** | **1,473** | **1,473** | **1,473** | **1,473** | **1,473** |
| MANUFACTURING | COLORADO | BRAZOS-COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | COLORADO | COLORADO | 176 | 192 | 205 | 217 | 227 | 245 |
| MANUFACTURING | COLORADO | LAVACA | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Manufacturing Water Totals** | | | **176** | **192** | **205** | **217** | **227** | **245** |
| MINING | COLORADO | BRAZOS-COLORADO | 119 | 122 | 123 | 124 | 125 | 126 |
| MINING | COLORADO | COLORADO | 18,958 | 19,316 | 19,515 | 19,704 | 19,885 | 20,044 |
| MINING | COLORADO | LAVACA | 1,727 | 1,759 | 1,778 | 1,795 | 1,811 | 1,826 |
| **Total Mining Water Totals** | | | **20,804** | **21,197** | **21,416** | **21,623** | **21,821** | **21,996** |
| STEAM ELECTRIC POWER | COLORADO | BRAZOS-COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | COLORADO | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | COLORADO | LAVACA | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **COLORADO COUNTY TOTAL WATER TOTALS** | | | **226,430** | **218,619** | **210,802** | **203,127** | **195,787** | **188,786** |
| AQUA WSC | FAYETTE | COLORADO | 90 | 115 | 135 | 150 | 168 | 194 |
| COUNTY-OTHER | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | FAYETTE | COLORADO | 464 | 307 | 206 | 137 | 93 | 64 |
| COUNTY-OTHER | FAYETTE | GUADALUPE | 31 | 18 | 11 | 6 | 4 | 2 |
| COUNTY-OTHER | FAYETTE | LAVACA | 185 | 111 | 68 | 41 | 25 | 16 |
| FAYETTE WSC | FAYETTE | COLORADO | 846 | 1,193 | 1,464 | 1,676 | 1,933 | 2,274 |
| FAYETTE WSC | FAYETTE | LAVACA | 74 | 105 | 129 | 147 | 170 | 200 |
| FLATONIA | FAYETTE | GUADALUPE | 76 | 82 | 88 | 92 | 97 | 105 |
| FLATONIA | FAYETTE | LAVACA | 263 | 286 | 306 | 319 | 337 | 363 |
| LA GRANGE | FAYETTE | COLORADO | 963 | 1,129 | 1,264 | 1,362 | 1,483 | 1,656 |
| LEE COUNTY WSC | FAYETTE | COLORADO | 254 | 338 | 407 | 461 | 522 | 609 |
| SCHULENBURG | FAYETTE | LAVACA | 644 | 733 | 801 | 853 | 919 | 1,012 |
| **Total Municipal Water Totals** | | | **3,890** | **4,417** | **4,879** | **5,244** | **5,751** | **6,495** |
| IRRIGATION | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| IRRIGATION | FAYETTE | COLORADO | 702 | 657 | 615 | 575 | 539 | 506 |
| IRRIGATION | FAYETTE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| IRRIGATION | FAYETTE | LAVACA | 37 | 35 | 33 | 31 | 29 | 27 |
| **Total Irrigation Water Totals** | | | **739** | **692** | **648** | **606** | **568** | **533** |
| LIVESTOCK | FAYETTE | BRAZOS | 24 | 24 | 24 | 24 | 24 | 24 |

# Region K Water Demand Projections by Water User Group

| | | | Water Demand (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| LIVESTOCK | FAYETTE | COLORADO | 1,774 | 1,774 | 1,774 | 1,774 | 1,774 | 1,774 |
| LIVESTOCK | FAYETTE | GUADALUPE | 144 | 144 | 144 | 144 | 144 | 144 |
| LIVESTOCK | FAYETTE | LAVACA | 455 | 455 | 455 | 455 | 455 | 455 |
| **Total Livestock Water Totals** | | | **2,397** | **2,397** | **2,397** | **2,397** | **2,397** | **2,397** |
| MANUFACTURING | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | FAYETTE | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | FAYETTE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | FAYETTE | LAVACA | 205 | 230 | 254 | 277 | 297 | 322 |
| **Total Manufacturing Water Totals** | | | **205** | **230** | **254** | **277** | **297** | **322** |
| MINING | FAYETTE | BRAZOS | 29 | 29 | 29 | 29 | 29 | 29 |
| MINING | FAYETTE | COLORADO | 4 | 4 | 4 | 4 | 4 | 4 |
| MINING | FAYETTE | GUADALUPE | 7 | 7 | 7 | 7 | 7 | 7 |
| MINING | FAYETTE | LAVACA | 2 | 2 | 2 | 2 | 2 | 2 |
| **Total Mining Water Totals** | | | **42** | **42** | **42** | **42** | **42** | **42** |
| STEAM ELECTRIC POWER | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | FAYETTE | COLORADO | 29,622 | 29,702 | 33,002 | 63,843 | 63,843 | 69,753 |
| STEAM ELECTRIC POWER | FAYETTE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | FAYETTE | LAVACA | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **29,622** | **29,702** | **33,002** | **63,843** | **63,843** | **69,753** |
| **FAYETTE COUNTY TOTAL WATER TOTALS** | | | **36,895** | **37,480** | **41,222** | **72,409** | **72,898** | **79,542** |
| COUNTY-OTHER | GILLESPIE | COLORADO | 1,581 | 1,754 | 1,786 | 1,750 | 1,732 | 1,732 |
| COUNTY-OTHER | GILLESPIE | GUADALUPE | 55 | 61 | 62 | 61 | 60 | 60 |
| FREDERICKSBURG | GILLESPIE | COLORADO | 3,113 | 3,583 | 3,798 | 3,765 | 3,749 | 3,749 |
| **Total Municipal Water Totals** | | | **4,749** | **5,398** | **5,646** | **5,576** | **5,541** | **5,541** |
| IRRIGATION | GILLESPIE | COLORADO | 2,039 | 2,013 | 1,987 | 1,960 | 1,936 | 1,912 |
| IRRIGATION | GILLESPIE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Irrigation Water Totals** | | | **2,039** | **2,013** | **1,987** | **1,960** | **1,936** | **1,912** |
| LIVESTOCK | GILLESPIE | COLORADO | 1,041 | 1,041 | 1,041 | 1,041 | 1,041 | 1,041 |
| LIVESTOCK | GILLESPIE | GUADALUPE | 21 | 21 | 21 | 21 | 21 | 21 |
| **Total Livestock Water Totals** | | | **1,062** | **1,062** | **1,062** | **1,062** | **1,062** | **1,062** |
| MANUFACTURING | GILLESPIE | COLORADO | 506 | 539 | 566 | 591 | 612 | 655 |
| MANUFACTURING | GILLESPIE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Manufacturing Water Totals** | | | **506** | **539** | **566** | **591** | **612** | **655** |
| MINING | GILLESPIE | COLORADO | 8 | 8 | 8 | 8 | 8 | 8 |
| MINING | GILLESPIE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Mining Water Totals** | | | **8** | **8** | **8** | **8** | **8** | **8** |
| STEAM ELECTRIC POWER | GILLESPIE | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | GILLESPIE | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **GILLESPIE COUNTY TOTAL WATER TOTALS** | | | **8,364** | **9,020** | **9,269** | **9,197** | **9,159** | **9,178** |
| BUDA | HAYS | COLORADO | 1,454 | 2,128 | 2,603 | 3,088 | 3,666 | 4,140 |
| CIMARRON PARK WATER | HAYS | COLORADO | 403 | 489 | 582 | 676 | 789 | 882 |
| COUNTY-OTHER | HAYS | COLORADO | 3,359 | 4,864 | 6,208 | 7,576 | 9,277 | 10,615 |
| DRIPPING SPRINGS | HAYS | COLORADO | 1,080 | 1,856 | 2,297 | 2,745 | 3,300 | 3,736 |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | 348 | 501 | 660 | 817 | 1,013 | 1,166 |

# Region K Water Demand Projections by Water User Group

| | | | Water Demand (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| WUG Name | County | River Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| HILL COUNTRY WSC | HAYS | COLORADO | 440 | 702 | 980 | 1,249 | 1,582 | 1,844 |
| MOUNTAIN CITY | HAYS | COLORADO | 118 | 116 | 116 | 115 | 115 | 115 |
| **Total Municipal Water Totals** | | | **7,202** | **10,656** | **13,446** | **16,266** | **19,742** | **22,498** |
| IRRIGATION | HAYS | COLORADO | 11 | 11 | 11 | 11 | 11 | 11 |
| **Total Irrigation Water Totals** | | | **11** | **11** | **11** | **11** | **11** | **11** |
| LIVESTOCK | HAYS | COLORADO | 220 | 220 | 220 | 220 | 220 | 220 |
| **Total Livestock Water Totals** | | | **220** | **220** | **220** | **220** | **220** | **220** |
| MANUFACTURING | HAYS | COLORADO | 691 | 809 | 928 | 1,048 | 1,156 | 1,255 |
| **Total Manufacturing Water Totals** | | | **691** | **809** | **928** | **1,048** | **1,156** | **1,255** |
| MINING | HAYS | COLORADO | 12 | 6 | 2 | 0 | 0 | 0 |
| **Total Mining Water Totals** | | | **12** | **6** | **2** | **0** | **0** | **0** |
| STEAM ELECTRIC POWER | HAYS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **HAYS COUNTY TOTAL WATER TOTALS** | | | **8,136** | **11,702** | **14,607** | **17,545** | **21,129** | **23,984** |
| COUNTY-OTHER [2] | LLANO | COLORADO | 1,991 | 2,243 | 2,428 | 2,608 | 2,784 | 2,970 |
| KINGSLAND WSC | LLANO | COLORADO | 689 | 734 | 731 | 729 | 737 | 751 |
| LAKE LBJ MUD | LLANO | COLORADO | 1,665 | 1,785 | 1,800 | 1,813 | 1,839 | 1,874 |
| LLANO | LLANO | COLORADO | 1,177 | 1,258 | 1,270 | 1,279 | 1,294 | 1,319 |
| SUNRISE BEACH VILLAGE | LLANO | COLORADO | 200 | 215 | 217 | 218 | 221 | 225 |
| **Total Municipal Water Totals** | | | **5,722** | **6,235** | **6,446** | **6,647** | **6,875** | **7,139** |
| IRRIGATION | LLANO | COLORADO | 979 | 963 | 946 | 930 | 915 | 900 |
| **Total Irrigation Water Totals** | | | **979** | **963** | **946** | **930** | **915** | **900** |
| LIVESTOCK | LLANO | COLORADO | 751 | 751 | 751 | 751 | 751 | 751 |
| **Total Livestock Water Totals** | | | **751** | **751** | **751** | **751** | **751** | **751** |
| MANUFACTURING | LLANO | COLORADO | 3 | 3 | 3 | 3 | 3 | 3 |
| **Total Manufacturing Water Totals** | | | **3** | **3** | **3** | **3** | **3** | **3** |
| MINING | LLANO | COLORADO | 149 | 148 | 148 | 148 | 148 | 148 |
| **Total Mining Water Totals** | | | **149** | **148** | **148** | **148** | **148** | **148** |
| STEAM ELECTRIC POWER | LLANO | COLORADO | 1,500 | 1,500 | 1,500 | 15,000 | 15,000 | 15,000 |
| **Total Steam Electric Power Water Totals** | | | **1,500** | **1,500** | **1,500** | **15,000** | **15,000** | **15,000** |
| **LLANO COUNTY TOTAL WATER TOTALS** | | | **9,104** | **9,600** | **9,794** | **23,479** | **23,692** | **23,941** |
| BAY CITY | MATAGORDA | BRAZOS-COLORADO | 3,236 | 3,387 | 3,445 | 3,441 | 3,416 | 3,416 |
| COUNTY-OTHER | MATAGORDA | BRAZOS-COLORADO | 787 | 815 | 819 | 808 | 798 | 798 |
| COUNTY-OTHER | MATAGORDA | COLORADO | 158 | 164 | 164 | 162 | 160 | 160 |
| COUNTY-OTHER | MATAGORDA | COLORADO-LAVACA | 581 | 601 | 604 | 596 | 589 | 589 |
| ORBIT SYSTEMS INC | MATAGORDA | COLORADO-LAVACA | 2 | 2 | 2 | 2 | 2 | 2 |
| PALACIOS | MATAGORDA | COLORADO-LAVACA | 745 | 777 | 787 | 789 | 782 | 782 |
| SOUTHWEST UTILITIES | MATAGORDA | BRAZOS-COLORADO | 81 | 84 | 85 | 85 | 84 | 84 |
| **Total Municipal Water Totals** | | | **5,590** | **5,830** | **5,906** | **5,883** | **5,831** | **5,831** |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | 90,733 | 87,454 | 84,296 | 81,271 | 78,359 | 75,553 |
| IRRIGATION | MATAGORDA | COLORADO | 11,583 | 11,164 | 10,761 | 10,375 | 10,003 | 9,645 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | 90,732 | 87,454 | 84,296 | 81,270 | 78,360 | 75,552 |
| **Total Irrigation Water Totals** | | | **193,048** | **186,072** | **179,353** | **172,916** | **166,722** | **160,750** |
| LIVESTOCK | MATAGORDA | BRAZOS-COLORADO | 529 | 529 | 529 | 529 | 529 | 529 |
| LIVESTOCK | MATAGORDA | COLORADO | 136 | 136 | 136 | 136 | 136 | 136 |

# Region K Water Demand Projections by Water User Group

| | | | Water Demand (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| LIVESTOCK | MATAGORDA | COLORADO-LAVACA | 486 | 486 | 486 | 486 | 486 | 486 |
| **Total Livestock Water Totals** | | | **1,151** | **1,151** | **1,151** | **1,151** | **1,151** | **1,151** |
| MANUFACTURING | MATAGORDA | BRAZOS-COLORADO | 6,369 | 6,930 | 7,316 | 7,680 | 7,979 | 8,507 |
| MANUFACTURING | MATAGORDA | COLORADO | 5,811 | 6,323 | 6,675 | 7,006 | 7,280 | 7,760 |
| MANUFACTURING | MATAGORDA | COLORADO-LAVACA | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Manufacturing Water Totals** | | | **12,180** | **13,253** | **13,991** | **14,686** | **15,259** | **16,267** |
| MINING | MATAGORDA | BRAZOS-COLORADO | 5 | 5 | 5 | 5 | 5 | 5 |
| MINING | MATAGORDA | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| MINING | MATAGORDA | COLORADO-LAVACA | 172 | 167 | 164 | 162 | 160 | 158 |
| **Total Mining Water Totals** | | | **177** | **172** | **169** | **167** | **165** | **163** |
| STEAM ELECTRIC POWER | MATAGORDA | BRAZOS-COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | 83,000 | 135,000 | 135,000 | 135,000 | 135,000 | 135,000 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO-LAVACA | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **83,000** | **135,000** | **135,000** | **135,000** | **135,000** | **135,000** |
| **MATAGORDA COUNTY TOTAL WATER TOTALS** | | | **295,146** | **341,478** | **335,570** | **329,803** | **324,128** | **319,162** |
| BROOKSMITH SUD | MILLS | COLORADO | 7 | 8 | 8 | 8 | 8 | 7 |
| COUNTY-OTHER | MILLS | BRAZOS | 176 | 179 | 185 | 171 | 187 | 195 |
| COUNTY-OTHER | MILLS | COLORADO | 258 | 262 | 271 | 251 | 274 | 286 |
| GOLDTHWAITE | MILLS | BRAZOS | 9 | 10 | 10 | 10 | 9 | 9 |
| GOLDTHWAITE | MILLS | COLORADO | 560 | 611 | 619 | 613 | 608 | 607 |
| **Total Municipal Water Totals** | | | **1,010** | **1,070** | **1,093** | **1,053** | **1,086** | **1,104** |
| IRRIGATION | MILLS | BRAZOS | 323 | 316 | 309 | 302 | 296 | 289 |
| IRRIGATION | MILLS | COLORADO | 2,613 | 2,556 | 2,501 | 2,447 | 2,393 | 2,342 |
| **Total Irrigation Water Totals** | | | **2,936** | **2,872** | **2,810** | **2,749** | **2,689** | **2,631** |
| LIVESTOCK | MILLS | BRAZOS | 367 | 367 | 367 | 367 | 367 | 367 |
| LIVESTOCK | MILLS | COLORADO | 551 | 551 | 551 | 551 | 551 | 551 |
| **Total Livestock Water Totals** | | | **918** | **918** | **918** | **918** | **918** | **918** |
| MANUFACTURING | MILLS | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| MANUFACTURING | MILLS | COLORADO | 1 | 1 | 1 | 1 | 1 | 1 |
| **Total Manufacturing Water Totals** | | | **1** | **1** | **1** | **1** | **1** | **1** |
| MINING | MILLS | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| MINING | MILLS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Mining Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| STEAM ELECTRIC POWER | MILLS | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| STEAM ELECTRIC POWER | MILLS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **MILLS COUNTY TOTAL WATER TOTALS** | | | **4,865** | **4,861** | **4,822** | **4,721** | **4,694** | **4,654** |
| COUNTY-OTHER | SAN SABA | COLORADO | 227 | 240 | 252 | 264 | 262 | 265 |
| RICHLAND SUD | SAN SABA | COLORADO | 188 | 199 | 207 | 213 | 213 | 215 |
| SAN SABA | SAN SABA | COLORADO | 884 | 877 | 869 | 862 | 856 | 856 |
| **Total Municipal Water Totals** | | | **1,299** | **1,316** | **1,328** | **1,339** | **1,331** | **1,336** |
| IRRIGATION | SAN SABA | COLORADO | 3,240 | 3,136 | 3,035 | 2,937 | 2,841 | 2,749 |
| **Total Irrigation Water Totals** | | | **3,240** | **3,136** | **3,035** | **2,937** | **2,841** | **2,749** |
| LIVESTOCK | SAN SABA | COLORADO | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 |
| **Total Livestock Water Totals** | | | **1,191** | **1,191** | **1,191** | **1,191** | **1,191** | **1,191** |

# Region K Water Demand Projections by Water User Group

| WUG Name | County | River Basin | Water Demand (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| MANUFACTURING | SAN SABA | COLORADO | 28 | 30 | 31 | 32 | 33 | 35 |
| **Total Manufacturing Water Totals** | | | **28** | **30** | **31** | **32** | **33** | **35** |
| MINING | SAN SABA | COLORADO | 163 | 163 | 163 | 163 | 163 | 163 |
| **Total Mining Water Totals** | | | **163** | **163** | **163** | **163** | **163** | **163** |
| STEAM ELECTRIC POWER | SAN SABA | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **SAN SABA COUNTY TOTAL WATER TOTALS** | | | **5,921** | **5,836** | **5,748** | **5,662** | **5,559** | **5,474** |
| ANDERSON MILL MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| AQUA WSC | TRAVIS | COLORADO | 1,421 | 1,634 | 1,815 | 1,938 | 2,066 | 2,214 |
| AUSTIN | TRAVIS | COLORADO | 150,180 | 179,861 | 212,133 | 241,074 | 271,296 | 293,095 |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | 401 | 398 | 395 | 393 | 391 | 391 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | 1,177 | 1,413 | 1,647 | 1,856 | 2,009 | 2,164 |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | 254 | 299 | 345 | 387 | 417 | 449 |
| CEDAR PARK | TRAVIS | COLORADO | 188 | 290 | 384 | 443 | 506 | 570 |
| COUNTY-OTHER [3] | TRAVIS | COLORADO | 8,343 | 8,662 | 7,907 | 7,648 | 7,952 | 8,675 |
| COUNTY-OTHER | TRAVIS | GUADALUPE | 1 | 1 | 1 | 1 | 1 | 1 |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | 612 | 717 | 820 | 884 | 951 | 1,030 |
| CREEDMOOR-MAHA WSC | TRAVIS | GUADALUPE | 16 | 19 | 21 | 23 | 25 | 27 |
| ELGIN | TRAVIS | COLORADO | 14 | 17 | 19 | 22 | 24 | 25 |
| GOFORTH WSC | TRAVIS | COLORADO | 30 | 39 | 47 | 52 | 58 | 63 |
| HILL COUNTRY WSC | TRAVIS | COLORADO | 238 | 364 | 484 | 555 | 633 | 714 |
| JONESTOWN | TRAVIS | COLORADO | 467 | 548 | 625 | 700 | 751 | 809 |
| JONESTOWN WSC | TRAVIS | COLORADO | 122 | 145 | 164 | 176 | 190 | 205 |
| LAGO VISTA | TRAVIS | COLORADO | 2,260 | 2,702 | 3,142 | 3,536 | 3,830 | 4,124 |
| LAKEWAY | TRAVIS | COLORADO | 4,750 | 5,682 | 6,582 | 7,407 | 8,023 | 8,641 |
| LAKEWAY MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| LOOP 360 WSC | TRAVIS | COLORADO | 1,228 | 1,225 | 1,221 | 1,218 | 1,218 | 1,218 |
| LOST CREEK MUD | TRAVIS | COLORADO | 935 | 921 | 906 | 891 | 882 | 882 |
| MANOR | TRAVIS | COLORADO | 1,356 | 1,601 | 1,834 | 2,051 | 2,213 | 2,378 |
| MANVILLE WSC | TRAVIS | COLORADO | 1,731 | 2,350 | 2,898 | 3,237 | 3,622 | 4,019 |
| MUSTANG RIDGE | TRAVIS | COLORADO | 93 | 111 | 128 | 139 | 150 | 162 |
| MUSTANG RIDGE | TRAVIS | GUADALUPE | 25 | 30 | 34 | 37 | 40 | 43 |
| NORTH AUSTIN MUD #1 | TRAVIS | COLORADO | 109 | 107 | 106 | 103 | 102 | 102 |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | COLORADO | 514 | 792 | 1,045 | 1,196 | 1,366 | 1,540 |
| PFLUGERVILLE | TRAVIS | COLORADO | 6,899 | 8,204 | 9,505 | 10,664 | 11,552 | 12,441 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | 1,470 | 1,723 | 1,723 | 1,717 | 1,717 | 1,717 |
| ROLLINGWOOD | TRAVIS | COLORADO | 377 | 376 | 374 | 372 | 371 | 373 |
| ROUND ROCK | TRAVIS | COLORADO | 399 | 605 | 792 | 909 | 1,036 | 1,167 |
| SAN LEANNA | TRAVIS | COLORADO | 100 | 120 | 140 | 158 | 171 | 184 |
| SHADY HOLLOW MUD | TRAVIS | COLORADO | 747 | 731 | 716 | 700 | 694 | 694 |
| THE HILLS | TRAVIS | COLORADO | 567 | 733 | 733 | 729 | 729 | 729 |
| TRAVIS COUNTY WCID #17 | TRAVIS | COLORADO | 4,712 | 5,752 | 6,331 | 6,990 | 7,339 | 7,777 |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | 853 | 1,075 | 1,278 | 1,404 | 1,535 | 1,683 |
| TRAVIS COUNTY WCID #19 | TRAVIS | COLORADO | 376 | 374 | 372 | 371 | 371 | 371 |
| TRAVIS COUNTY WCID #20 | TRAVIS | COLORADO | 462 | 460 | 457 | 456 | 455 | 455 |

# Region K Water Demand Projections by Water User Group

| | | | Water Demand (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| WELLS BRANCH MUD | TRAVIS | COLORADO | 1,508 | 1,490 | 1,472 | 1,444 | 1,435 | 1,435 |
| WEST LAKE HILLS | TRAVIS | COLORADO | 1,605 | 1,833 | 2,049 | 2,178 | 2,320 | 2,471 |
| WEST TRAVIS COUNTY | TRAVIS | COLORADO | 782 | 1,114 | 1,420 | 1,605 | 1,811 | 2,023 |
| WILLIAMSON-TRAVIS COUNTY | TRAVIS | COLORADO | 198 | 274 | 344 | 385 | 433 | 482 |
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | 2,157 | 2,222 | 2,201 | 2,180 | 2,180 | 2,180 |
| **Total Municipal Water Totals** | | | **199,677** | **237,014** | **274,610** | **308,229** | **342,865** | **369,723** |
| IRRIGATION | TRAVIS | COLORADO | 1,002 | 920 | 846 | 778 | 716 | 659 |
| IRRIGATION | TRAVIS | GUADALUPE | 124 | 114 | 105 | 97 | 89 | 82 |
| **Total Irrigation Water Totals** | | | **1,126** | **1,034** | **951** | **875** | **805** | **741** |
| LIVESTOCK | TRAVIS | COLORADO | 676 | 676 | 676 | 676 | 676 | 676 |
| LIVESTOCK | TRAVIS | GUADALUPE | 28 | 28 | 28 | 28 | 28 | 28 |
| **Total Livestock Water Totals** | | | **704** | **704** | **704** | **704** | **704** | **704** |
| MANUFACTURING | TRAVIS | COLORADO | 23,002 | 28,294 | 38,508 | 50,483 | 57,703 | 64,652 |
| MANUFACTURING | TRAVIS | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Manufacturing Water Totals** | | | **23,002** | **28,294** | **38,508** | **50,483** | **57,703** | **64,652** |
| MINING | TRAVIS | COLORADO | 1,531 | 1,649 | 1,727 | 1,804 | 1,880 | 1,935 |
| MINING | TRAVIS | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Mining Water Totals** | | | **1,531** | **1,649** | **1,727** | **1,804** | **1,880** | **1,935** |
| STEAM ELECTRIC POWER | TRAVIS | COLORADO | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| STEAM ELECTRIC POWER | TRAVIS | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **17,500** | **18,500** | **22,500** | **23,500** | **27,500** | **28,500** |
| **TRAVIS COUNTY TOTAL WATER TOTALS** | | | **243,540** | **287,195** | **339,000** | **385,595** | **431,457** | **466,255** |
| COUNTY-OTHER | WHARTON | BRAZOS-COLORADO | 1,162 | 1,192 | 1,197 | 1,181 | 1,170 | 1,157 |
| COUNTY-OTHER | WHARTON | COLORADO | 439 | 450 | 451 | 446 | 441 | 436 |
| COUNTY-OTHER | WHARTON | COLORADO-LAVACA | 235 | 241 | 241 | 238 | 236 | 234 |
| EAST BERNARD | WHARTON | BRAZOS-COLORADO | 277 | 285 | 286 | 282 | 279 | 276 |
| WHARTON | WHARTON | BRAZOS-COLORADO | 1,141 | 1,175 | 1,191 | 1,189 | 1,181 | 1,169 |
| WHARTON | WHARTON | COLORADO | 522 | 537 | 544 | 544 | 540 | 534 |
| **Total Municipal Water Totals** | | | **3,776** | **3,880** | **3,910** | **3,880** | **3,847** | **3,806** |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | 99,711 | 96,144 | 92,703 | 89,390 | 86,193 | 74,059 |
| IRRIGATION | WHARTON | COLORADO | 51,772 | 49,921 | 48,135 | 46,413 | 44,753 | 38,454 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | 31,502 | 30,376 | 29,289 | 28,241 | 27,231 | 23,398 |
| **Total Irrigation Water Totals** | | | **182,985** | **176,441** | **170,127** | **164,044** | **158,177** | **135,911** |
| LIVESTOCK | WHARTON | BRAZOS-COLORADO | 321 | 321 | 321 | 321 | 321 | 321 |
| LIVESTOCK | WHARTON | COLORADO | 247 | 247 | 247 | 247 | 247 | 247 |
| LIVESTOCK | WHARTON | COLORADO-LAVACA | 160 | 160 | 160 | 160 | 160 | 160 |
| **Total Livestock Water Totals** | | | **728** | **728** | **728** | **728** | **728** | **728** |
| MANUFACTURING | WHARTON | BRAZOS-COLORADO | 62 | 68 | 73 | 78 | 82 | 88 |
| MANUFACTURING | WHARTON | COLORADO | 129 | 141 | 150 | 160 | 168 | 181 |
| MANUFACTURING | WHARTON | COLORADO-LAVACA | 122 | 134 | 143 | 152 | 160 | 173 |
| **Total Manufacturing Water Totals** | | | **313** | **343** | **366** | **390** | **410** | **442** |
| MINING | WHARTON | BRAZOS-COLORADO | 724 | 766 | 791 | 815 | 836 | 856 |
| MINING | WHARTON | COLORADO | 1 | 1 | 1 | 1 | 1 | 1 |
| MINING | WHARTON | COLORADO-LAVACA | 6 | 6 | 6 | 6 | 7 | 7 |
| **Total Mining Water Totals** | | | **731** | **773** | **798** | **822** | **844** | **864** |

# Region K Water Demand Projections by Water User Group

| | | | Water Demand (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| STEAM ELECTRIC POWER | WHARTON | BRAZOS-COLORADO | 245 | 351 | 411 | 483 | 572 | 679 |
| STEAM ELECTRIC POWER | WHARTON | COLORADO | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 |
| STEAM ELECTRIC POWER | WHARTON | COLORADO-LAVACA | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **2,545** | **2,651** | **2,711** | **2,783** | **2,872** | **2,979** |
| **WHARTON COUNTY TOTAL WATER TOTALS** | | | **191,078** | **184,816** | **178,640** | **172,647** | **166,878** | **144,730** |
| ANDERSON MILL MUD | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| AUSTIN | WILLIAMSON | BRAZOS | 5,457 | 7,398 | 9,691 | 12,161 | 14,834 | 17,693 |
| COUNTY-OTHER | WILLIAMSON | BRAZOS | 2,401 | 2,729 | 3,118 | 3,536 | 3,989 | 4,469 |
| NORTH AUSTIN MUD #1 | WILLIAMSON | BRAZOS | 983 | 968 | 952 | 928 | 920 | 920 |
| **Total Municipal Water Totals** | | | **8,841** | **11,095** | **13,761** | **16,625** | **19,743** | **23,082** |
| IRRIGATION | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Irrigation Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| LIVESTOCK | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Livestock Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| MANUFACTURING | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Manufacturing Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| MINING | WILLIAMSON | BRAZOS | 9 | 5 | 1 | 0 | 0 | 0 |
| **Total Mining Water Totals** | | | **9** | **5** | **1** | **0** | **0** | **0** |
| STEAM ELECTRIC POWER | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Steam Electric Power Water Totals** | | | **0** | **0** | **0** | **0** | **0** | **0** |
| **WILLIAMSON COUNTY TOTAL WATER TOTALS** | | | **8,850** | **11,100** | **13,762** | **16,625** | **19,743** | **23,082** |
| **REGION K TOTALS** | | | **1,086,692** | **1,180,160** | **1,231,018** | **1,315,609** | **1,359,261** | **1,382,534** |

[1] Demand includes domestic lake use that is not accounted for in water usage data in the following annual amounts: 962 ac-ft (2010), 1162 ac-ft (2020), 1362 ac-ft (2030), 1562 ac-ft (2040), 1762 ac-ft (2050), 1962 ac-ft (2060)

[2] Demand includes domestic lake use that is not accounted for in water usage data in the following annual amounts: 768 ac-ft (2010), 928 ac-ft (2020), 1087 ac-ft (2030), 1247 ac-ft (2040), 1406 ac-ft (2050), 1566 ac-ft (2060)

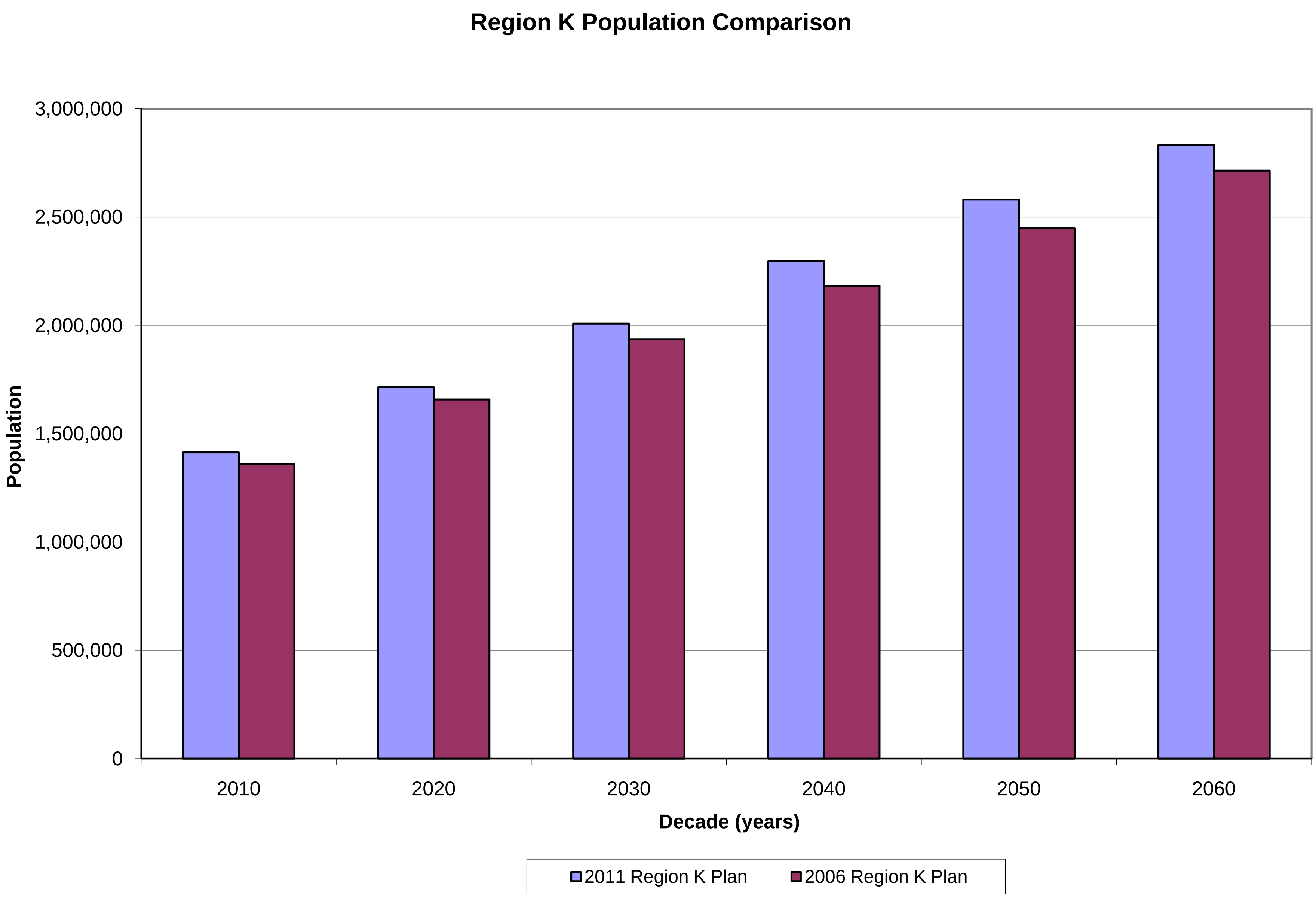
[3] Demand includes domestic lake use that is not accounted for in water usage data in the following annual amounts: 3082 ac-ft (2010), 3722 ac-ft (2020), 4363 ac-ft (2030), 5003 ac-ft (2040), 5644 ac-ft (2050), 6284 ac-ft (2060)

## Population

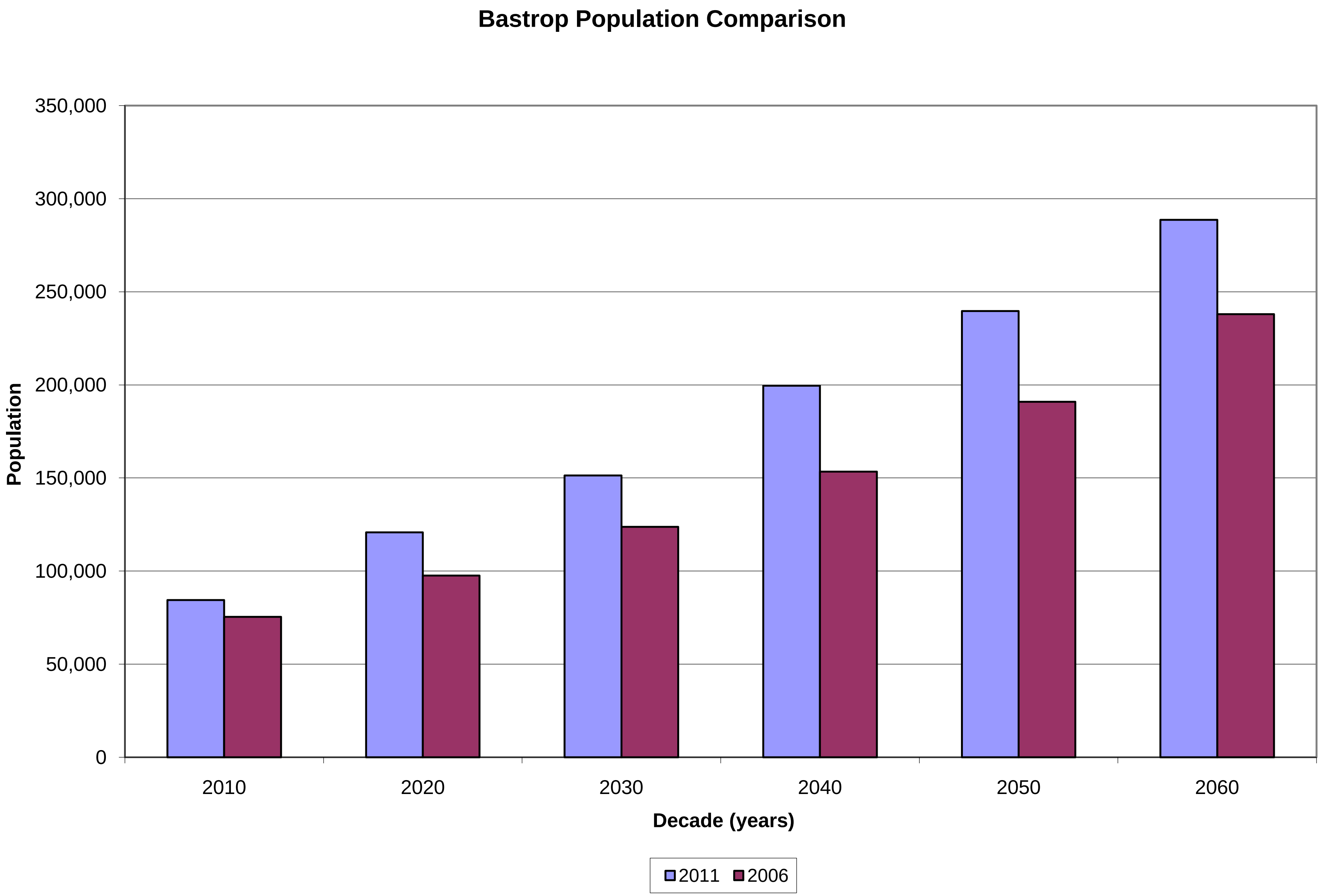
| RWP | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Region K** | | | | | | |
| 2011 | 1,412,834 | 1,714,281 | 2,008,141 | 2,295,627 | 2,580,534 | 2,831,937 |
| 2006 | 1,359,677 | 1,657,025 | 1,936,324 | 2,181,851 | 2,447,058 | 2,713,905 |
| Difference | 53,157 | 57,256 | 71,817 | 113,776 | 133,476 | 118,032 |
| % Change | 3.9 | 3.5 | 3.7 | 5.2 | 5.5 | 4.3 |
| **Bastrop** | | | | | | |
| 2011 | 84,449 | 120,739 | 151,364 | 199,548 | 239,589 | 288,683 |
| 2006 | 75,386 | 97,601 | 123,734 | 153,392 | 190,949 | 237,958 |
| Difference | 9,063 | 23,138 | 27,630 | 46,156 | 48,640 | 50,725 |
| % Change | 12.0 | 23.7 | 22.3 | 30.1 | 25.5 | 21.3 |
| **Blanco** | | | | | | |
| 2011 | 9,946 | 11,756 | 13,487 | 15,002 | 16,641 | 18,544 |
| 2006 | 9,946 | 11,756 | 13,487 | 15,002 | 16,641 | 18,544 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Burnet** | | | | | | |
| 2011 | 47,160 | 61,191 | 78,133 | 94,716 | 105,095 | 115,056 |
| 2006 | 41,924 | 51,044 | 60,382 | 69,271 | 78,981 | 90,263 |
| Difference | 5,236 | 10,147 | 17,751 | 25,445 | 26,114 | 24,793 |
| % Change | 12.5 | 19.9 | 29.4 | 36.7 | 33.1 | 27.5 |
| **Colorado** | | | | | | |
| 2011 | 21,239 | 22,591 | 23,311 | 23,424 | 23,900 | 24,324 |
| 2006 | 21,101 | 22,032 | 22,550 | 22,760 | 22,801 | 22,561 |
| Difference | 138 | 559 | 761 | 664 | 1,099 | 1,763 |
| % Change | 0.7 | 2.5 | 3.4 | 2.9 | 4.8 | 7.8 |
| **Fayette** | | | | | | |
| 2011 | 24,826 | 28,808 | 32,363 | 35,259 | 38,933 | 44,120 |
| 2006 | 24,826 | 28,808 | 32,363 | 35,259 | 38,933 | 44,120 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Gillespie** | | | | | | |
| 2011 | 25,258 | 29,117 | 30,861 | 30,861 | 30,861 | 30,861 |
| 2006 | 24,089 | 27,510 | 28,845 | 28,845 | 28,845 | 28,845 |
| Difference | 1,169 | 1,607 | 2,016 | 2,016 | 2,016 | 2,016 |
| % Change | 4.9 | 5.8 | 7.0 | 7.0 | 7.0 | 7.0 |
| **Hays** | | | | | | |
| 2011 | 46,143 | 69,377 | 88,887 | 108,495 | 132,051 | 150,574 |
| 2006 | 46,143 | 69,377 | 88,887 | 108,495 | 132,051 | 150,574 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

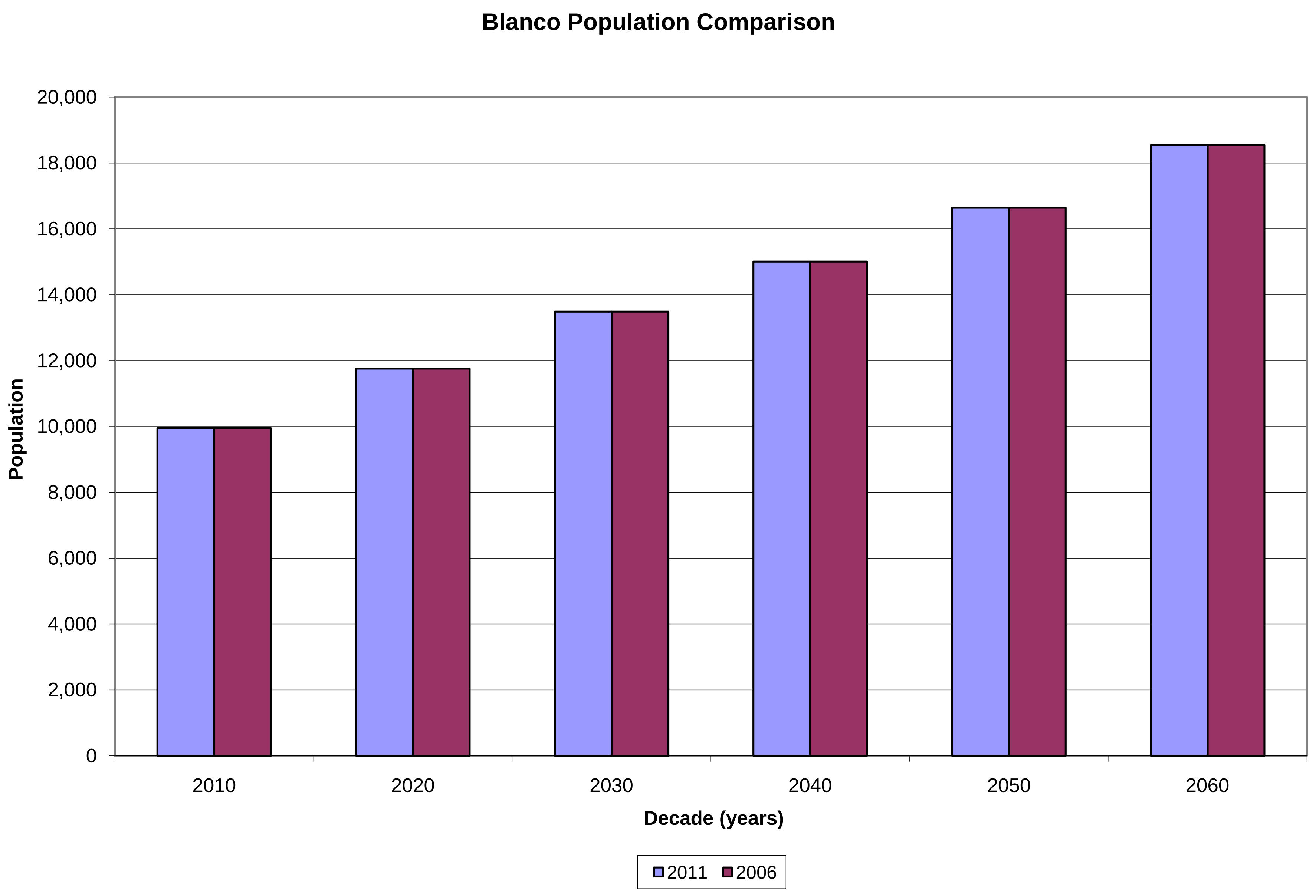
## Population

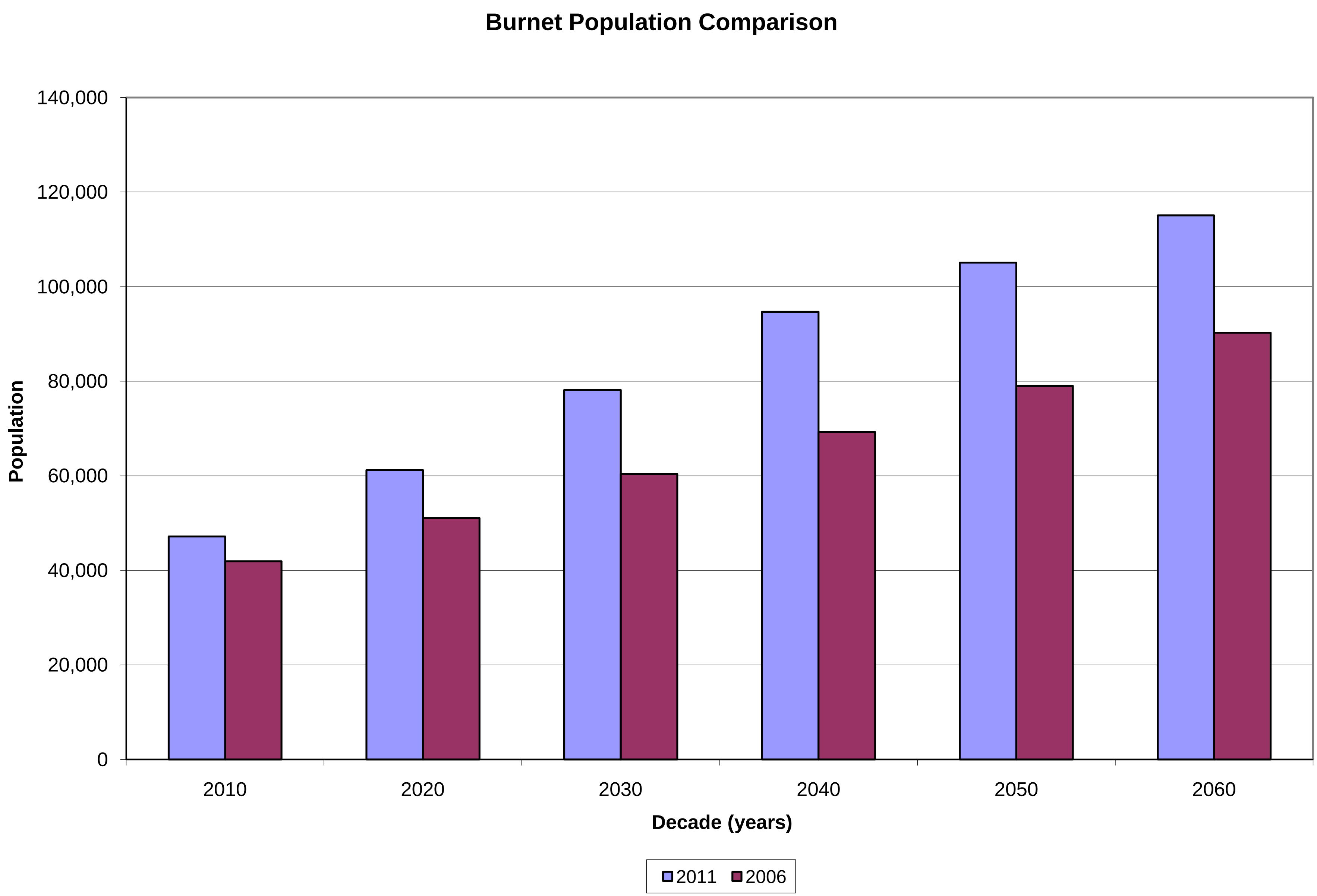
| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Llano** | | | | | | |
| 2011 | 21,284 | 23,007 | 23,471 | 23,932 | 24,393 | 24,855 |
| 2006 | 17,360 | 17,360 | 17,360 | 17,360 | 17,360 | 17,360 |
| Difference | 3,924 | 5,647 | 6,111 | 6,572 | 7,033 | 7,495 |
| % Change | 22.6 | 32.5 | 35.2 | 37.9 | 40.5 | 43.2 |
| **Matagorda** | | | | | | |
| 2011 | 40,506 | 43,295 | 44,991 | 45,925 | 45,925 | 45,925 |
| 2006 | 40,506 | 43,295 | 44,991 | 45,925 | 45,793 | 45,377 |
| Difference | 0 | 0 | 0 | 0 | 132 | 548 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.2 |
| **Mills** | | | | | | |
| 2011 | 5,466 | 5,815 | 6,107 | 5,930 | 6,329 | 6,497 |
| 2006 | 5,137 | 5,414 | 5,476 | 5,537 | 5,497 | 5,397 |
| Difference | 329 | 401 | 631 | 393 | 832 | 1,100 |
| % Change | 6.4 | 7.4 | 11.5 | 7.1 | 15.1 | 20.4 |
| **San Saba** | | | | | | |
| 2011 | 6,387 | 6,746 | 7,059 | 7,332 | 7,365 | 7,409 |
| 2006 | 6,387 | 6,746 | 7,059 | 7,332 | 7,365 | 7,409 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Travis** | | | | | | |
| 2011 | 1,003,253 | 1,201,256 | 1,402,153 | 1,583,068 | 1,770,347 | 1,918,135 |
| 2006 | 969,955 | 1,185,499 | 1,385,236 | 1,550,538 | 1,722,737 | 1,888,543 |
| Difference | 33,298 | 15,757 | 16,917 | 32,530 | 47,610 | 29,592 |
| % Change | 3.4 | 1.3 | 1.2 | 2.1 | 2.8 | 1.6 |
| **Wharton** | | | | | | |
| 2011 | 28,260 | 29,872 | 30,911 | 31,508 | 31,523 | 31,188 |
| 2006 | 28,260 | 29,872 | 30,911 | 31,508 | 31,523 | 31,188 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Williamson** | | | | | | |
| 2011 | 48,657 | 60,711 | 75,043 | 90,627 | 107,582 | 125,766 |
| 2006 | 48,657 | 60,711 | 75,043 | 90,627 | 107,582 | 125,766 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

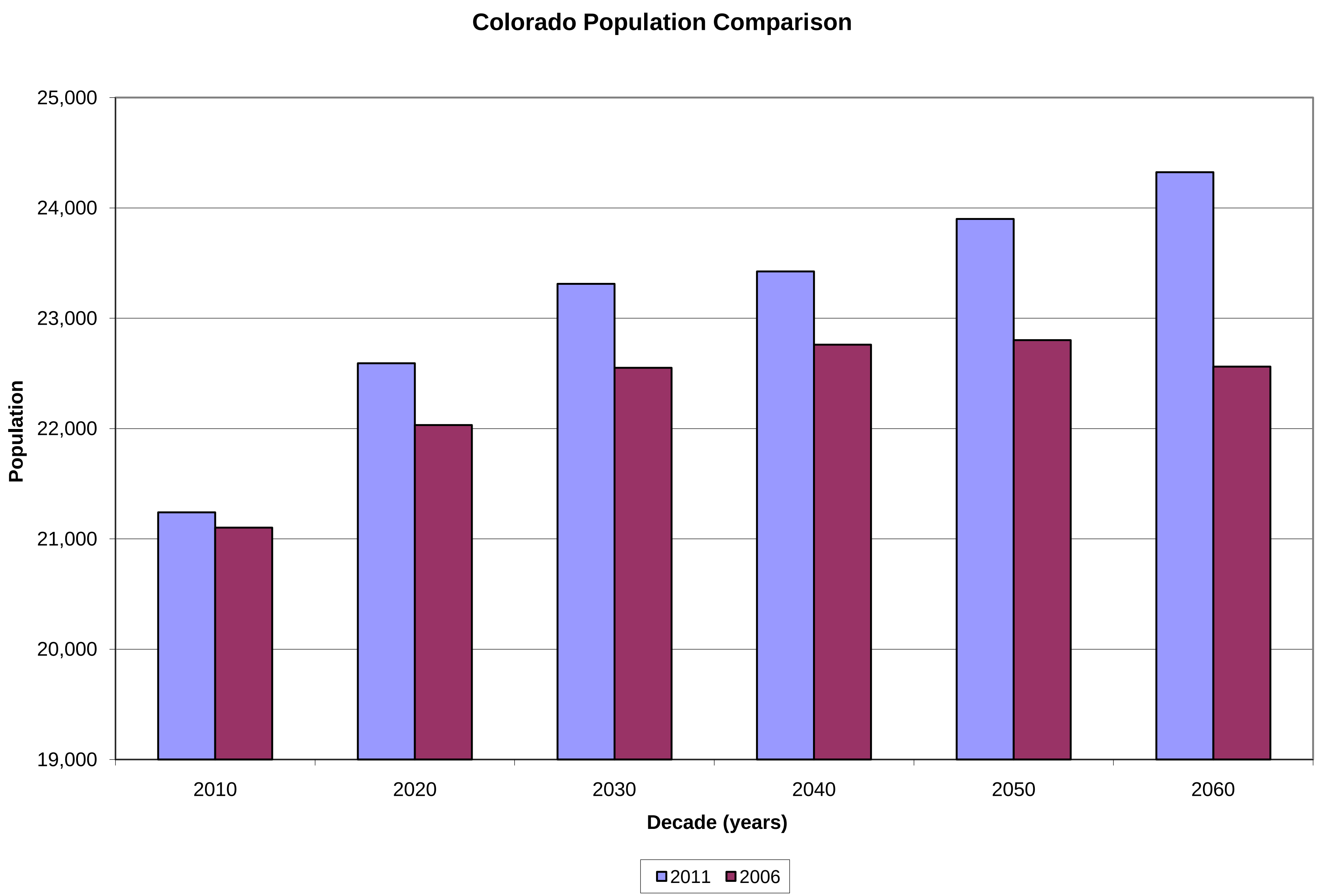


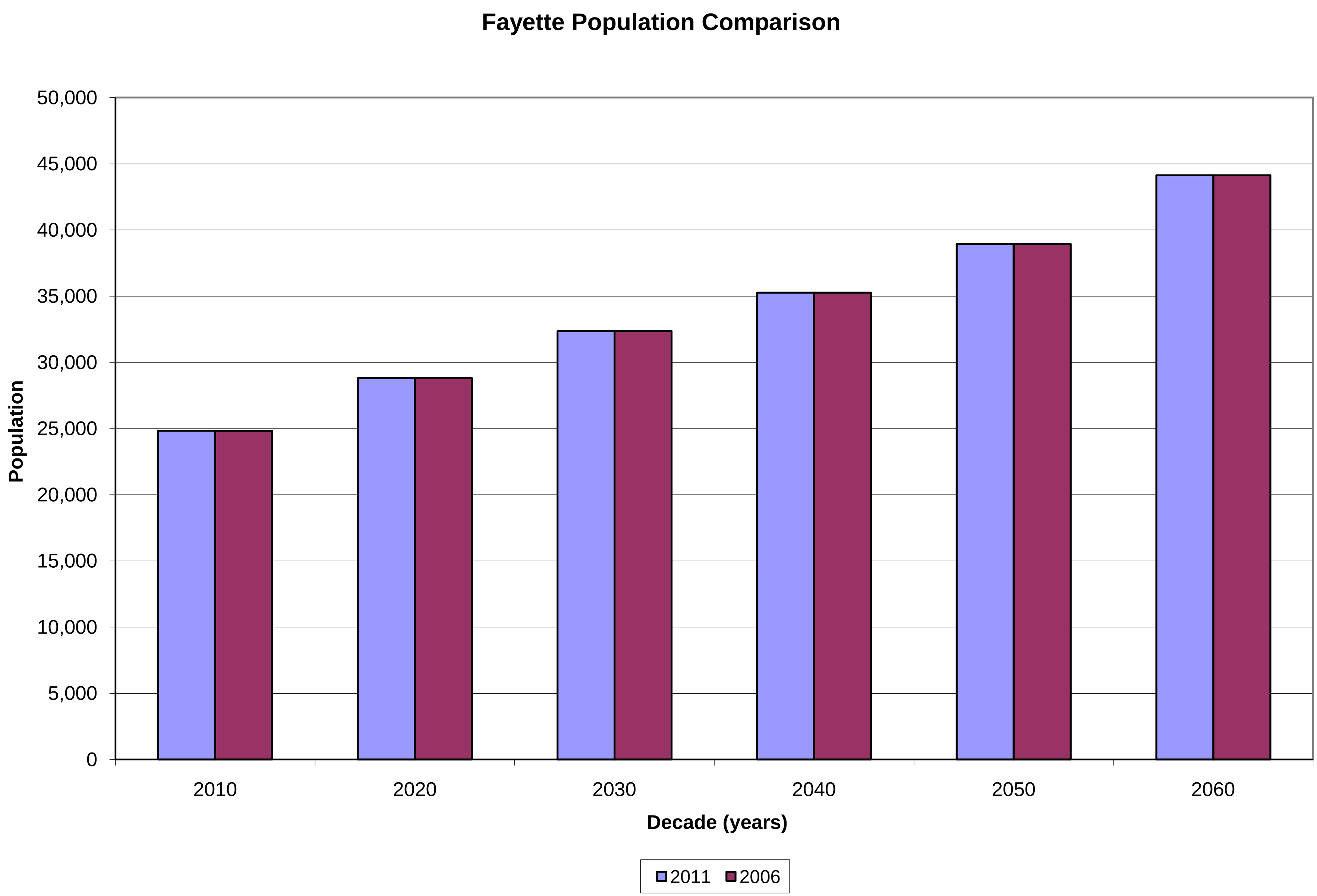
Region K Population Comparison
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011 Region K Plan
2006 Region K Plan

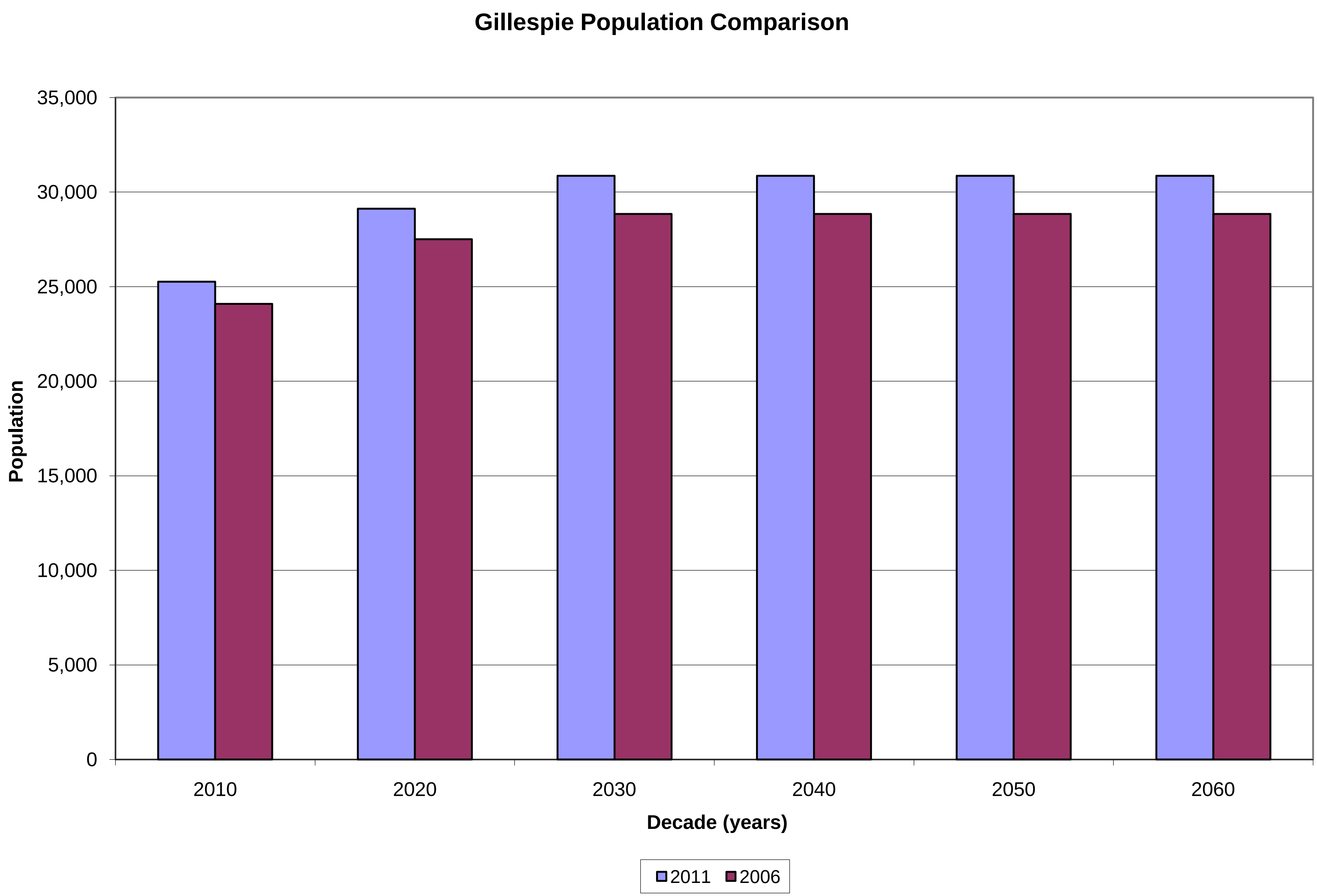

Bastrop Population Comparison
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006


Blanco Population Comparison
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

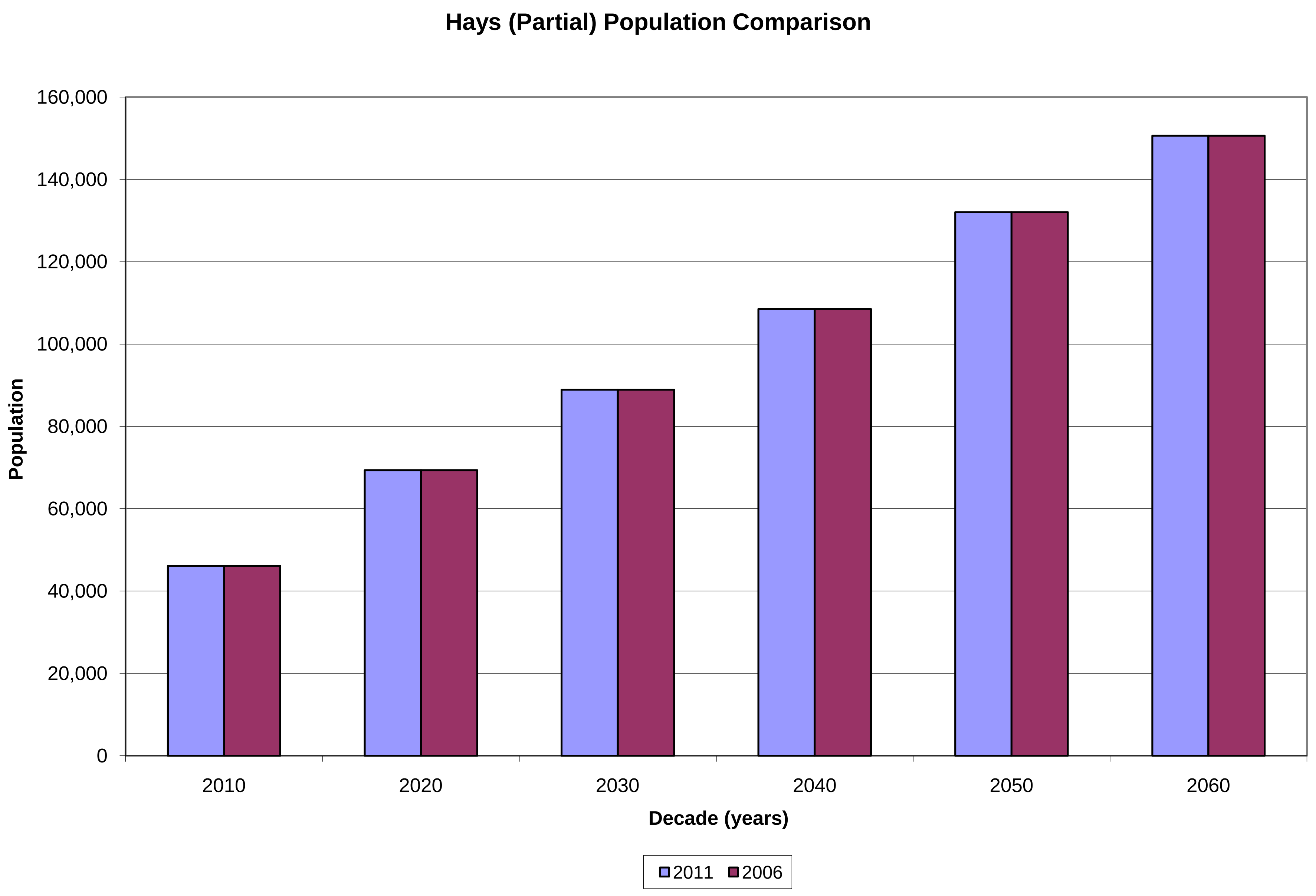

Burnet Population Comparison
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

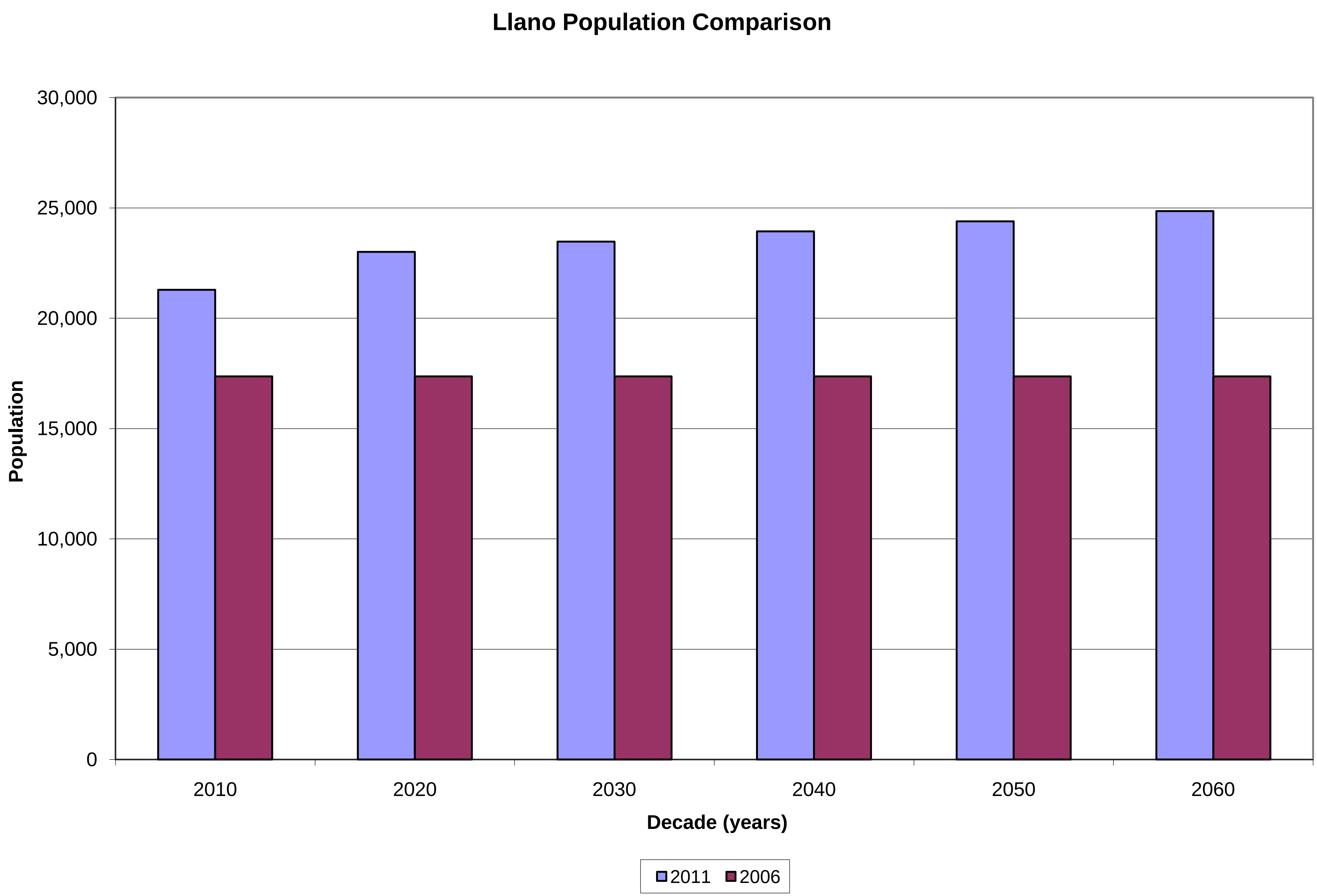

Colorado Population Comparison
25,000
24,000
23,000
22,000
21,000
20,000
19,000
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

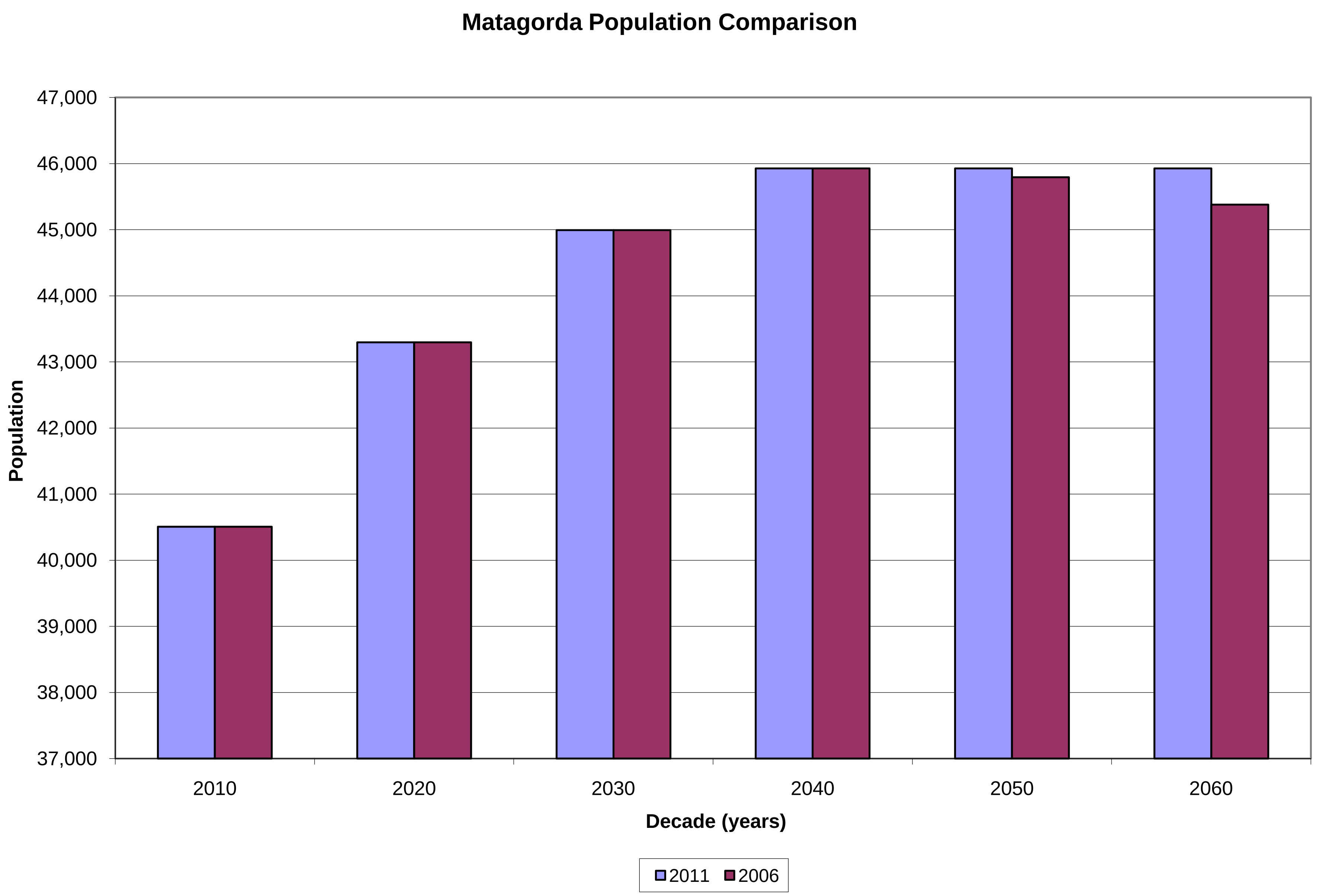

Fayette Population Comparison
Population
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

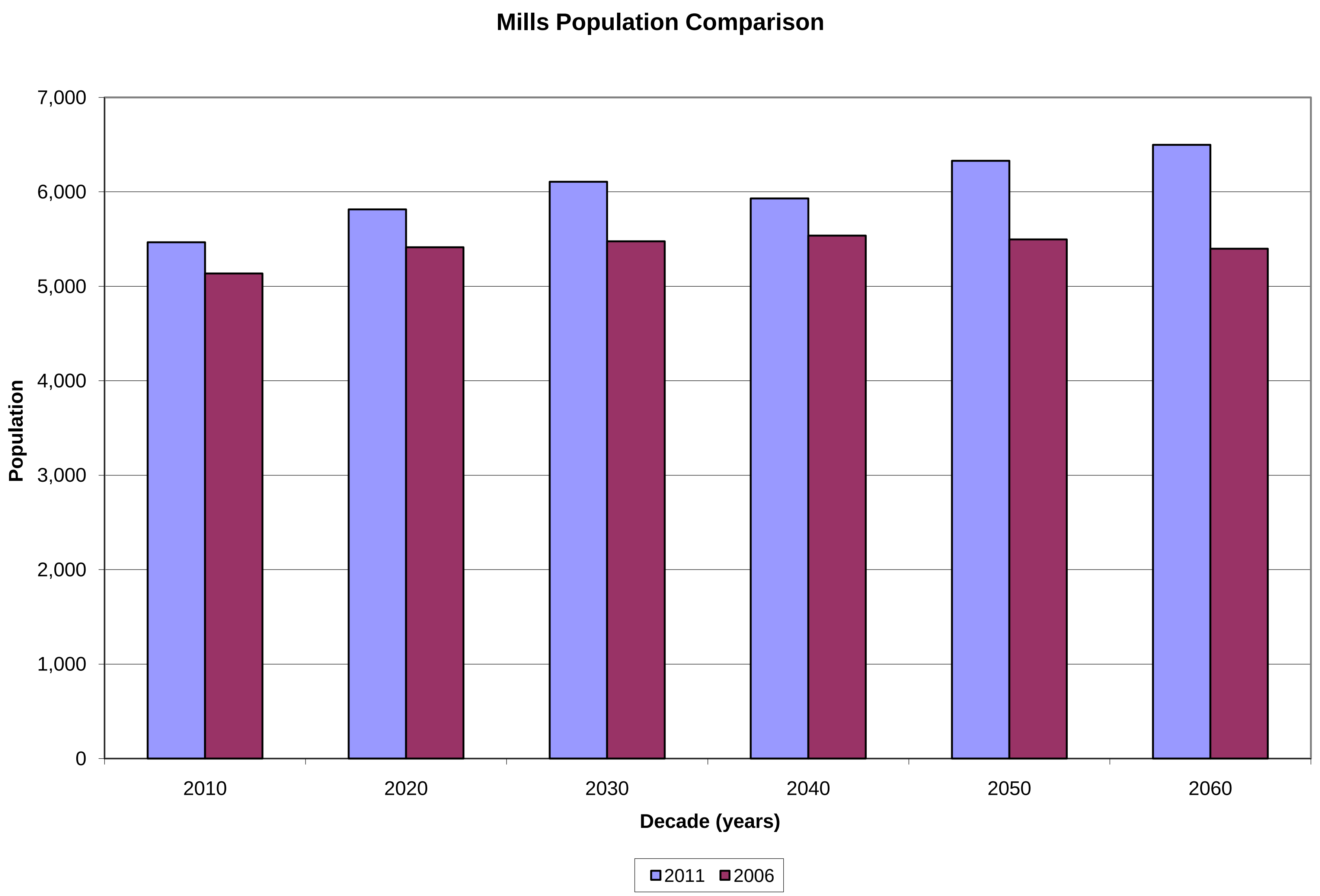


Gillespie Population Comparison
Population
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

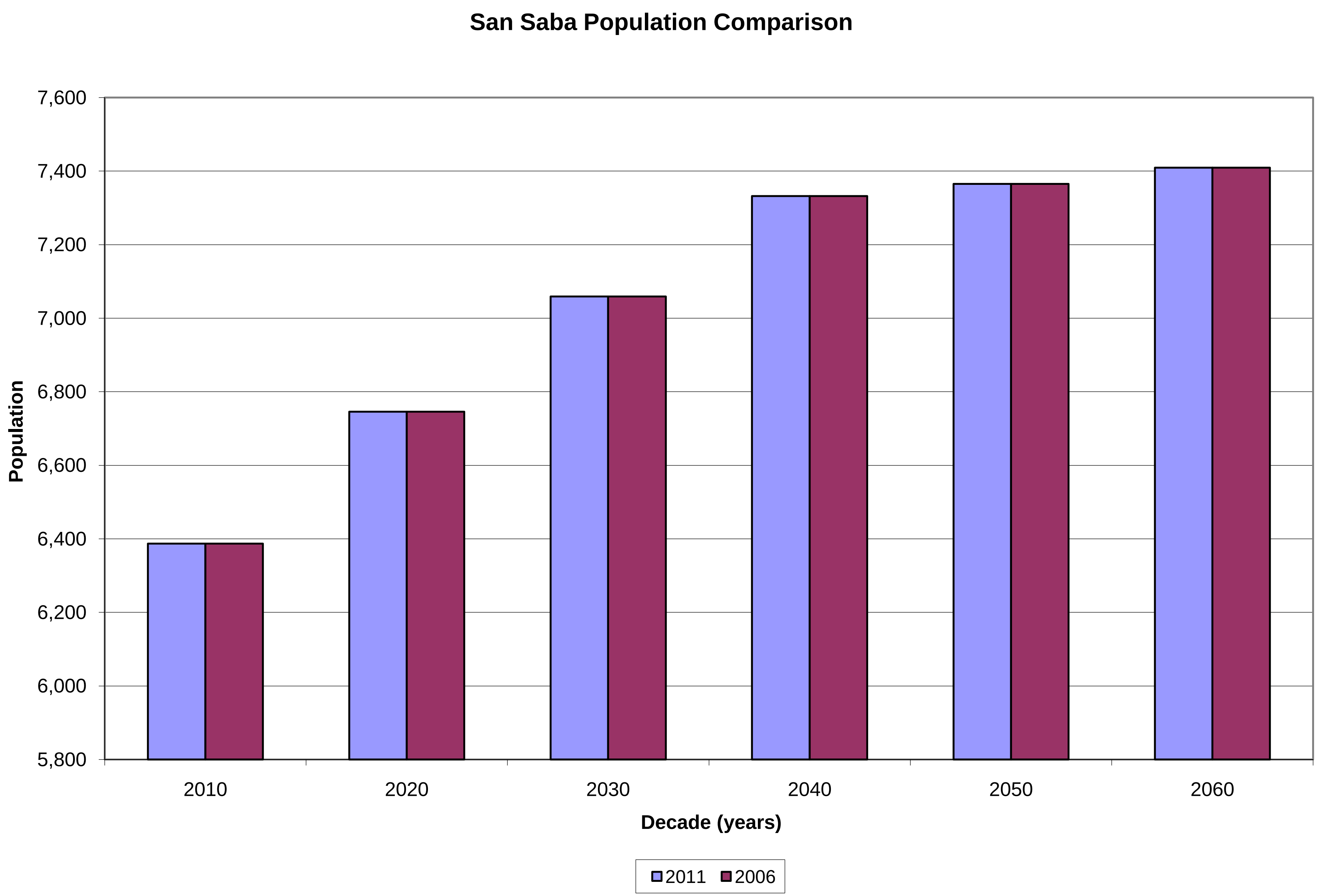

Hays (Partial) Population Comparison
Population
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006


Llano Population Comparison
30,000
25,000
20,000
15,000
10,000
5,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

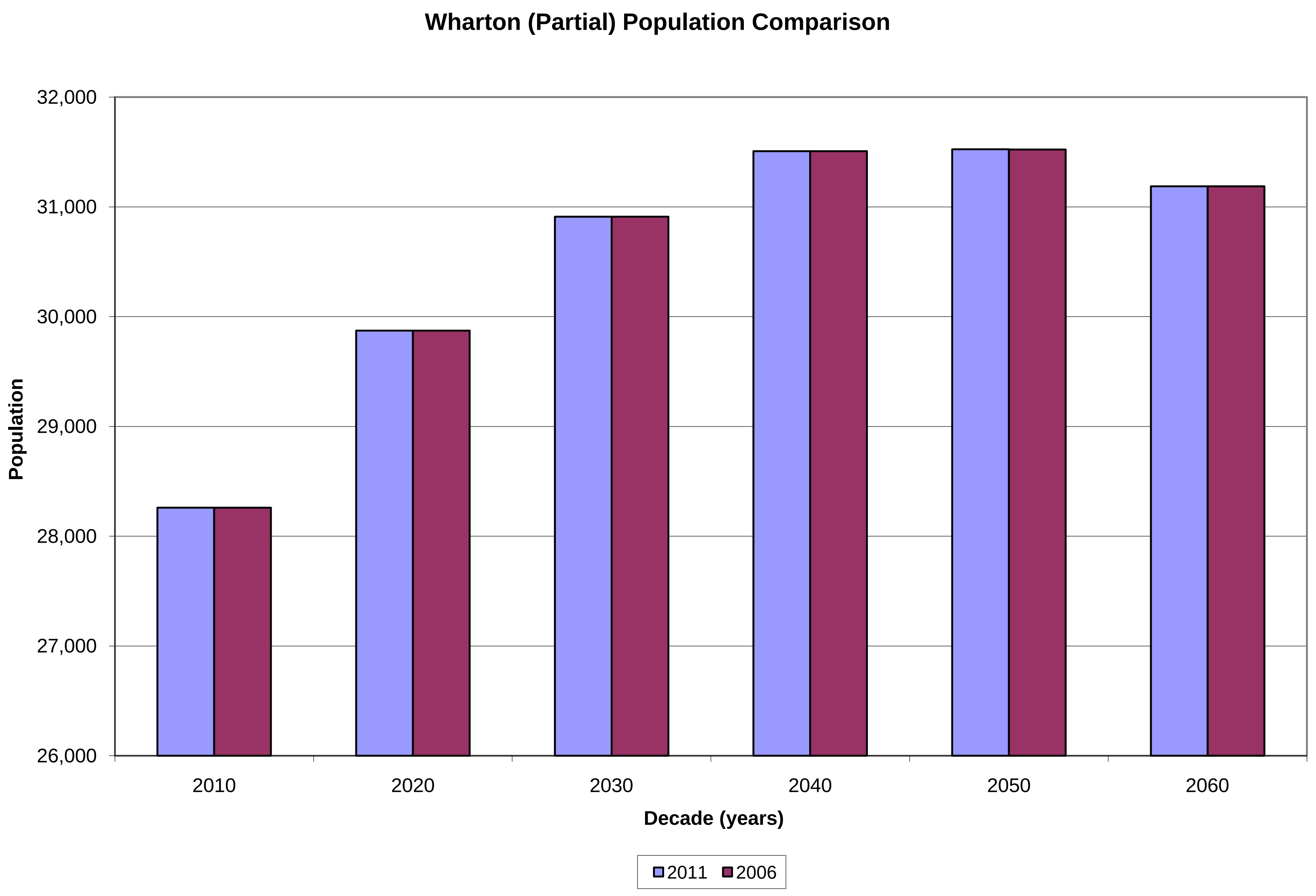

Matagorda Population Comparison
47,000
46,000
45,000
44,000
43,000
42,000
41,000
40,000
39,000
38,000
37,000
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006



Mills Population Comparison
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

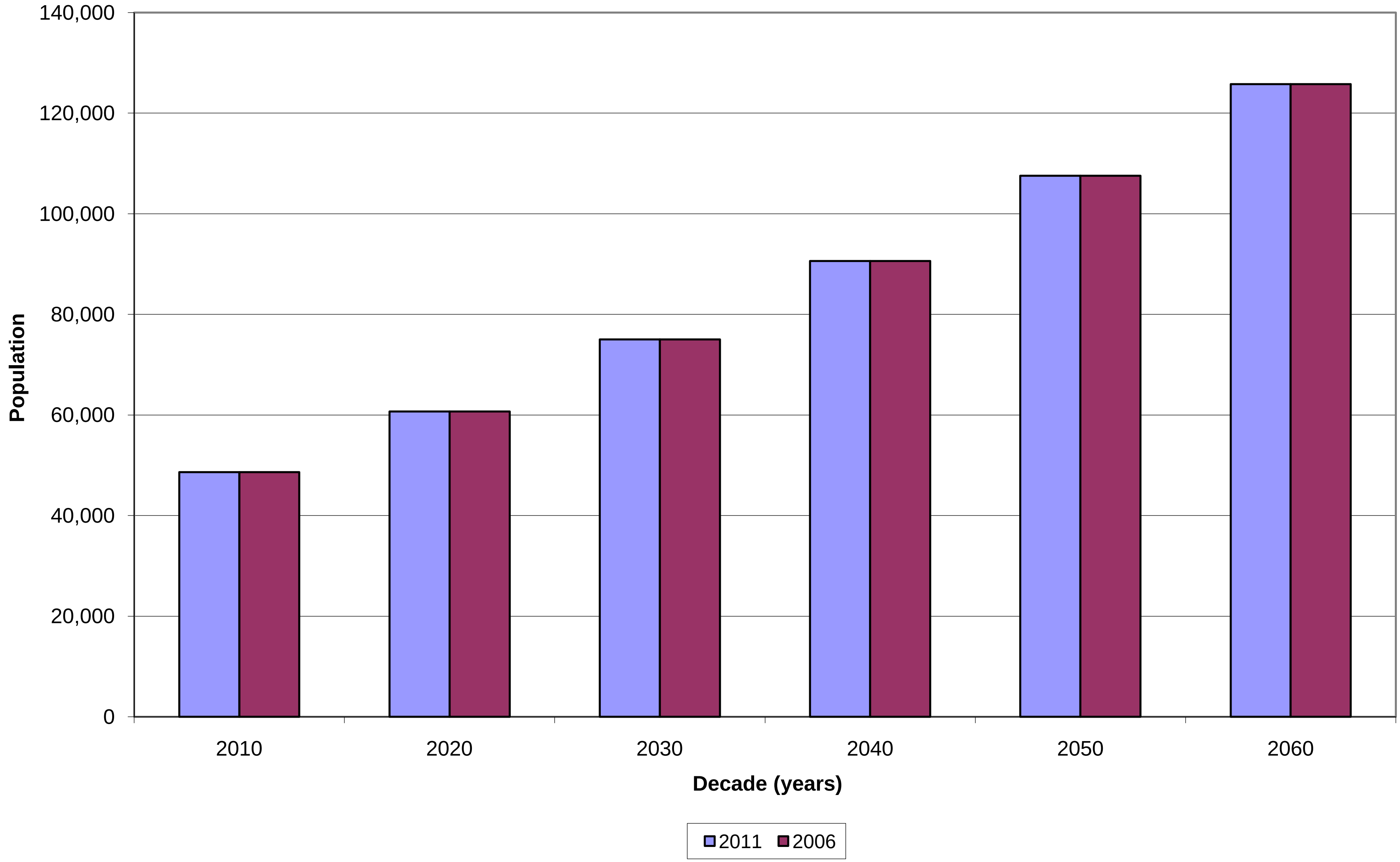

San Saba Population Comparison
7,600
7,400
7,200
7,000
6,800
6,600
6,400
6,200
6,000
5,800
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006


Travis Population Comparison
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006



Wharton (Partial) Population Comparison
32,000
31,000
30,000
29,000
28,000
27,000
26,000
Population
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

## Williamson (Partial) Population Comparison

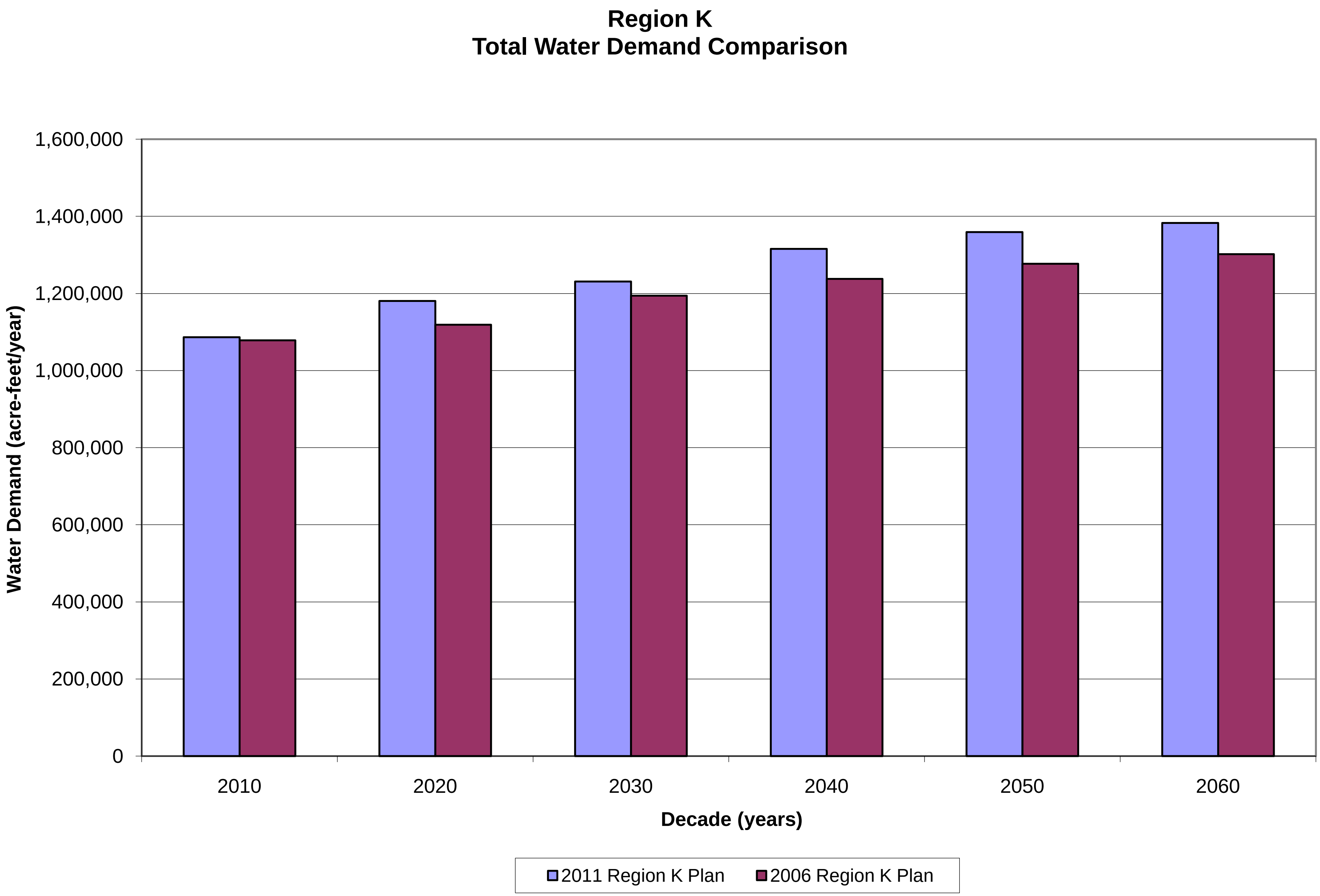


**Water Demands* (in acre-feet per year) by WUG Category**
**Region K**

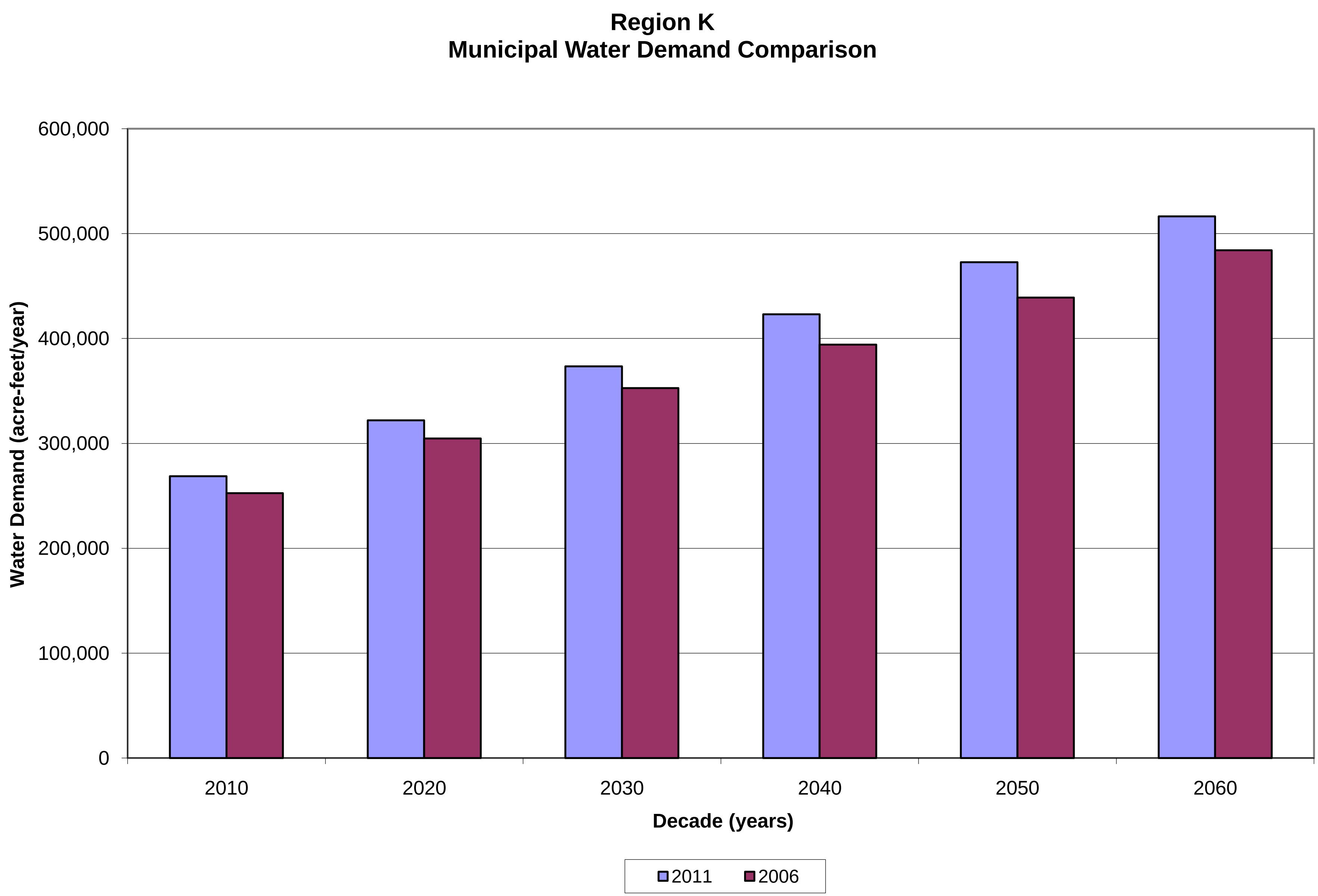
| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 268,643 | 321,972 | 373,430 | 423,051 | 472,778 | 516,348 |
| 2006 | 252,637 | 304,735 | 352,737 | 394,101 | 439,049 | 484,170 |
| Difference | 16,006 | 17,237 | 20,693 | 28,950 | 33,729 | 32,178 |
| % Change | 6.3 | 5.7 | 5.9 | 7.3 | 7.7 | 6.6 |
| **Livestock** | | | | | | |
| 2011 | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 |
| 2006 | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 | 13,395 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 589,705 | 567,272 | 545,634 | 524,809 | 504,695 | 468,763 |
| 2006 | 589,705 | 567,272 | 545,634 | 524,809 | 504,695 | 468,763 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 38,162 | 44,916 | 56,233 | 69,264 | 77,374 | 85,698 |
| 2006 | 38,162 | 44,916 | 56,233 | 69,264 | 77,374 | 85,698 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 30,620 | 31,252 | 31,613 | 26,964 | 27,304 | 27,598 |
| 2006 | 30,620 | 31,252 | 31,613 | 26,964 | 27,304 | 27,598 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 146,167 | 201,353 | 210,713 | 258,126 | 263,715 | 270,732 |
| 2006 | 153,522 | 156,894 | 194,396 | 208,982 | 214,783 | 222,058 |
| Difference | -7,355 | 44,459 | 16,317 | 49,144 | 48,932 | 48,674 |
| % Change | -4.8 | 28.3 | 8.4 | 23.5 | 22.8 | 21.9 |

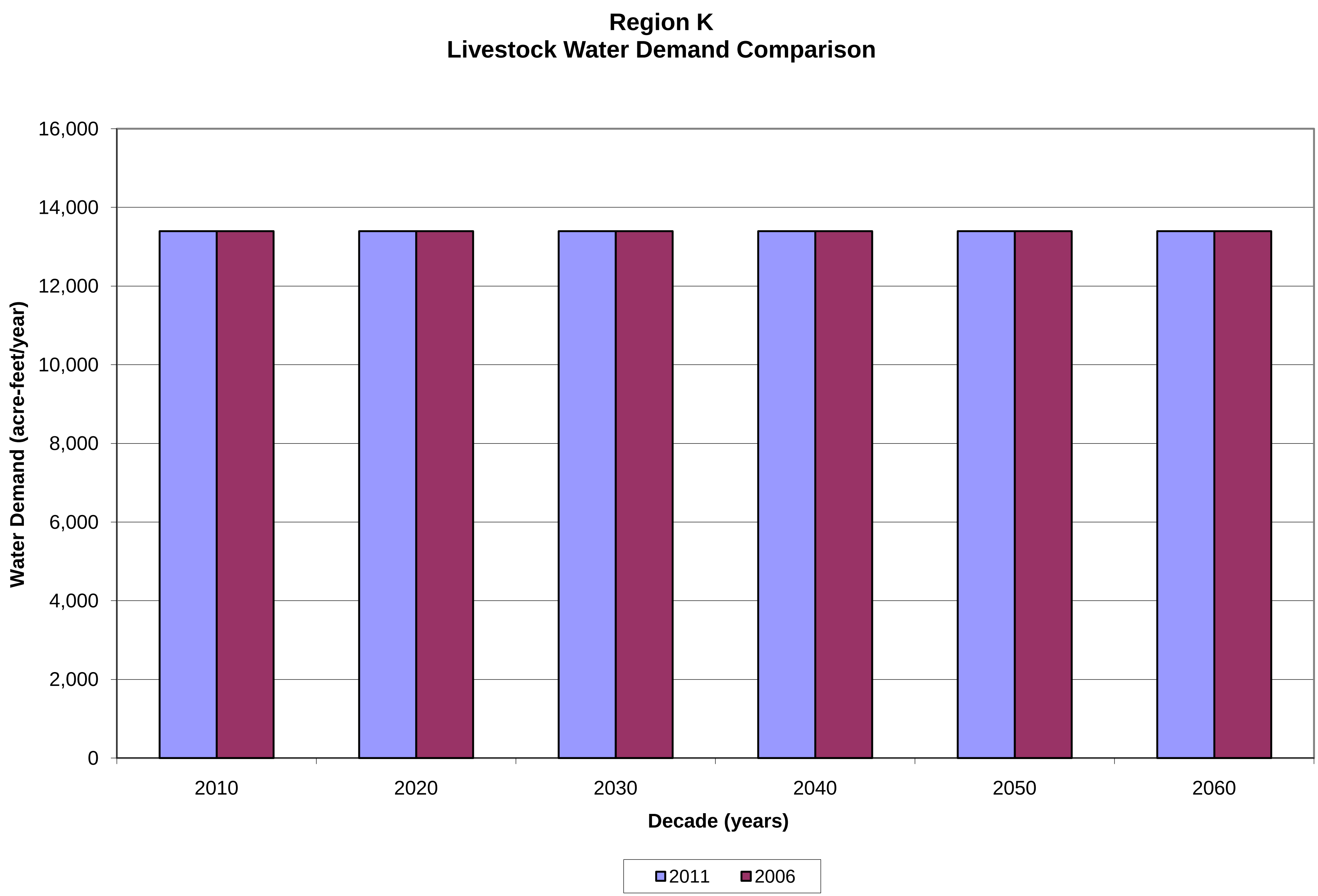
*All values are presented in acre-feet per year

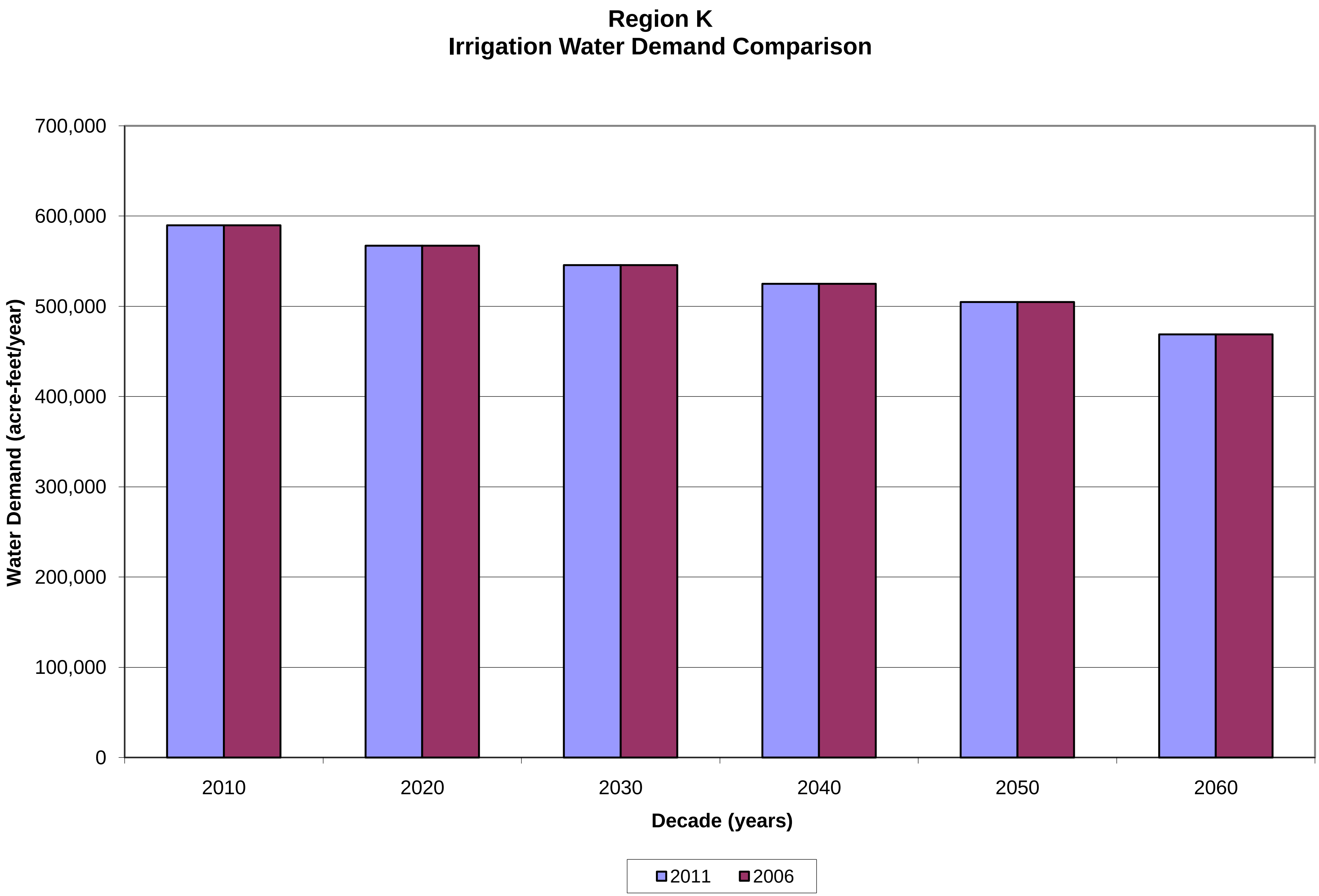
| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 1,086,692 | 1,180,160 | 1,231,018 | 1,315,609 | 1,359,261 | 1,382,534 |
| 2006 | 1,078,041 | 1,118,464 | 1,194,008 | 1,237,515 | 1,276,600 | 1,301,682 |
| Difference | 8,651 | 61,696 | 37,010 | 78,094 | 82,661 | 80,852 |
| % Change | 0.8 | 5.5 | 3.1 | 6.3 | 6.5 | 6.2 |

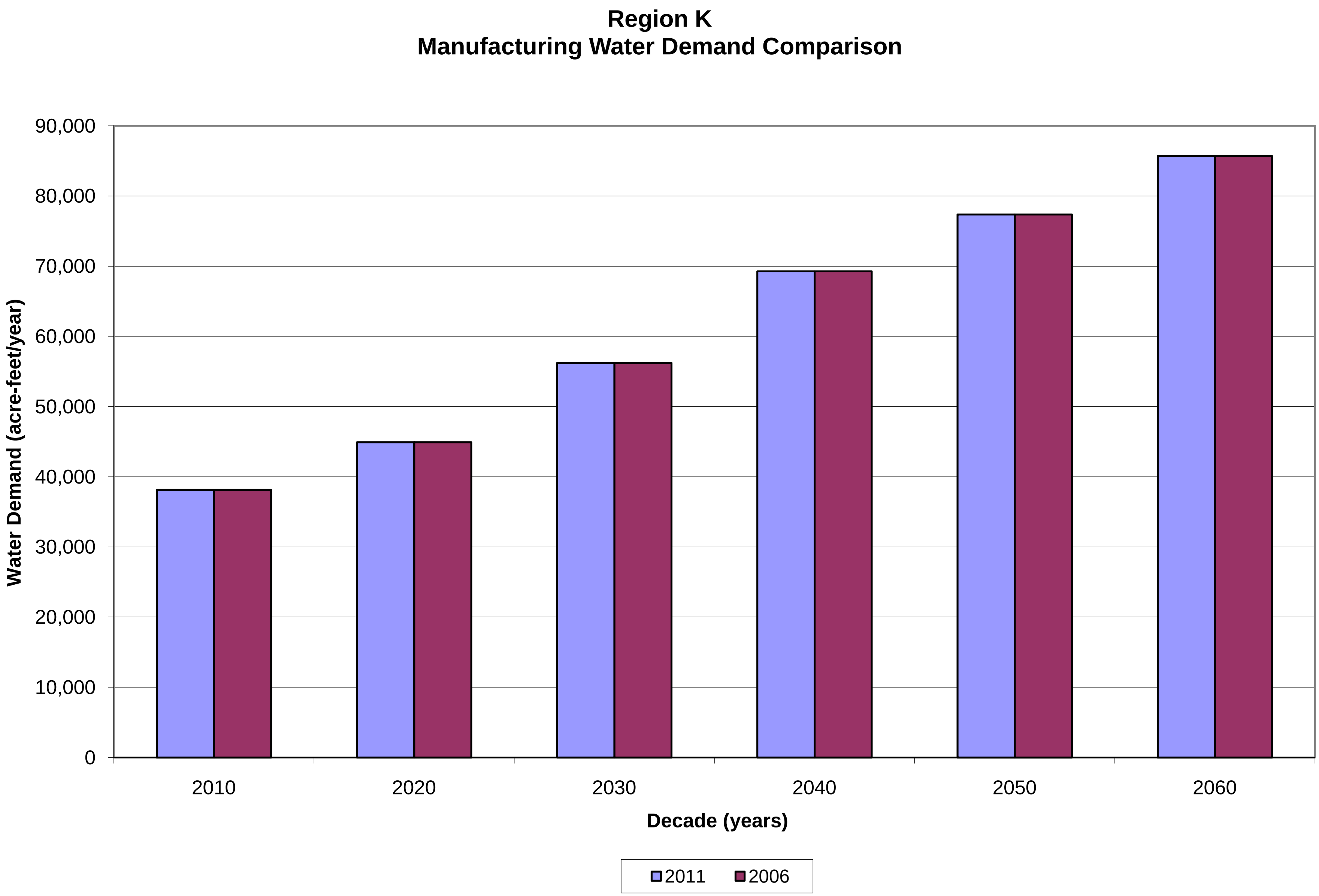


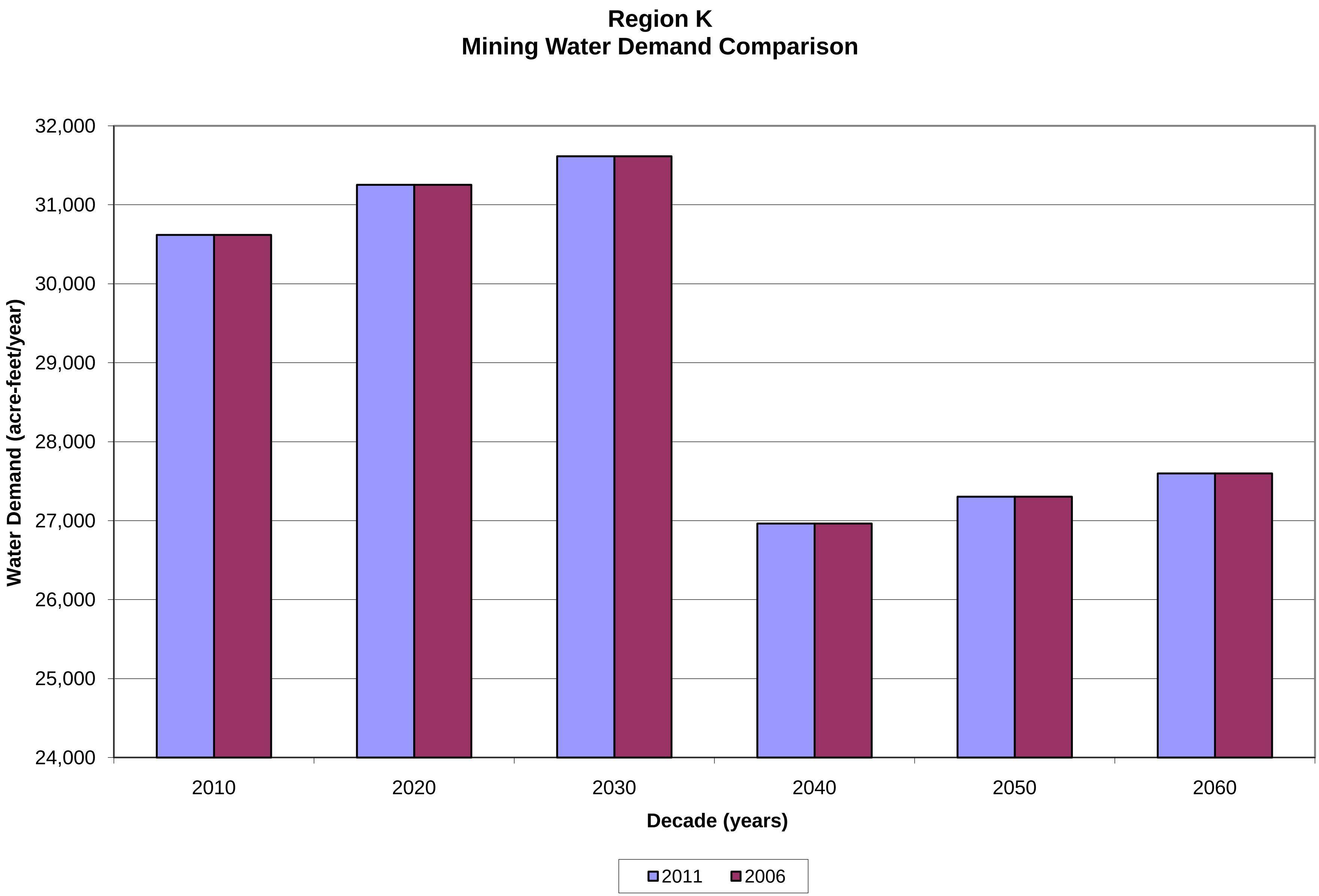
Region K
Total Water Demand Comparison
Water Demand (acre-feet/year)
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011 Region K Plan
2006 Region K Plan


Region K
Municipal Water Demand Comparison
600,000
500,000
400,000
300,000
200,000
100,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

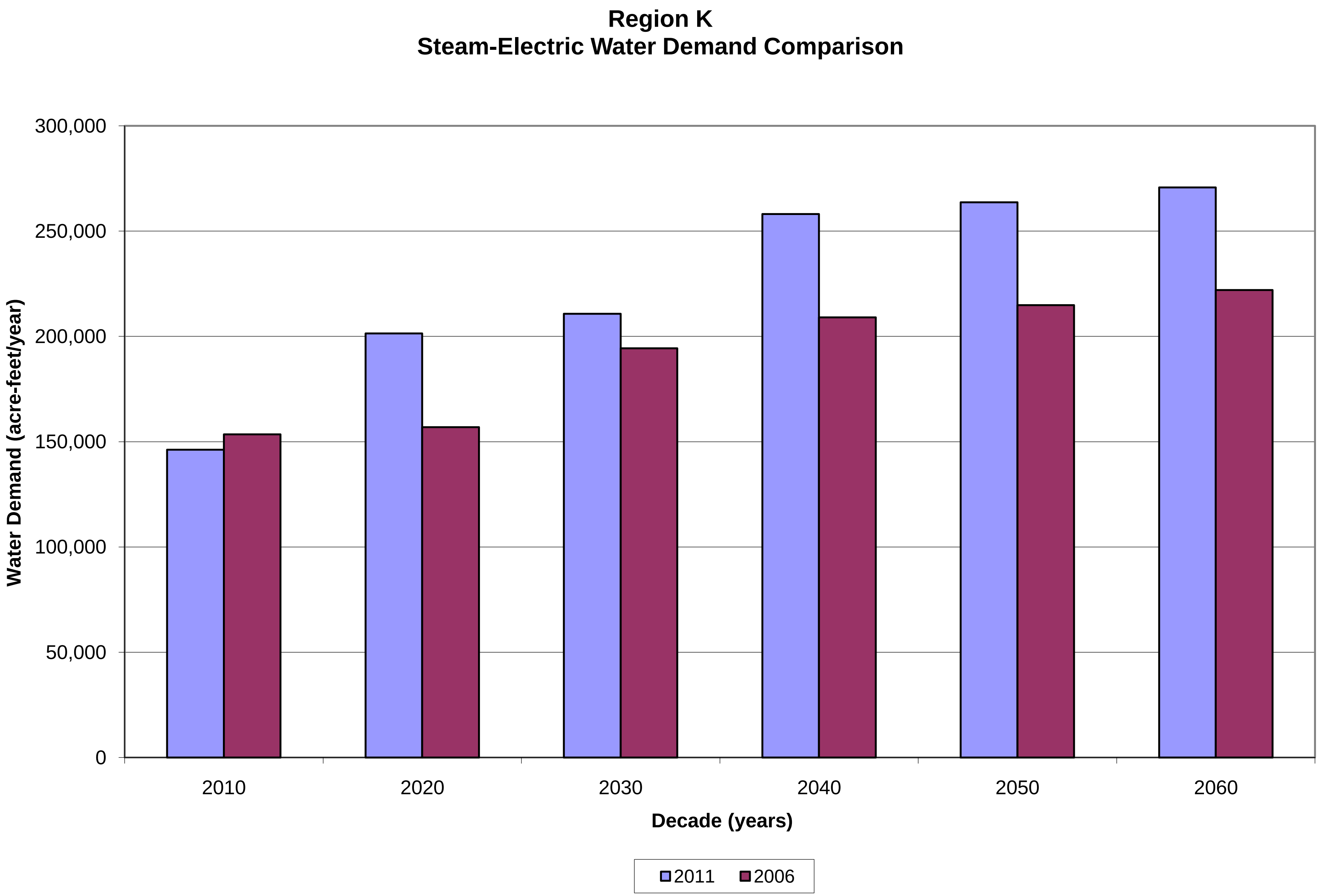

Region K
Livestock Water Demand Comparison
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006


Region K
Irrigation Water Demand Comparison
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006


Region K
Manufacturing Water Demand Comparison
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006



Region K
Mining Water Demand Comparison
32,000
31,000
30,000
29,000
28,000
27,000
26,000
25,000
24,000
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

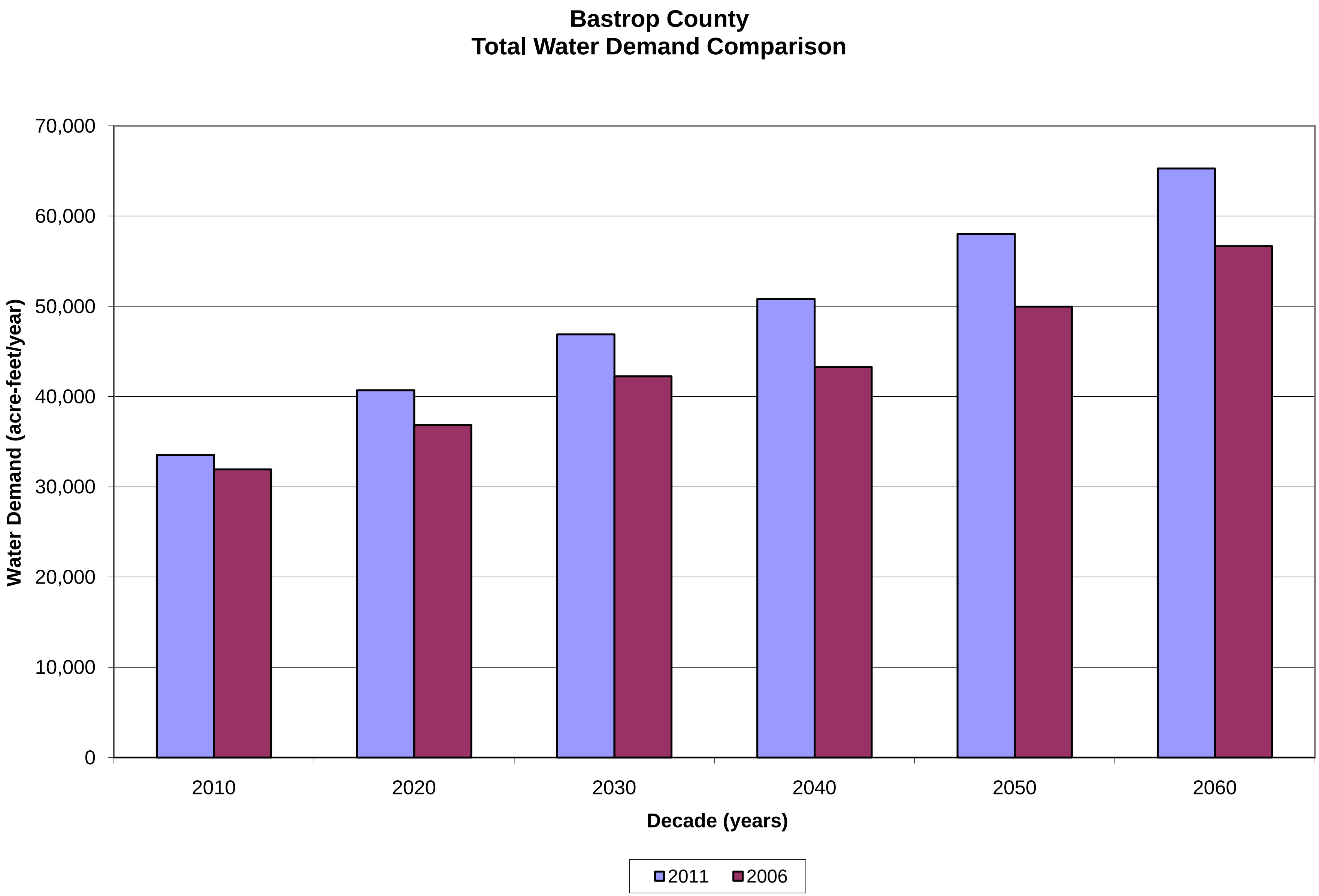

Region K
Steam-Electric Water Demand Comparison
300,000
250,000
200,000
150,000
100,000
50,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Bastrop County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 13,275 | 18,620 | 22,964 | 30,040 | 35,860 | 43,208 |
| 2006 | 11,679 | 14,762 | 18,327 | 22,505 | 27,818 | 34,610 |
| Difference | 1,596 | 3,858 | 4,637 | 7,535 | 8,042 | 8,598 |
| % Change | 13.7 | 26.1 | 25.3 | 33.5 | 28.9 | 24.8 |
| **Livestock** | | | | | | |
| 2011 | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 |
| 2006 | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 | 1,522 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 1,610 | 1,407 | 1,226 | 1,072 | 934 | 814 |
| 2006 | 1,610 | 1,407 | 1,226 | 1,072 | 934 | 814 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 92 | 111 | 130 | 150 | 169 | 183 |
| 2006 | 92 | 111 | 130 | 150 | 169 | 183 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 5,033 | 5,035 | 5,036 | 37 | 38 | 39 |
| 2006 | 5,033 | 5,035 | 5,036 | 37 | 38 | 39 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 12,000 | 14,000 | 16,000 | 18,000 | 19,500 | 19,500 |
| 2006 | 12,000 | 14,000 | 16,000 | 18,000 | 19,500 | 19,500 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 33,532 | 40,695 | 46,878 | 50,821 | 58,023 | 65,266 |
| 2006 | 31,936 | 36,837 | 42,241 | 43,286 | 49,981 | 56,668 |
| Difference | 1,596 | 3,858 | 4,637 | 7,535 | 8,042 | 8,598 |
| % Change | 5.0 | 10.5 | 11.0 | 17.4 | 16.1 | 15.2 |

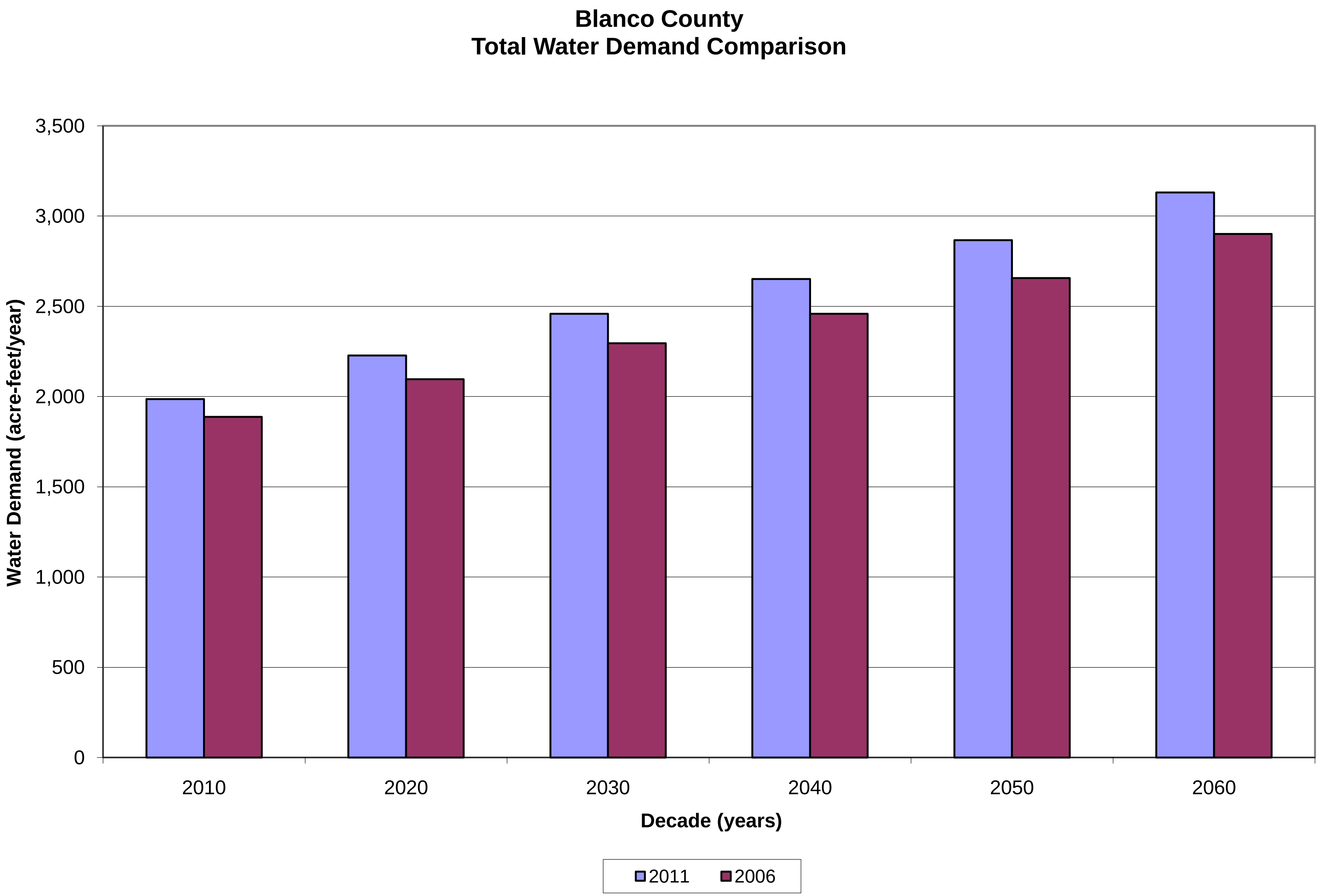

Bastrop County
Total Water Demand Comparison
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Blanco County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 1,467 | 1,712 | 1,947 | 2,143 | 2,360 | 2,626 |
| 2006 | 1,369 | 1,580 | 1,783 | 1,951 | 2,151 | 2,396 |
| Difference | 98 | 132 | 164 | 192 | 209 | 230 |
| % Change | 7.2 | 8.4 | 9.2 | 9.8 | 9.7 | 9.6 |
| **Livestock** | | | | | | |
| 2011 | 443 | 443 | 443 | 443 | 443 | 443 |
| 2006 | 443 | 443 | 443 | 443 | 443 | 443 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 69 | 66 | 62 | 58 | 56 | 55 |
| 2006 | 69 | 66 | 62 | 58 | 56 | 55 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2006 | 2 | 2 | 2 | 2 | 2 | 2 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 5 | 5 | 5 | 5 | 5 | 5 |
| 2006 | 5 | 5 | 5 | 5 | 5 | 5 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 1,986 | 2,228 | 2,459 | 2,651 | 2,866 | 3,131 |
| 2006 | 1,888 | 2,096 | 2,295 | 2,459 | 2,657 | 2,901 |
| Difference | 98 | 132 | 164 | 192 | 209 | 230 |
| % Change | 5.2 | 6.3 | 7.1 | 7.8 | 7.9 | 7.9 |



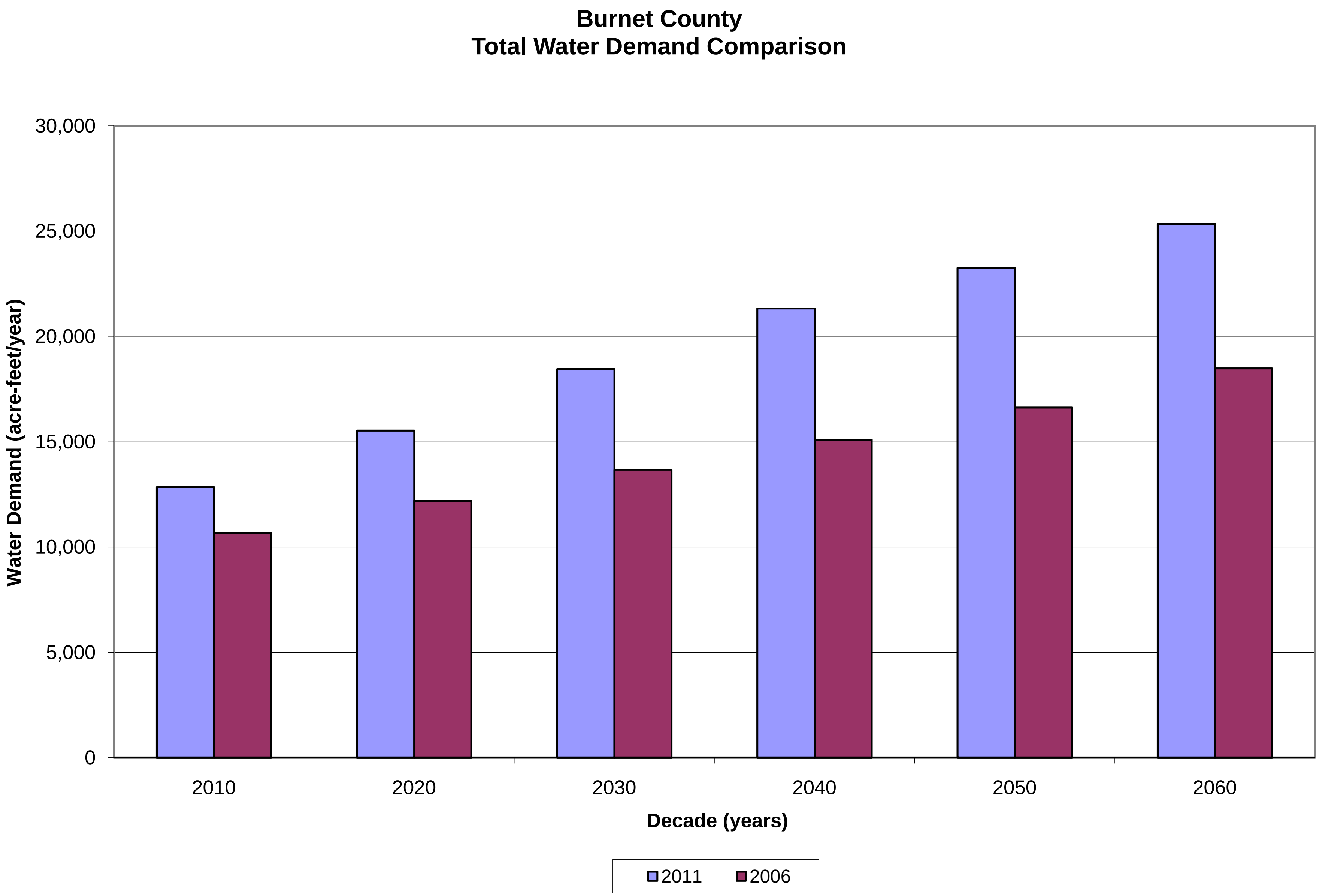
Blanco County
Total Water Demand Comparison
Water Demand (acre-feet/year)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Burnet County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 8,990 | 11,437 | 14,166 | 16,867 | 18,626 | 20,550 |
| 2006 | 6,810 | 8,097 | 9,380 | 10,633 | 12,003 | 13,684 |
| Difference | 2,180 | 3,340 | 4,786 | 6,234 | 6,623 | 6,866 |
| % Change | 32.0 | 41.2 | 51.0 | 58.6 | 55.2 | 50.2 |
| **Livestock** | | | | | | |
| 2011 | 835 | 835 | 835 | 835 | 835 | 835 |
| 2006 | 835 | 835 | 835 | 835 | 835 | 835 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 101 | 100 | 98 | 96 | 95 | 93 |
| 2006 | 101 | 100 | 98 | 96 | 95 | 93 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 963 | 1,109 | 1,248 | 1,384 | 1,502 | 1,636 |
| 2006 | 963 | 1,109 | 1,248 | 1,384 | 1,502 | 1,636 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 1,956 | 2,049 | 2,098 | 2,145 | 2,190 | 2,235 |
| 2006 | 1,956 | 2,049 | 2,098 | 2,145 | 2,190 | 2,235 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 12,845 | 15,530 | 18,445 | 21,327 | 23,248 | 25,349 |
| 2006 | 10,665 | 12,190 | 13,659 | 15,093 | 16,625 | 18,483 |
| Difference | 2,180 | 3,340 | 4,786 | 6,234 | 6,623 | 6,866 |
| % Change | 20.4 | 27.4 | 35.0 | 41.3 | 39.8 | 37.1 |



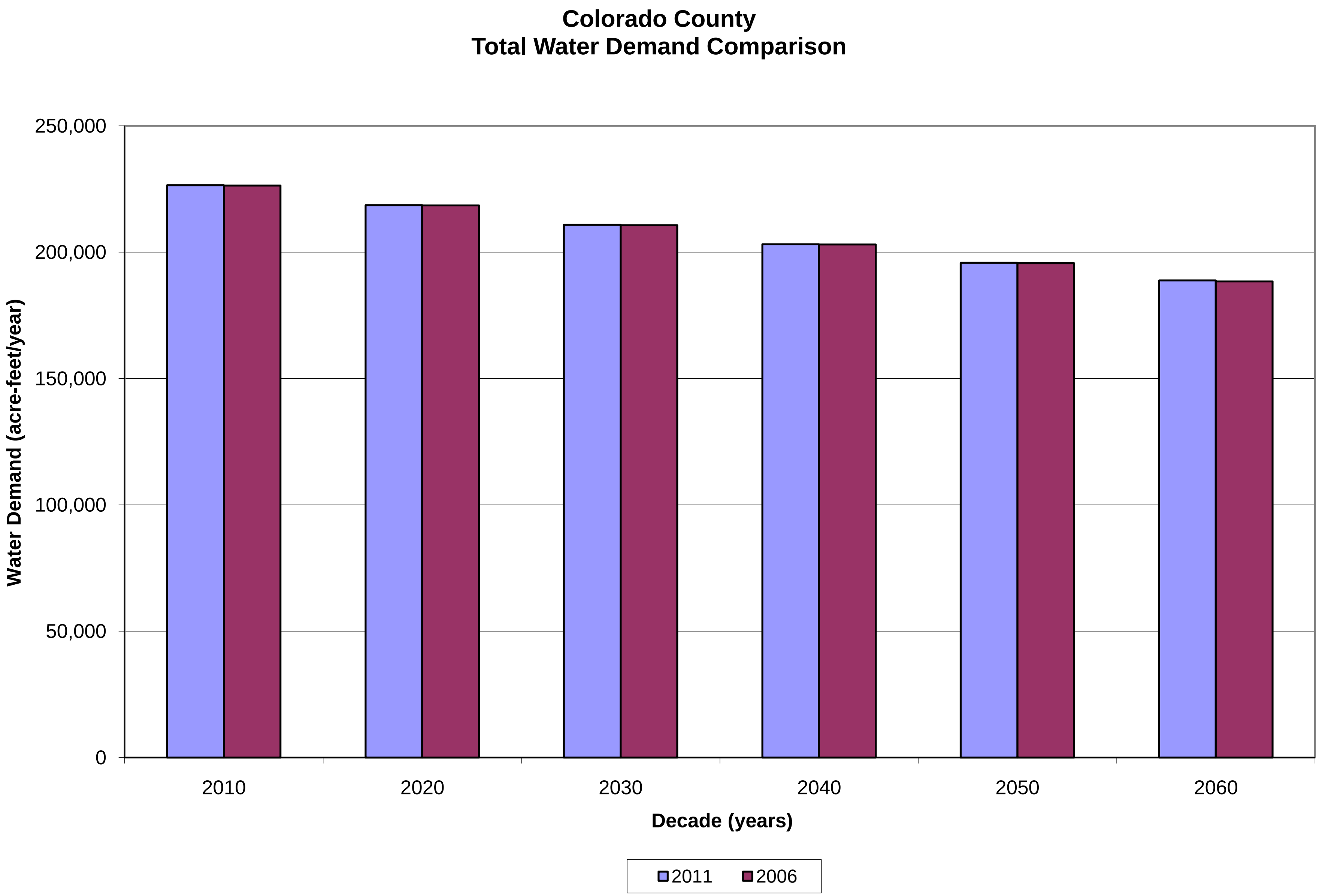
Burnet County
Total Water Demand Comparison
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Colorado County**

| ***RWP*** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 3,155 | 3,292 | 3,328 | 3,259 | 3,320 | 3,409 |
| 2006 | 3,132 | 3,189 | 3,189 | 3,141 | 3,122 | 3,089 |
| Difference | 23 | 103 | 139 | 118 | 198 | 320 |
| % Change | 0.7 | 3.2 | 4.4 | 3.8 | 6.3 | 10.4 |
| **Livestock** | | | | | | |
| 2011 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 |
| 2006 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 200,822 | 192,465 | 184,380 | 176,555 | 168,946 | 161,663 |
| 2006 | 200,822 | 192,465 | 184,380 | 176,555 | 168,946 | 161,663 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 176 | 192 | 205 | 217 | 227 | 245 |
| 2006 | 176 | 192 | 205 | 217 | 227 | 245 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 20,804 | 21,197 | 21,416 | 21,623 | 21,821 | 21,996 |
| 2006 | 20,804 | 21,197 | 21,416 | 21,623 | 21,821 | 21,996 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 226,430 | 218,619 | 210,802 | 203,127 | 195,787 | 188,786 |
| 2006 | 226,407 | 218,516 | 210,663 | 203,009 | 195,589 | 188,466 |
| Difference | 23 | 103 | 139 | 118 | 198 | 320 |
| % Change | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 |



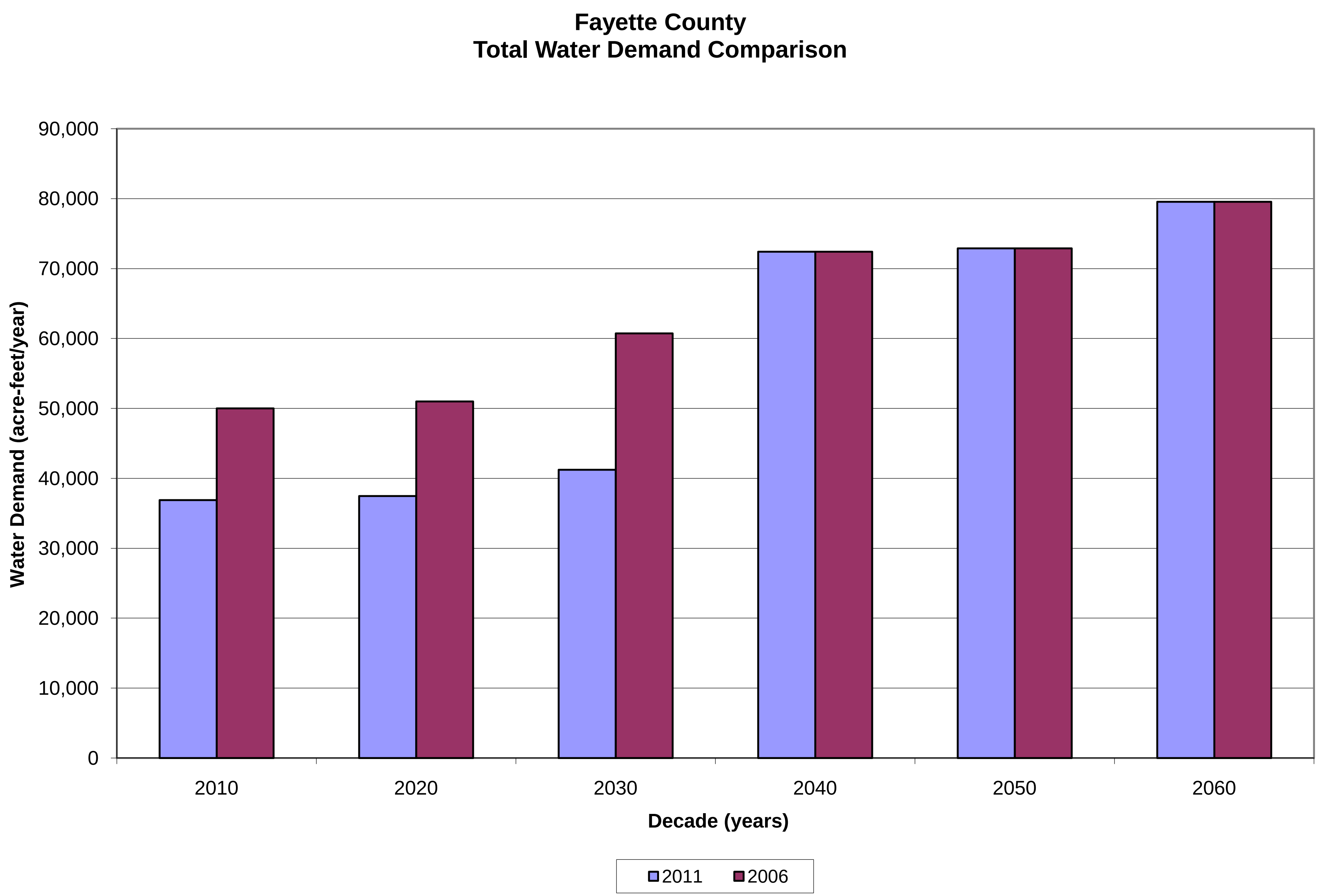
Colorado County
Total Water Demand Comparison
250,000
200,000
150,000
100,000
50,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Fayette County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 3,890 | 4,417 | 4,879 | 5,244 | 5,751 | 6,495 |
| 2006 | 3,890 | 4,417 | 4,879 | 5,244 | 5,751 | 6,495 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Livestock** | | | | | | |
| 2011 | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 |
| 2006 | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 | 2,397 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 739 | 692 | 648 | 606 | 568 | 533 |
| 2006 | 739 | 692 | 648 | 606 | 568 | 533 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 205 | 230 | 254 | 277 | 297 | 322 |
| 2006 | 205 | 230 | 254 | 277 | 297 | 322 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 42 | 42 | 42 | 42 | 42 | 42 |
| 2006 | 42 | 42 | 42 | 42 | 42 | 42 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 29,622 | 29,702 | 33,002 | 63,843 | 63,843 | 69,753 |
| 2006 | 42,720 | 43,200 | 52,500 | 63,840 | 63,840 | 69,750 |
| Difference | -13,098 | -13,498 | -19,498 | 3 | 3 | 3 |
| % Change | -30.7 | -31.2 | -37.1 | 0.0 | 0.0 | 0.0 |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 36,895 | 37,480 | 41,222 | 72,409 | 72,898 | 79,542 |
| 2006 | 49,993 | 50,978 | 60,720 | 72,406 | 72,895 | 79,539 |
| Difference | -13,098 | -13,498 | -19,498 | 3 | 3 | 3 |
| % Change | -26.2 | -26.5 | -32.1 | 0.0 | 0.0 | 0.0 |

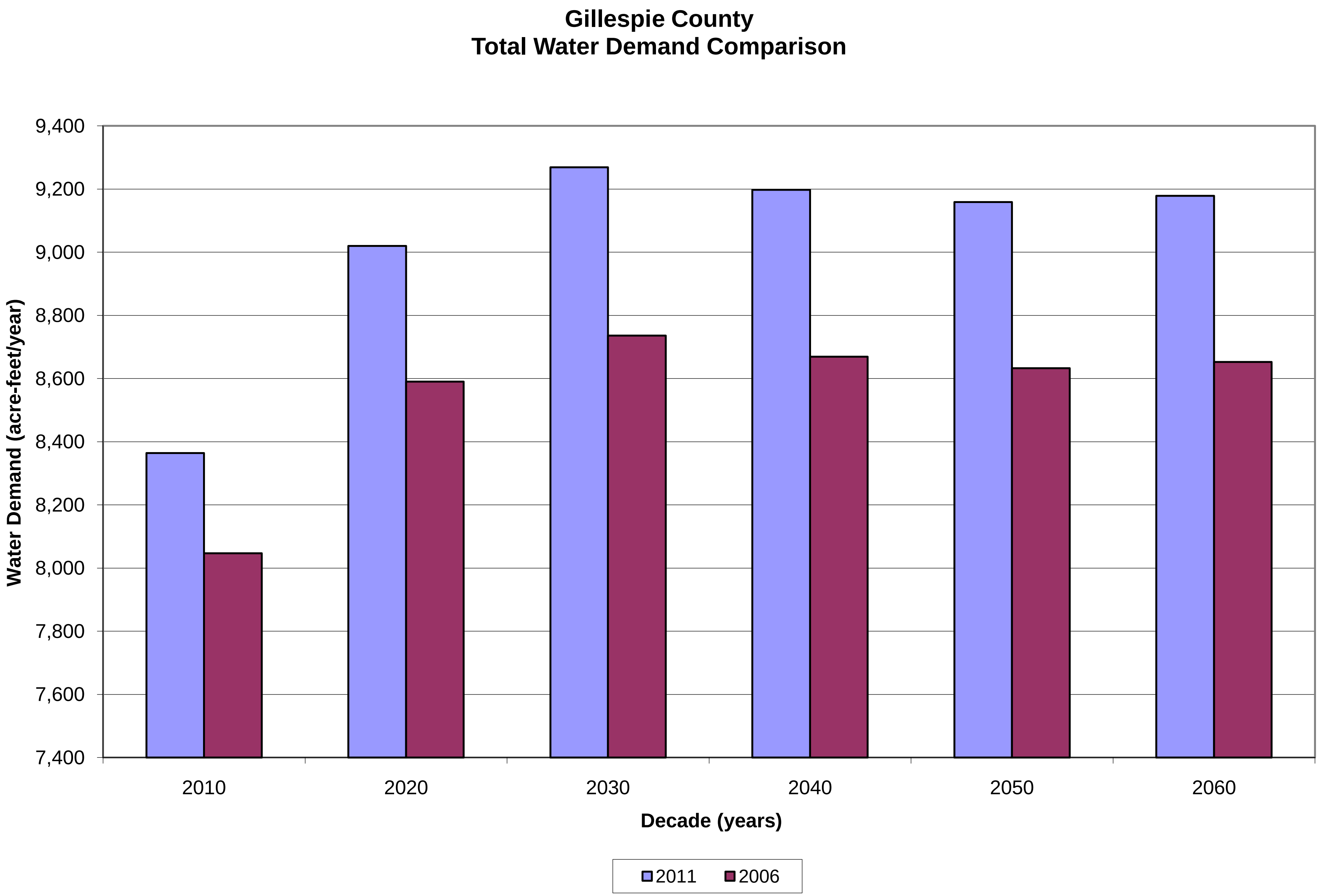

Fayette County
Total Water Demand Comparison
Water Demand (acre-feet/year)
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Gillespie County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 4,749 | 5,398 | 5,646 | 5,576 | 5,541 | 5,541 |
| 2006 | 4,432 | 4,968 | 5,113 | 5,048 | 5,015 | 5,015 |
| Difference | 317 | 430 | 533 | 528 | 526 | 526 |
| % Change | 7.2 | 8.7 | 10.4 | 10.5 | 10.5 | 10.5 |
| **Livestock** | | | | | | |
| 2011 | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 |
| 2006 | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 | 1,062 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 2,039 | 2,013 | 1,987 | 1,960 | 1,936 | 1,912 |
| 2006 | 2,039 | 2,013 | 1,987 | 1,960 | 1,936 | 1,912 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 506 | 539 | 566 | 591 | 612 | 655 |
| 2006 | 506 | 539 | 566 | 591 | 612 | 655 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 8 | 8 | 8 | 8 | 8 | 8 |
| 2006 | 8 | 8 | 8 | 8 | 8 | 8 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 8,364 | 9,020 | 9,269 | 9,197 | 9,159 | 9,178 |
| 2006 | 8,047 | 8,590 | 8,736 | 8,669 | 8,633 | 8,652 |
| Difference | 317 | 430 | 533 | 528 | 526 | 526 |
| % Change | 3.9 | 5.0 | 6.1 | 6.1 | 6.1 | 6.1 |



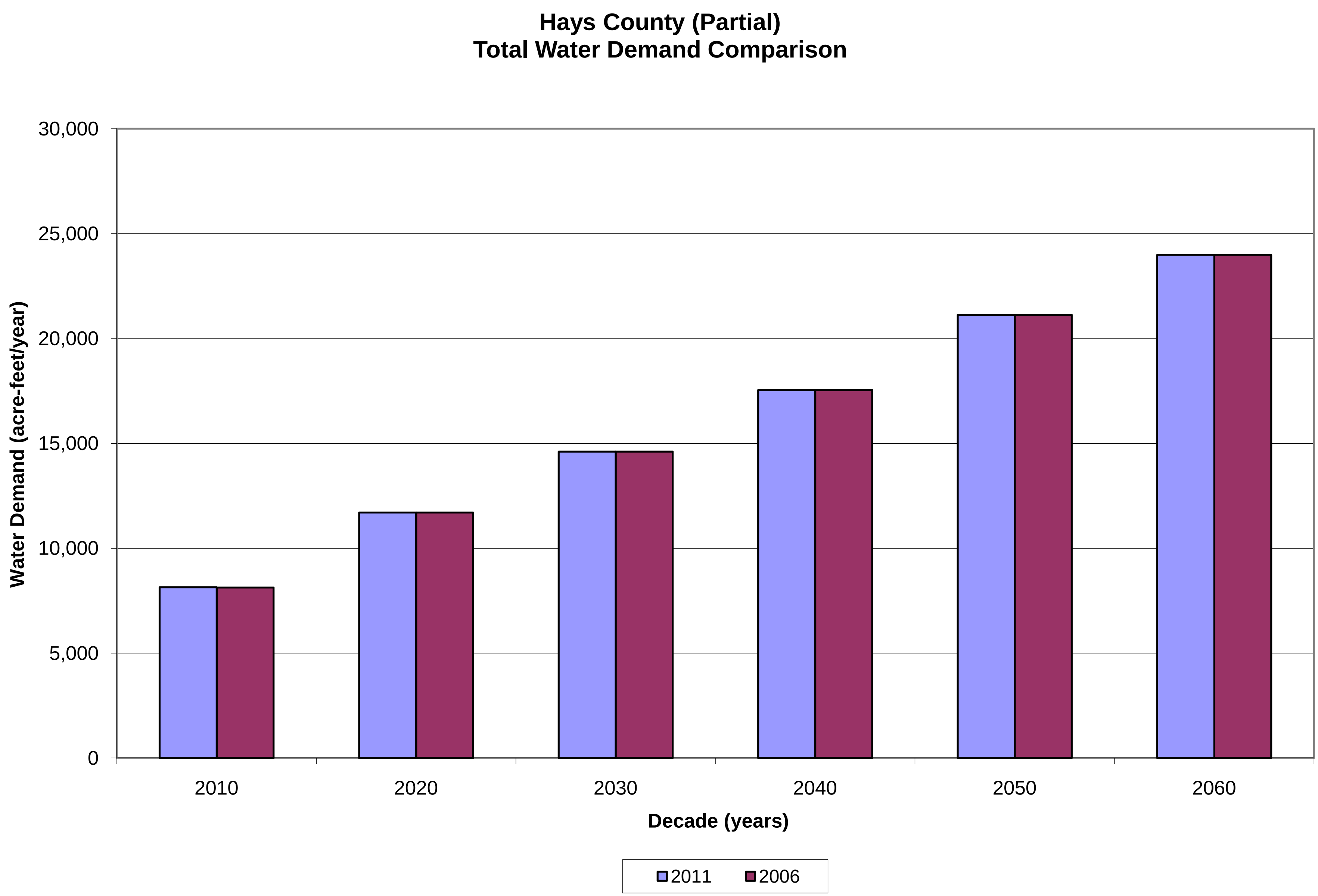
Gillespie County
Total Water Demand Comparison
Water Demand (acre-feet/year)
9,400
9,200
9,000
8,800
8,600
8,400
8,200
8,000
7,800
7,600
7,400
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Hays County (partial)**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 7,202 | 10,656 | 13,446 | 16,266 | 19,742 | 22,498 |
| 2006 | 7,192 | 10,656 | 13,446 | 16,266 | 19,742 | 22,498 |
| Difference | 10 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Livestock** | | | | | | |
| 2011 | 220 | 220 | 220 | 220 | 220 | 220 |
| 2006 | 220 | 220 | 220 | 220 | 220 | 220 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 11 | 11 | 11 | 11 | 11 | 11 |
| 2006 | 11 | 11 | 11 | 11 | 11 | 11 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 691 | 809 | 928 | 1,048 | 1,156 | 1,255 |
| 2006 | 691 | 809 | 928 | 1,048 | 1,156 | 1,255 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 12 | 6 | 2 | 0 | 0 | 0 |
| 2006 | 12 | 6 | 2 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | NA | NA | NA |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 8,136 | 11,702 | 14,607 | 17,545 | 21,129 | 23,984 |
| 2006 | 8,126 | 11,702 | 14,607 | 17,545 | 21,129 | 23,984 |
| Difference | 10 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

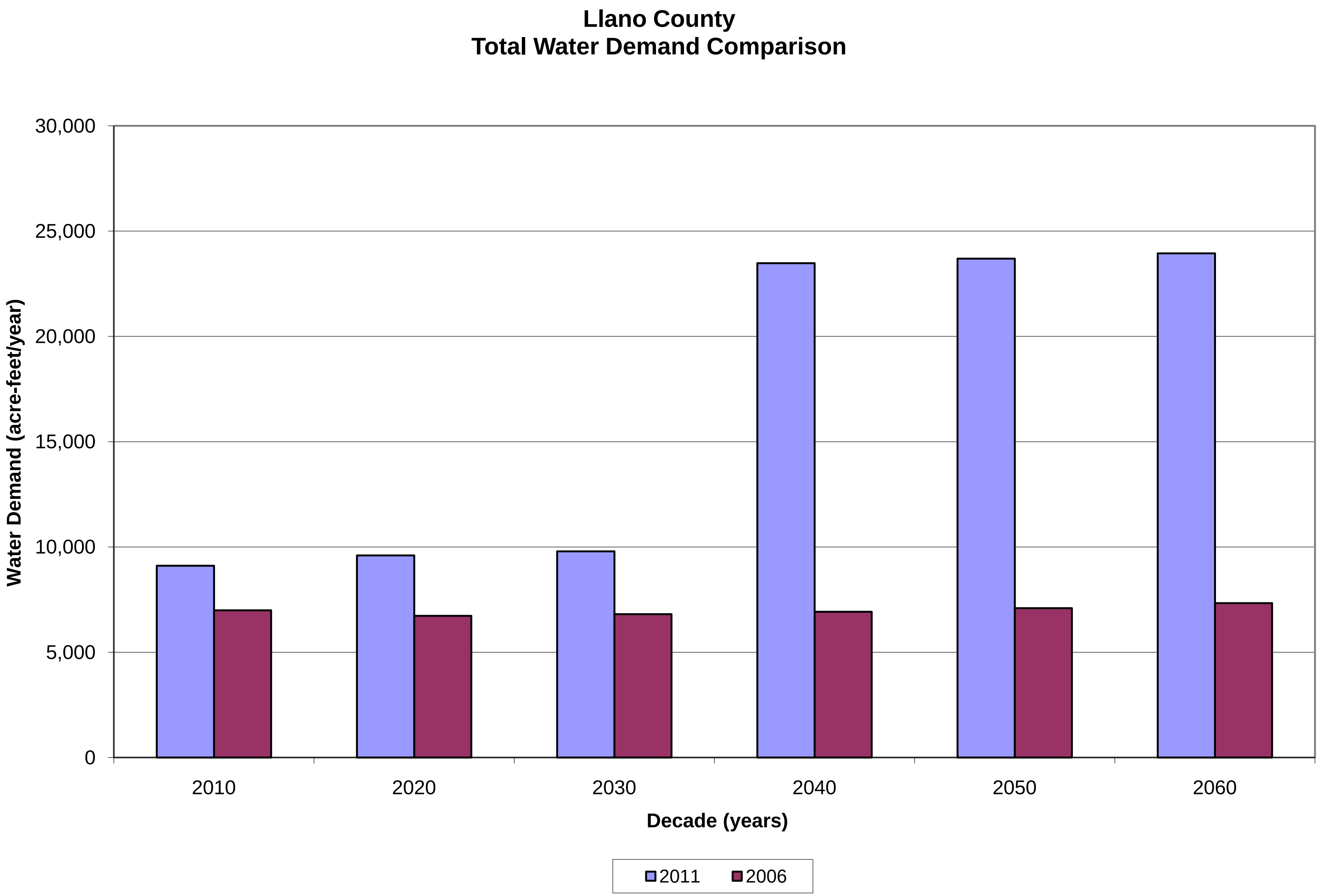

Hays County (Partial)
Total Water Demand Comparison
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Llano County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 5,722 | 6,235 | 6,446 | 6,647 | 6,875 | 7,139 |
| 2006 | 4,054 | 4,018 | 3,976 | 3,929 | 3,905 | 3,905 |
| Difference | 1,668 | 2,217 | 2,470 | 2,718 | 2,970 | 3,234 |
| % Change | 41.1 | 55.2 | 62.1 | 69.2 | 76.1 | 82.8 |
| **Livestock** | | | | | | |
| 2011 | 751 | 751 | 751 | 751 | 751 | 751 |
| 2006 | 751 | 751 | 751 | 751 | 751 | 751 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 979 | 963 | 946 | 930 | 915 | 900 |
| 2006 | 979 | 963 | 946 | 930 | 915 | 900 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2006 | 3 | 3 | 3 | 3 | 3 | 3 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 149 | 148 | 148 | 148 | 148 | 148 |
| 2006 | 149 | 148 | 148 | 148 | 148 | 148 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 1,500 | 1,500 | 1,500 | 15,000 | 15,000 | 15,000 |
| 2006 | 1,057 | 843 | 985 | 1,159 | 1,371 | 1,629 |
| Difference | 443 | 657 | 515 | 13,841 | 13,629 | 13,371 |
| % Change | 41.9 | 77.9 | 52.3 | 1194.2 | 994.1 | 820.8 |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 9,104 | 9,600 | 9,794 | 23,479 | 23,692 | 23,941 |
| 2006 | 6,993 | 6,726 | 6,809 | 6,920 | 7,093 | 7,336 |
| Difference | 2,111 | 2,874 | 2,985 | 16,559 | 16,599 | 16,605 |
| % Change | 30.2 | 42.7 | 43.8 | 239.3 | 234.0 | 226.3 |


Llano County
Total Water Demand Comparison
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

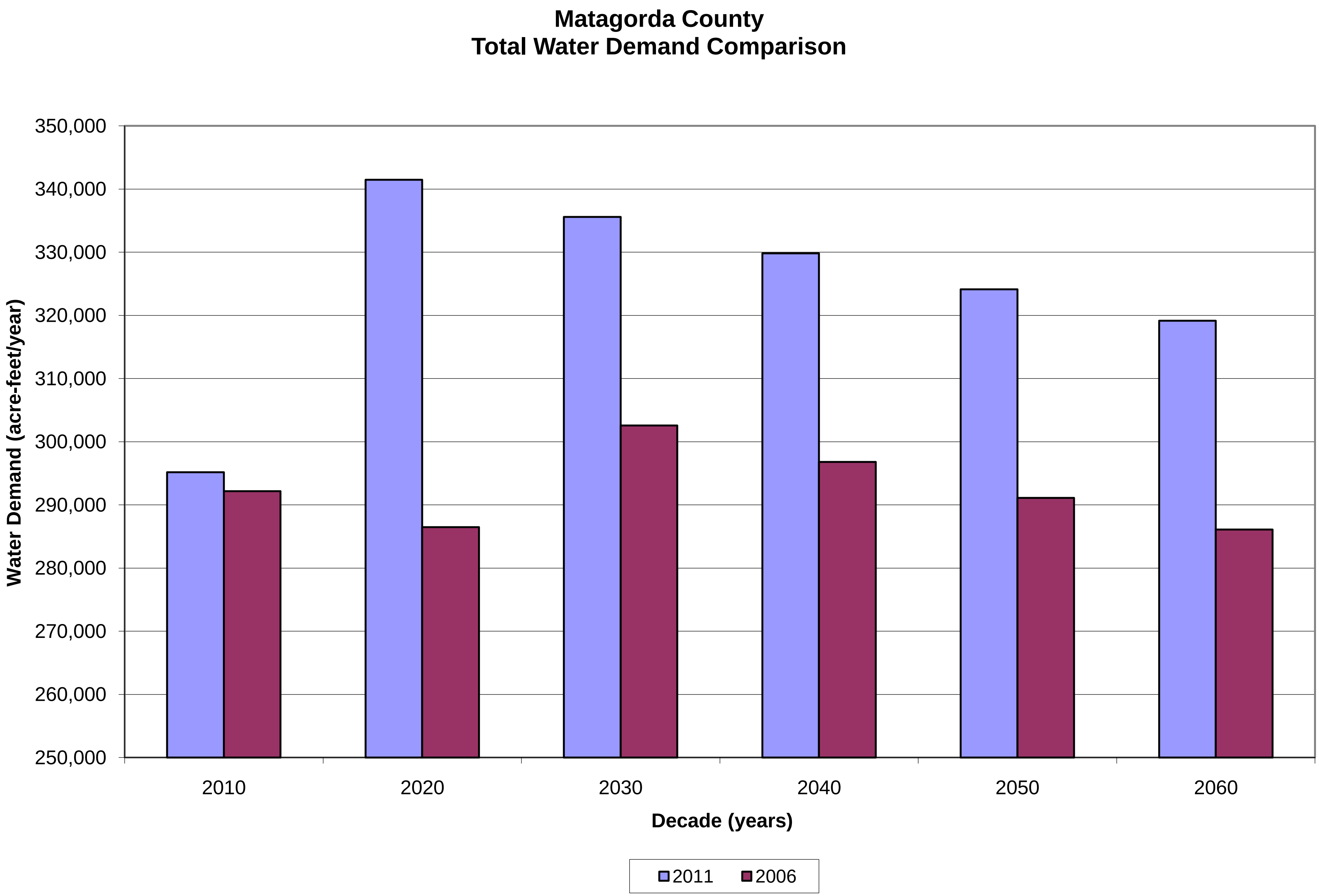
## Comparison Between 20011 RWP and 2006 RWP

**Water Demands* (in acre-feet per year) by WUG Category**
**Matagorda County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 5,590 | 5,830 | 5,906 | 5,883 | 5,831 | 5,831 |
| 2006 | 5,590 | 5,830 | 5,906 | 5,883 | 5,815 | 5,762 |
| Difference | 0 | 0 | 0 | 0 | 16 | 69 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.2 |
| **Livestock** | | | | | | |
| 2011 | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 |
| 2006 | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 | 1,151 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 193,048 | 186,072 | 179,353 | 172,916 | 166,722 | 160,750 |
| 2006 | 193,048 | 186,072 | 179,353 | 172,916 | 166,722 | 160,750 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 12,180 | 13,253 | 13,991 | 14,686 | 15,259 | 16,267 |
| 2006 | 12,180 | 13,253 | 13,991 | 14,686 | 15,259 | 16,267 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 177 | 172 | 169 | 167 | 165 | 163 |
| 2006 | 177 | 172 | 169 | 167 | 165 | 163 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 83,000 | 135,000 | 135,000 | 135,000 | 135,000 | 135,000 |
| 2006 | 80,000 | 80,000 | 102,000 | 102,000 | 102,000 | 102,000 |
| Difference | 3,000 | 55,000 | 33,000 | 33,000 | 33,000 | 33,000 |
| % Change | 3.8 | 68.8 | 32.4 | 32.4 | 32.4 | 32.4 |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 295,146 | 341,478 | 335,570 | 329,803 | 324,128 | 319,162 |
| 2006 | 292,146 | 286,478 | 302,570 | 296,803 | 291,112 | 286,093 |
| Difference | 3,000 | 55,000 | 33,000 | 33,000 | 33,016 | 33,069 |
| % Change | 1.0 | 19.2 | 10.9 | 11.1 | 11.3 | 11.6 |


Matagorda County
Total Water Demand Comparison
Water Demand (acre-feet/year)
350,000
340,000
330,000
320,000
310,000
300,000
290,000
280,000
270,000
260,000
250,000
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

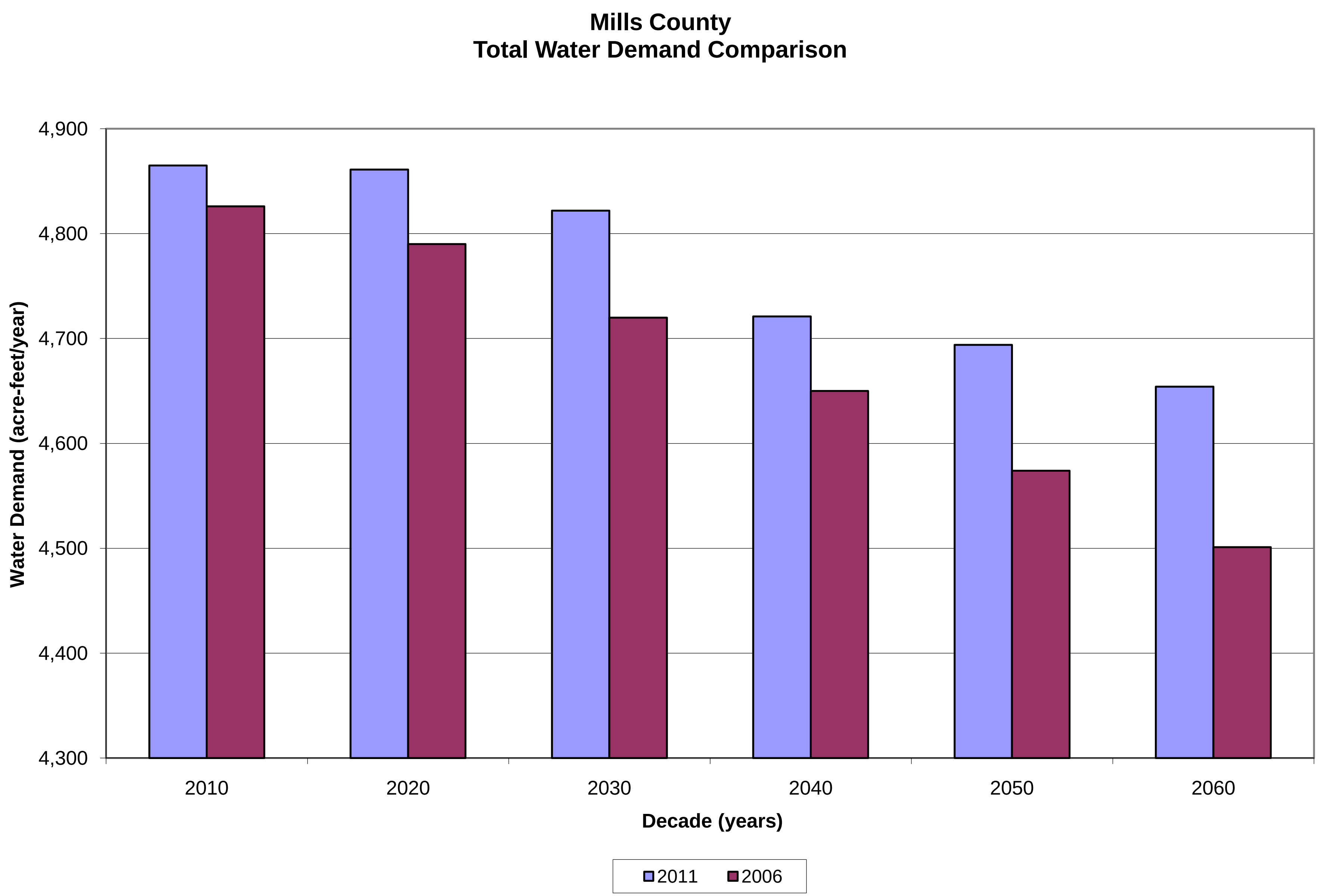
**Comparison Between 2011 RWP and 2006 RWP**

**Water Demands* (in acre-feet per year) by WUG Category**
**Mills County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 1,010 | 1,070 | 1,093 | 1,053 | 1,086 | 1,104 |
| 2006 | 971 | 999 | 991 | 982 | 966 | 951 |
| Difference | 39 | 71 | 102 | 71 | 120 | 153 |
| % Change | 4.0 | 7.1 | 10.3 | 7.2 | 12.4 | 16.1 |
| **Livestock** | | | | | | |
| 2011 | 918 | 918 | 918 | 918 | 918 | 918 |
| 2006 | 918 | 918 | 918 | 918 | 918 | 918 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 2,936 | 2,872 | 2,810 | 2,749 | 2,689 | 2,631 |
| 2006 | 2,936 | 2,872 | 2,810 | 2,749 | 2,689 | 2,631 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2006 | 1 | 1 | 1 | 1 | 1 | 1 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 4,865 | 4,861 | 4,822 | 4,721 | 4,694 | 4,654 |
| 2006 | 4,826 | 4,790 | 4,720 | 4,650 | 4,574 | 4,501 |
| Difference | 39 | 71 | 102 | 71 | 120 | 153 |
| % Change | 0.8 | 1.5 | 2.2 | 1.5 | 2.6 | 3.4 |

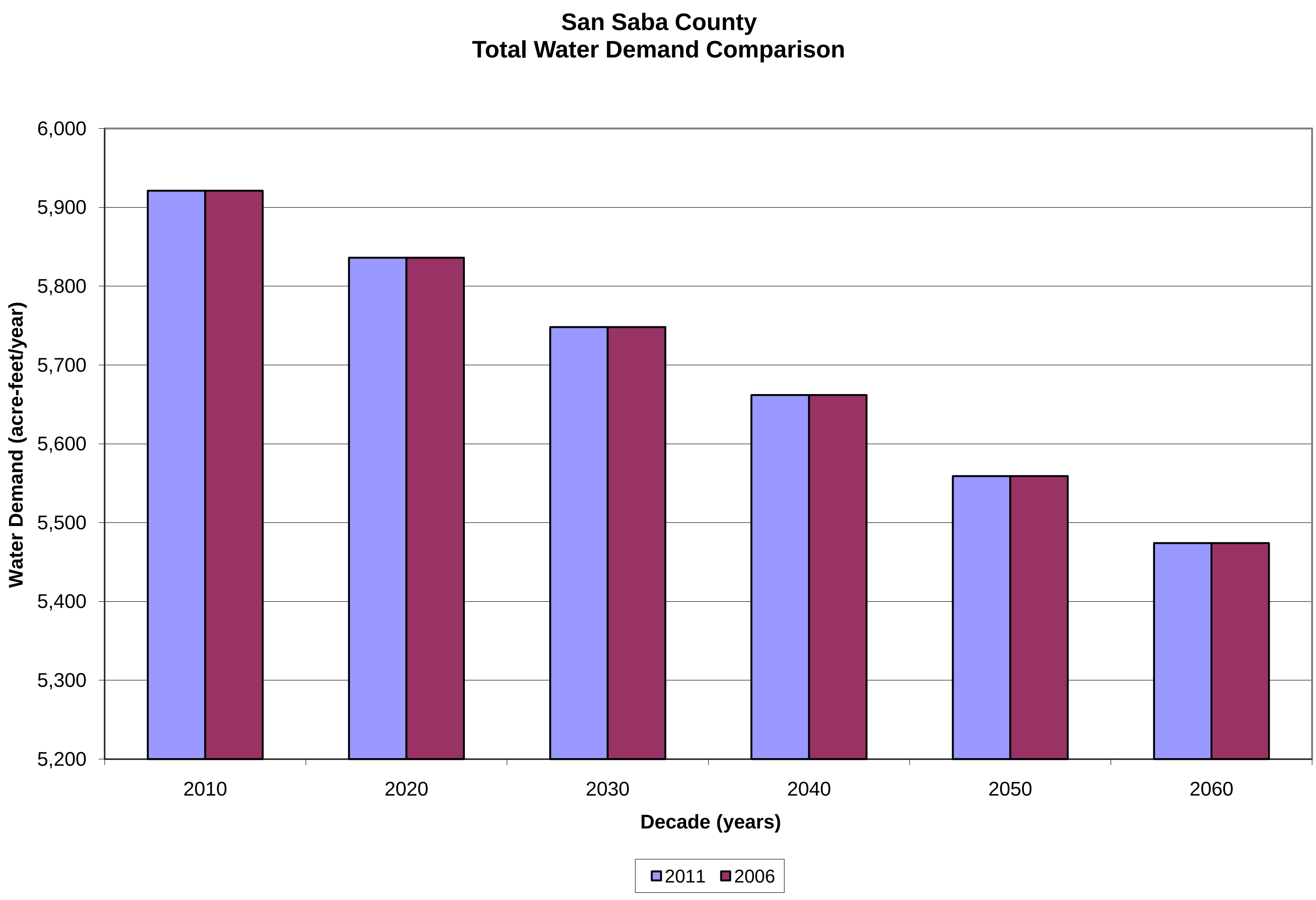

Mills County
Total Water Demand Comparison
4,900
4,800
4,700
4,600
4,500
4,400
4,300
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**San Saba County**

| ***RWP*** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 1,299 | 1,316 | 1,328 | 1,339 | 1,331 | 1,336 |
| 2006 | 1,299 | 1,316 | 1,328 | 1,339 | 1,331 | 1,336 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Livestock** | | | | | | |
| 2011 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 |
| 2006 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 3,240 | 3,136 | 3,035 | 2,937 | 2,841 | 2,749 |
| 2006 | 3,240 | 3,136 | 3,035 | 2,937 | 2,841 | 2,749 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 28 | 30 | 31 | 32 | 33 | 35 |
| 2006 | 28 | 30 | 31 | 32 | 33 | 35 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 163 | 163 | 163 | 163 | 163 | 163 |
| 2006 | 163 | 163 | 163 | 163 | 163 | 163 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 5,921 | 5,836 | 5,748 | 5,662 | 5,559 | 5,474 |
| 2006 | 5,921 | 5,836 | 5,748 | 5,662 | 5,559 | 5,474 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

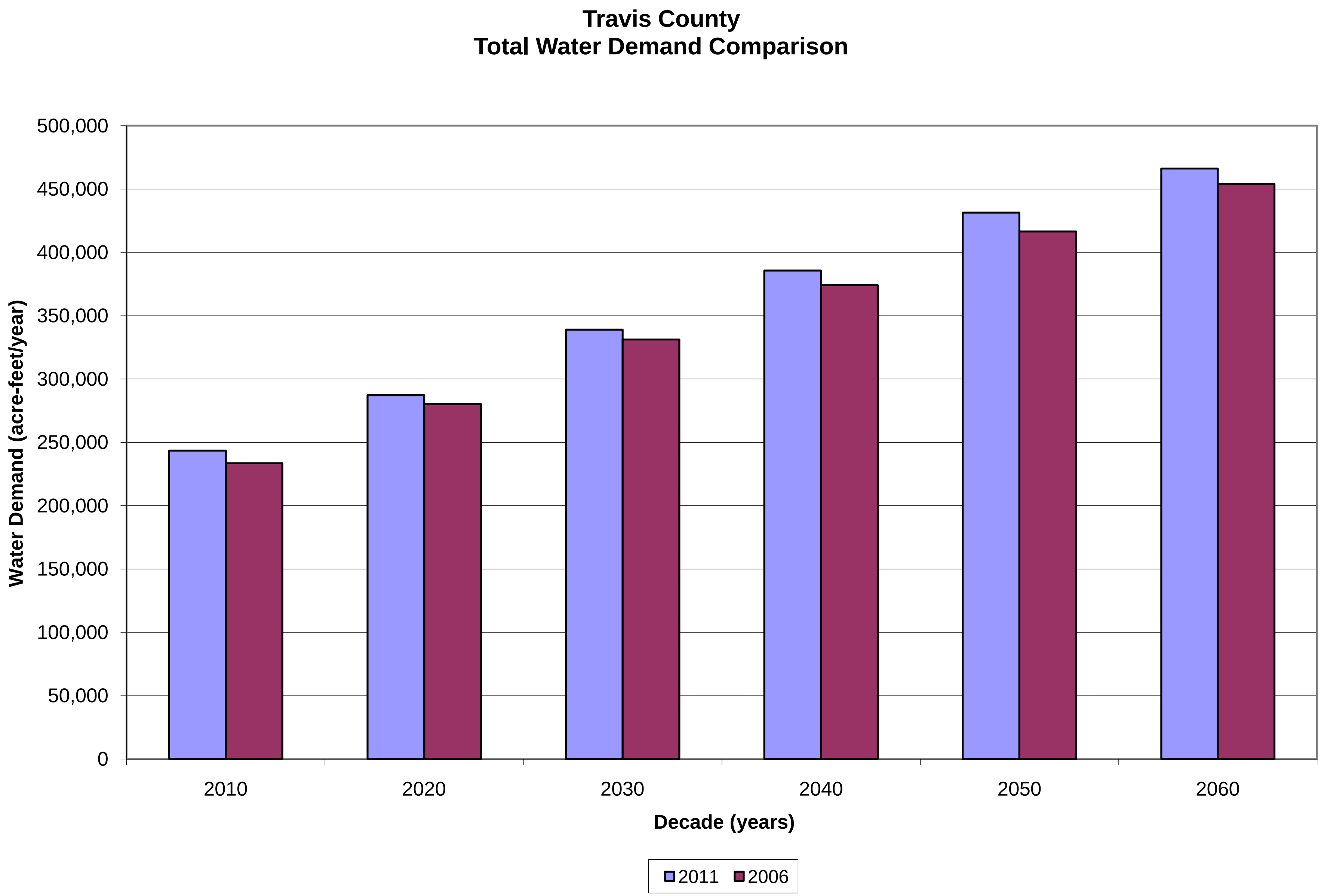

San Saba County
Total Water Demand Comparison
Water Demand (acre-feet/year)
6,000
5,900
5,800
5,700
5,600
5,500
5,400
5,300
5,200
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Travis County**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 199,677 | 237,014 | 274,610 | 308,229 | 342,865 | 369,723 |
| 2006 | 189,602 | 229,928 | 266,748 | 296,675 | 327,840 | 357,541 |
| Difference | 10,075 | 7,086 | 7,862 | 11,554 | 15,025 | 12,182 |
| % Change | 5.3 | 3.1 | 2.9 | 3.9 | 4.6 | 3.4 |
| **Livestock** | | | | | | |
| 2011 | 704 | 704 | 704 | 704 | 704 | 704 |
| 2006 | 704 | 704 | 704 | 704 | 704 | 704 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 1,126 | 1,034 | 951 | 875 | 805 | 741 |
| 2006 | 1,126 | 1,034 | 951 | 875 | 805 | 741 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 23,002 | 28,294 | 38,508 | 50,483 | 57,703 | 64,652 |
| 2006 | 23,002 | 28,294 | 38,508 | 50,483 | 57,703 | 64,652 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 1,531 | 1,649 | 1,727 | 1,804 | 1,880 | 1,935 |
| 2006 | 1,531 | 1,649 | 1,727 | 1,804 | 1,880 | 1,935 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| 2006 | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 243,540 | 287,195 | 339,000 | 385,595 | 431,457 | 466,255 |
| 2006 | 233,465 | 280,109 | 331,138 | 374,041 | 416,432 | 454,073 |
| Difference | 10,075 | 7,086 | 7,862 | 11,554 | 15,025 | 12,182 |
| % Change | 4.3 | 2.5 | 2.4 | 3.1 | 3.6 | 2.7 |

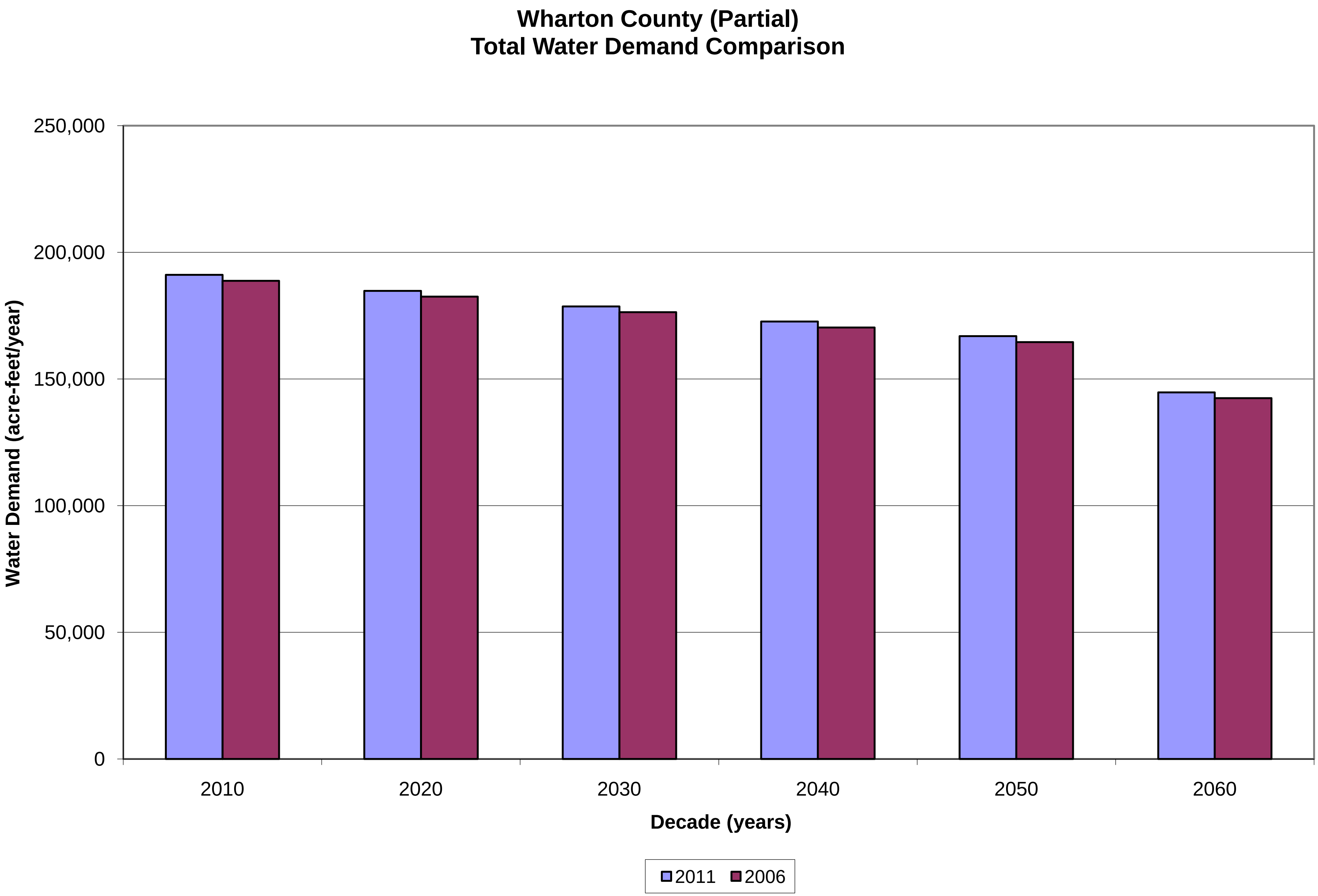

Travis County
Total Water Demand Comparison
Water Demand (acre-feet/year)
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Wharton County (partial)**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 3,776 | 3,880 | 3,910 | 3,880 | 3,847 | 3,806 |
| 2006 | 3,776 | 3,880 | 3,910 | 3,880 | 3,847 | 3,806 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Livestock** | | | | | | |
| 2011 | 728 | 728 | 728 | 728 | 728 | 728 |
| 2006 | 728 | 728 | 728 | 728 | 728 | 728 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Irrigation** | | | | | | |
| 2011 | 182,985 | 176,441 | 170,127 | 164,044 | 158,177 | 135,911 |
| 2006 | 182,985 | 176,441 | 170,127 | 164,044 | 158,177 | 135,911 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Manufacturing** | | | | | | |
| 2011 | 313 | 343 | 366 | 390 | 410 | 442 |
| 2006 | 313 | 343 | 366 | 390 | 410 | 442 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Mining** | | | | | | |
| 2011 | 731 | 773 | 798 | 822 | 844 | 864 |
| 2006 | 731 | 773 | 798 | 822 | 844 | 864 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 2,545 | 2,651 | 2,711 | 2,783 | 2,872 | 2,979 |
| 2006 | 245 | 351 | 411 | 483 | 572 | 679 |
| Difference | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 |
| % Change | 938.8 | 655.3 | 559.6 | 476.2 | 402.1 | 338.7 |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 191,078 | 184,816 | 178,640 | 172,647 | 166,878 | 144,730 |
| 2006 | 188,778 | 182,516 | 176,340 | 170,347 | 164,578 | 142,430 |
| Difference | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 |
| % Change | 1.2 | 1.3 | 1.3 | 1.4 | 1.4 | 1.6 |

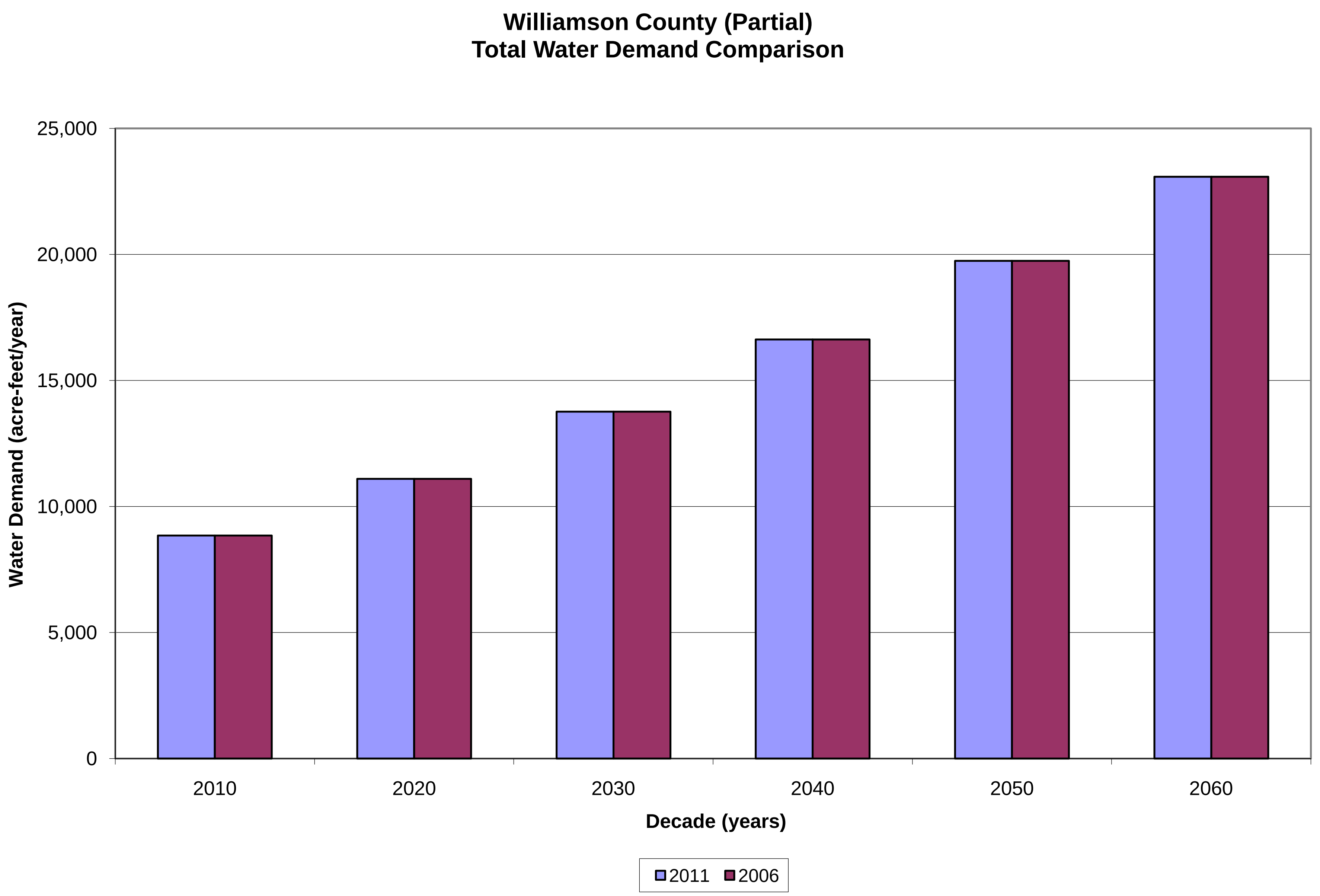

Wharton County (Partial)
Total Water Demand Comparison
250,000
200,000
150,000
100,000
50,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

**Water Demands* (in acre-feet per year) by WUG Category**
**Williamson County (partial)**

| *RWP* | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| **Municipal** | | | | | | |
| 2011 | 8,841 | 11,095 | 13,761 | 16,625 | 19,743 | 23,082 |
| 2006 | 8,841 | 11,095 | 13,761 | 16,625 | 19,743 | 23,082 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Livestock** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |
| **Irrigation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |
| **Manufacturing** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |
| **Mining** | | | | | | |
| 2011 | 9 | 5 | 1 | 0 | 0 | 0 |
| 2006 | 9 | 5 | 1 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | NA | NA | NA |
| **Steam-Electric Power Generation** | | | | | | |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | NA | NA | NA | NA | NA | NA |

*All values are presented in acre-feet per year

| **Total Water Demand** | | | | | | |
|---|---|---|---|---|---|---|
| 2011 | 8,850 | 11,100 | 13,762 | 16,625 | 19,743 | 23,082 |
| 2006 | 8,850 | 11,100 | 13,762 | 16,625 | 19,743 | 23,082 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % Change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |


Williamson County (Partial)
Total Water Demand Comparison
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2010
2020
2030
2040
2050
2060
Decade (years)
2011
2006

| | | | Estimated Gallons per Capita Day* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| AQUA WSC | BASTROP | COLORADO | 134 | 131 | 128 | 127 | 126 | 126 |
| BASTROP | BASTROP | COLORADO | 200 | 196 | 194 | 192 | 191 | 191 |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | 134 | 132 | 130 | 129 | 129 | 129 |
| COUNTY-OTHER | BASTROP | BRAZOS | 122 | 122 | 121 | 121 | 121 | 121 |
| COUNTY-OTHER | BASTROP | COLORADO | 122 | 122 | 121 | 121 | 121 | 121 |
| COUNTY-OTHER | BASTROP | GUADALUPE | 123 | 121 | 121 | 121 | 121 | 121 |
| CREEDMOOR-MAHA WSC | BASTROP | COLORADO | 94 | 89 | 89 | 87 | 86 | 87 |
| ELGIN | BASTROP | COLORADO | 148 | 145 | 142 | 140 | 139 | 139 |
| LEE COUNTY WSC | BASTROP | BRAZOS | 130 | 127 | 125 | 124 | 123 | 123 |
| LEE COUNTY WSC | BASTROP | COLORADO | 131 | 127 | 125 | 124 | 123 | 123 |
| MANVILLE WSC | BASTROP | COLORADO | 119 | 117 | 115 | 114 | 114 | 114 |
| POLONIA WSC | BASTROP | COLORADO | 80 | 78 | 77 | 75 | 75 | 75 |
| SMITHVILLE | BASTROP | COLORADO | 144 | 140 | 138 | 136 | 135 | 135 |
| | | | | | | | | |
| BLANCO | BLANCO | GUADALUPE | 162 | 158 | 156 | 153 | 152 | 152 |
| CANYON LAKE WSC | BLANCO | GUADALUPE | 134 | 133 | 132 | 132 | 132 | 132 |
| COUNTY-OTHER | BLANCO | COLORADO | 88 | 85 | 83 | 81 | 80 | 80 |
| COUNTY-OTHER | BLANCO | GUADALUPE | 88 | 85 | 83 | 81 | 80 | 80 |
| JOHNSON CITY | BLANCO | COLORADO | 211 | 208 | 205 | 203 | 202 | 202 |
| | | | | | | | | |
| BERTRAM | BURNET | BRAZOS | 176 | 173 | 171 | 169 | 168 | 168 |
| BURNET | BURNET | COLORADO | 156 | 153 | 150 | 149 | 148 | 148 |
| CHISHOLM TRAIL SUD | BURNET | BRAZOS | 140 | 143 | 147 | 151 | 152 | 152 |
| COTTONWOOD SHORES | BURNET | COLORADO | 119 | 116 | 114 | 113 | 112 | 112 |
| COUNTY-OTHER | BURNET | BRAZOS | 80 | 78 | 76 | 75 | 74 | 74 |
| COUNTY-OTHER | BURNET | COLORADO | 80 | 78 | 76 | 75 | 74 | 74 |
| GRANITE SHOALS | BURNET | COLORADO | 138 | 134 | 132 | 130 | 129 | 129 |
| KEMPNER WSC | BURNET | BRAZOS | 301 | 298 | 297 | 296 | 295 | 295 |
| KINGSLAND WSC | BURNET | COLORADO | 134 | 132 | 128 | 126 | 125 | 124 |
| LAKE LBJ MUD | BURNET | COLORADO | 248 | 246 | 243 | 240 | 239 | 239 |
| MARBLE FALLS | BURNET | COLORADO | 286 | 283 | 280 | 278 | 277 | 277 |
| MEADOWLAKES | BURNET | COLORADO | 337 | 335 | 334 | 333 | 333 | 333 |
| | | | | | | | | |
| COLUMBUS | COLORADO | COLORADO | 226 | 223 | 220 | 217 | 216 | 216 |
| COUNTY-OTHER | COLORADO | BRAZOS-COLORADO | 95 | 92 | 89 | 86 | 85 | 85 |
| COUNTY-OTHER | COLORADO | COLORADO | 95 | 92 | 89 | 86 | 85 | 85 |
| COUNTY-OTHER | COLORADO | LAVACA | 95 | 92 | 89 | 86 | 85 | 85 |
| EAGLE LAKE | COLORADO | BRAZOS-COLORADO | 135 | 131 | 128 | 125 | 124 | 124 |
| EAGLE LAKE | COLORADO | COLORADO | 135 | 131 | 128 | 125 | 124 | 124 |
| WEIMAR | COLORADO | COLORADO | 148 | 144 | 141 | 138 | 137 | 137 |
| WEIMAR | COLORADO | LAVACA | 148 | 144 | 142 | 137 | 137 | 137 |
| | | | | | | | | |
| AQUA WSC | FAYETTE | COLORADO | 133 | 130 | 128 | 127 | 126 | 126 |

| | | | Estimated Gallons per Capita Day* | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| COUNTY-OTHER | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | FAYETTE | COLORADO | 120 | 116 | 114 | 111 | 110 | 111 |
| COUNTY-OTHER | FAYETTE | GUADALUPE | 120 | 115 | 116 | 105 | 115 | 94 |
| COUNTY-OTHER | FAYETTE | LAVACA | 120 | 116 | 114 | 111 | 109 | 112 |
| FAYETTE WSC | FAYETTE | COLORADO | 115 | 113 | 111 | 110 | 110 | 110 |
| FAYETTE WSC | FAYETTE | LAVACA | 114 | 113 | 111 | 110 | 110 | 110 |
| FLATONIA | FAYETTE | GUADALUPE | 197 | 191 | 190 | 188 | 186 | 186 |
| FLATONIA | FAYETTE | LAVACA | 196 | 192 | 190 | 187 | 186 | 186 |
| LA GRANGE | FAYETTE | COLORADO | 155 | 152 | 150 | 148 | 147 | 147 |
| LEE COUNTY WSC | FAYETTE | COLORADO | 131 | 127 | 125 | 124 | 123 | 123 |
| SCHULENBURG | FAYETTE | LAVACA | 180 | 177 | 174 | 172 | 171 | 171 |
| | | | | | | | | |
| COUNTY-OTHER | GILLESPIE | COLORADO | 106 | 103 | 100 | 98 | 97 | 97 |
| COUNTY-OTHER | GILLESPIE | GUADALUPE | 106 | 103 | 100 | 98 | 97 | 97 |
| FREDERICKSBURG | GILLESPIE | COLORADO | 242 | 239 | 236 | 234 | 233 | 233 |
| | | | | | | | | |
| BUDA | HAYS | COLORADO | 139 | 136 | 134 | 133 | 132 | 132 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | 149 | 145 | 143 | 142 | 141 | 141 |
| COUNTY-OTHER | HAYS | COLORADO | 132 | 129 | 127 | 126 | 126 | 126 |
| DRIPPING SPRINGS | HAYS | COLORADO | 181 | 178 | 176 | 175 | 175 | 175 |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | 125 | 123 | 122 | 121 | 121 | 121 |
| HILL COUNTRY WSC | HAYS | COLORADO | 126 | 124 | 124 | 123 | 123 | 123 |
| MOUNTAIN CITY | HAYS | COLORADO | 143 | 141 | 141 | 139 | 139 | 139 |
| | | | | | | | | |
| COUNTY-OTHER | LLANO | COLORADO | 185 | 184 | 184 | 183 | 182 | 182 |
| KINGSLAND WSC | LLANO | COLORADO | 134 | 132 | 129 | 126 | 125 | 125 |
| LAKE LBJ MUD | LLANO | COLORADO | 248 | 246 | 243 | 240 | 239 | 239 |
| LLANO | LLANO | COLORADO | 265 | 262 | 259 | 256 | 254 | 254 |
| SUNRISE BEACH VILLAGE | LLANO | COLORADO | 215 | 214 | 212 | 209 | 208 | 208 |
| | | | | | | | | |
| BAY CITY | MATAGORDA | BRAZOS-COLORADO | 145 | 142 | 139 | 136 | 135 | 135 |
| COUNTY-OTHER | MATAGORDA | BRAZOS-COLORADO | 95 | 92 | 89 | 86 | 85 | 85 |
| COUNTY-OTHER | MATAGORDA | COLORADO | 95 | 92 | 89 | 86 | 85 | 85 |
| COUNTY-OTHER | MATAGORDA | COLORADO-LAVACA | 95 | 92 | 89 | 86 | 85 | 85 |
| ORBIT SYSTEMS INC | MATAGORDA | COLORADO-LAVACA | 69 | 66 | 64 | 62 | 62 | 62 |
| PALACIOS | MATAGORDA | COLORADO-LAVACA | 121 | 118 | 115 | 113 | 112 | 112 |
| SOUTHWEST UTILITIES | MATAGORDA | BRAZOS-COLORADO | 100 | 97 | 95 | 93 | 92 | 92 |
| | | | | | | | | |
| BROOKSMITH SUD | MILLS | COLORADO | 160 | 159 | 155 | 152 | 155 | 142 |
| COUNTY-OTHER | MILLS | BRAZOS | 107 | 104 | 101 | 98 | 97 | 97 |
| COUNTY-OTHER | MILLS | COLORADO | 107 | 104 | 101 | 98 | 97 | 97 |
| GOLDTHWAITE | MILLS | BRAZOS | 298 | 287 | 287 | 287 | 255 | 255 |
| GOLDTHWAITE | MILLS | COLORADO | 282 | 279 | 276 | 273 | 271 | 271 |

| | | | Estimated Gallons per Capita Day* | | | | | |
|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| | | | | | | | | |
| COUNTY-OTHER | SAN SABA | COLORADO | 75 | 72 | 70 | 69 | 68 | 68 |
| RICHLAND SUD | SAN SABA | COLORADO | 160 | 157 | 154 | 151 | 150 | 150 |
| SAN SABA | SAN SABA | COLORADO | 299 | 296 | 293 | 290 | 288 | 288 |
| | | | | | | | | |
| ANDERSON MILL MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| AQUA WSC | TRAVIS | COLORADO | 134 | 131 | 128 | 127 | 126 | 126 |
| AUSTIN | TRAVIS | COLORADO | 174 | 173 | 172 | 171 | 170 | 169 |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | 246 | 244 | 242 | 241 | 240 | 240 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | 464 | 463 | 462 | 461 | 461 | 461 |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | 176 | 172 | 170 | 169 | 168 | 168 |
| CEDAR PARK | TRAVIS | COLORADO | 182 | 181 | 180 | 180 | 180 | 180 |
| COUNTY-OTHER | TRAVIS | COLORADO | 174 | 173 | 172 | 171 | 170 | 169 |
| COUNTY-OTHER | TRAVIS | GUADALUPE | 128 | 128 | 128 | 128 | 128 | 128 |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | 94 | 90 | 88 | 87 | 86 | 86 |
| CREEDMOOR-MAHA WSC | TRAVIS | GUADALUPE | 95 | 92 | 87 | 88 | 88 | 87 |
| ELGIN | TRAVIS | COLORADO | 143 | 144 | 139 | 140 | 140 | 139 |
| GOFORTH WSC | TRAVIS | COLORADO | 93 | 91 | 89 | 88 | 89 | 87 |
| HILL COUNTRY WSC | TRAVIS | COLORADO | 126 | 124 | 124 | 123 | 123 | 123 |
| JONESTOWN | TRAVIS | COLORADO | 126 | 123 | 120 | 119 | 118 | 118 |
| JONESTOWN WSC | TRAVIS | COLORADO | 118 | 115 | 112 | 111 | 110 | 110 |
| LAGO VISTA | TRAVIS | COLORADO | 292 | 290 | 289 | 288 | 288 | 288 |
| LAKEWAY | TRAVIS | COLORADO | 292 | 290 | 288 | 287 | 287 | 287 |
| LAKEWAY MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 |
| LOOP 360 WSC | TRAVIS | COLORADO | 391 | 390 | 389 | 388 | 388 | 388 |
| LOST CREEK MUD | TRAVIS | COLORADO | 191 | 188 | 185 | 182 | 180 | 180 |
| MANOR | TRAVIS | COLORADO | 193 | 189 | 186 | 184 | 183 | 183 |
| MANVILLE WSC | TRAVIS | COLORADO | 119 | 117 | 115 | 114 | 114 | 114 |
| MUSTANG RIDGE | TRAVIS | COLORADO | 216 | 213 | 211 | 211 | 210 | 210 |
| MUSTANG RIDGE | TRAVIS | GUADALUPE | 219 | 216 | 211 | 210 | 210 | 209 |
| NORTH AUSTIN MUD #1 | TRAVIS | COLORADO | 125 | 122 | 121 | 118 | 117 | 117 |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | COLORADO | 127 | 126 | 125 | 124 | 124 | 124 |
| PFLUGERVILLE | TRAVIS | COLORADO | 156 | 154 | 153 | 152 | 152 | 152 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | 295 | 293 | 293 | 292 | 292 | 292 |
| ROLLINGWOOD | TRAVIS | COLORADO | 238 | 235 | 232 | 229 | 227 | 227 |
| ROUND ROCK | TRAVIS | COLORADO | 197 | 194 | 192 | 191 | 191 | 191 |
| SAN LEANNA | TRAVIS | COLORADO | 163 | 163 | 163 | 163 | 163 | 163 |
| SHADY HOLLOW MUD | TRAVIS | COLORADO | 141 | 138 | 135 | 132 | 131 | 131 |
| THE HILLS | TRAVIS | COLORADO | 220 | 218 | 218 | 217 | 217 | 217 |
| TRAVIS COUNTY WCID #17 | TRAVIS | COLORADO | 161 | 158 | 157 | 156 | 156 | 156 |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | 121 | 118 | 116 | 115 | 114 | 114 |
| TRAVIS COUNTY WCID #19 | TRAVIS | COLORADO | 469 | 466 | 464 | 463 | 463 | 463 |
| TRAVIS COUNTY WCID #20 | TRAVIS | COLORADO | 362 | 360 | 358 | 357 | 356 | 356 |

| | | | Estimated Gallons per Capita Day* | | | | | |
|---|---|---|---|---|---|---|---|---|
| WUG Name | County | River Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| WELLS BRANCH MUD | TRAVIS | COLORADO | 164 | 162 | 160 | 157 | 156 | 156 |
| WEST LAKE HILLS | TRAVIS | COLORADO | 407 | 403 | 401 | 399 | 398 | 398 |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | 143 | 141 | 140 | 139 | 139 | 139 |
| WILLIAMSON-TRAVIS COUNTY MUD #1 | TRAVIS | COLORADO | 104 | 102 | 101 | 100 | 100 | 100 |
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | 107 | 106 | 105 | 104 | 104 | 104 |
| | | | | | | | | |
| COUNTY-OTHER | WHARTON | BRAZOS-COLORADO | 102 | 99 | 96 | 93 | 92 | 92 |
| COUNTY-OTHER | WHARTON | COLORADO | 102 | 99 | 96 | 93 | 92 | 92 |
| COUNTY-OTHER | WHARTON | COLORADO-LAVACA | 102 | 99 | 96 | 93 | 92 | 92 |
| EAST BERNARD | WHARTON | BRAZOS-COLORADO | 102 | 99 | 96 | 93 | 92 | 92 |
| WHARTON | WHARTON | BRAZOS-COLORADO | 152 | 148 | 145 | 142 | 141 | 141 |
| WHARTON | WHARTON | COLORADO | 152 | 148 | 145 | 142 | 141 | 141 |
| | | | | | | | | |
| ANDERSON MILL MUD | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 |
| AUSTIN | WILLIAMSON | BRAZOS | 174 | 173 | 172 | 171 | 170 | 169 |
| COUNTY-OTHER | WILLIAMSON | BRAZOS | 174 | 173 | 172 | 171 | 170 | 169 |
| NORTH AUSTIN MUD #1 | WILLIAMSON | BRAZOS | 125 | 123 | 121 | 118 | 117 | 117 |
| | | | | | | | | |

**Note: (daily per capita water-use rate, gallons per capita day, GPCD) = Municipal Water Demand (ac-ft/yr) / Population * (1 year / 365 days) * (325,851 gallons / 1 ac-ft)**

# Resolution by the Lower Colorado Regional Water Planning Group Regarding Population Projections for the 2011 Regional Water Planning Cycle Adopted June 10, 2009

**WHEREAS**, the Lower Colorado Regional Water Planning Group (Region K) is charged with developing and adopting, with broad public input, a regional water plan every five years; and

**WHEREAS**, Region K received guidance from the Texas Water Development Board (TWDB) in a letter dated December 2, 2008 that indicated with the exception of steam-electric water demands, the TWDB (also referred to as the Board) is not generating new 2011 plan projections for approval by the Board; and

**WHEREAS**, TWDB indicated that planning groups may request that the Board consider revisions to 2006 Regional Water Plan and 2007 State Water Plan population and water demand projections if conditions in a given planning area have changed sufficiently to warrant revisions. The TWDB further indicated:

- The January 2007 population estimates from the Texas State Data Center will be used as the primary standard to determine if changed conditions warrant any revisions to population projections, both at the local and regional level; and
- The Texas State Data Center estimates indicate that current population growth is exceeding projected growth rates for Region K as a whole. Increased regional totals, commensurate with growth which has occurred, are likely justified for this region, subject to TWDB approval; and

**WHEREAS**, Region K formed a Population and Water Demands Committee to develop population and water demand projections for the 2011 Regional Water Plan process; and

**WHEREAS**, the Population and Water Demands Committee in conjunction with its consultant, AECOM, reviewed available data and information from various sources, including the Texas State Data Center, Capitol Area Council of Governments, Harris-Galveston Area Council, U. S. Census Bureau, LCRA's population and water demand projections, and input from various regional water planning group members; and

**WHEREAS**, the Population and Water Demands Committee developed a set of recommended population and water demands projections for each county in Region K and then dispersed those projections to the Water User Group (WUG) level for the regional planning group members to review and provide comments; and

**WHEREAS**, at a regularly scheduled meeting on March 11, 2009 in Bastrop, Region K unanimously adopted these projections as its initially prepared projections for WUGs, TWDB and the public to review and comment on (also referred to as the March 2009 projection - see Attachment 1 to this resolution); and

**WHEREAS**, Region K conducted two public input meetings on March 19, 2009 and April 1, 2009 to receive comments from the public and WUGs; and

**WHEREAS**, on March 26, 2009, the TWDB sent an e-mail to Region K's consultant indicating generally that:

- Blanco, Matagorda, San Saba, and Wharton Counties are currently considered "over-projected" and the TWDB recommended that these counties be kept at their 2006 Region K Plan projection totals;
- For the remaining counties in the planning area where Region K suggested revisions, the TWDB recommended revising the city population projections only. Any non-city WUGs, including County-Other, were recommended to be kept at the 2006 Region K Plan projection levels; and

The TWDB only offered comments on the population projections and offered no comments on any of the increased water demand projections in other categories; and

**WHEREAS**, the Population and Water Demands Committee, in its research of 2006 Region K Plan data and its planning group members' experience indicated that the area of higher growth rates in most counties in Region K, with the exception of Travis County, was in the non-city WUG category, not the city WUG category; and

**WHEREAS**, members of the Region K Population and Water Demands Committee and the Region K consultant, AECOM, met with TWDB staff to discuss their response to Region K's prepared projections. In that discussion, TWDB demographers indicated that the overall projections of State population and State growth rate was a prime motivator for the TWDB staff limiting the population projections for Region K to about one-half of the overall proposed increase in the Region K's initially prepared population projections (March 2009); and

**WHEREAS**, after considerable debate, discussion and some dissention, among the group at its regular meeting on April 8, 2009 in Burnet, Region K gave guidance to its Population and Water Demand Committee to use the TWDB recommended population projections as a guide for developing new population and water demand projections for the 2011 planning process. During this discussion, planning group members expressed their concern that to continue forward and challenge the TWDB's staff recommendation on population projections for Region K may not be successful, but most importantly would put at risk the ability to develop a regional plan within the deadlines established by the TWDB; and

**WHEREAS**, the Population and Water Demand Committee and Region K's consultant, AECOM, redistributed the TWDB recommended population projections and developed an amended set of water demand projections and provided such to the full Region K planning group at its regular meeting on May 5, 2009 in Bastrop. Region K adopted these revised population and water demand projections at the meeting (allowing for the additional 14 day requisite public comment period to follow). A county-level comparison summary of differences between the March 2009 projections and the May 2009 projections is attached (Attachment 2); and

**WHEREAS**, Region K appointed a committee of planning group members to draft a resolution for its consideration at its June 10, 2009 meeting as a method to express and document its concerns regarding the use of the TWDB recommended population projections for the 2011 plan. The planning group has expressed concerns that the adopted revised TWDB recommended population projections do not reflect the actual growth that it is seeing in its planning region over the recent past and expects to experience in the near future;

**THEREFORE BE IT RESOLVED** that:

(1) Region K desires to express its appreciation to the TWDB for recognizing that this region is seeing increased demands for water and has experienced significant population growth at a rate greater than expected in the approved 2006 Region K Plan. However, the planning group does not believe that the TWDB recommended population projections for the 2011 planning process for Region K captures all of the population growth that is begin experienced in the planning area and what is expected to be seen in the near future.

(2) Region K's data review has shown that there are areas within the region that are currently experiencing growth beyond what is projected in the TWDB's recommended population projections for the 2011 planning process for Region K.

(3) Given the tight plan development timeline requirements, Region K decided to move forward with adopting the TWDB's recommended population projections for the 2011 planning process in order to assure that Region K could develop and approve a regional plan that would meet the required TWDB planning process deadlines.

(4) Region K urges the TWDB to consider starting the 2016 planning cycle population and water demand projection development as early as possible in order to provide additional time to consider new information at that time, including 2010 census data.

6-15-09

JOHN BURKE, P.E., CHAIRMAN — DATE

Lower Colorado Regional Water Planning Group

ATTEST:

6/18/09

Secretary

AECOM

**AECOM**
400 West 15th Street, Suite 500, Austin, Texas 78701
T 512.472.4519 F 512.472.7519 www.aecom.com

# Memorandum

| | |
|---|---|
| Date | March 6, 2009 |
| To | Lower Colorado Regional Water Planning Group Members |
| From | Region K Population and Water Demand Committee |
| Subject | Initially Prepared Region K Population and Water Demand Projections for the 2011 Region K Water Plan |

## Background

A memo received from the Texas Water Development Board (TWDB), dated December 2, 2008, provides guidance on and discusses the process of determining whether or not changed conditions in a regional planning area warrant revisions to the population and water demand projections as part of the 2007-2012 Regional Water Planning Cycle. The memo also describes the steps a regional planning area must take if it determines revisions are warranted. As part of the scoping process that occurred for the current phase of planning, TWDB agreed that growth in Region K has exceeded the projected growth in the 2006 Region K Water Plan, thus warranting revisions to the population and water demand projections. This round of planning is different from previous rounds in that TWDB will not provide recommended population nor water demand projection updates to Region K. Any desired revisions to the population and water demand projections must be determined by Region K and submitted as a request for approval to TWDB.

The Region K Population and Water Demand Committee was initially organized at the January 14, 2009, Region K meeting. The first committee meeting was held on February 4, 2009. Additional meetings were held on February 11, February 25, and March 4. The committee's purpose and primary objective was to review all population and water demand projections in the 2006 Region K Plan and recommend any appropriate changes. The committee looked at the various water use categories and recommended that only the municipal and steam-electric use projections be revised. The committee is recommending that the projections for the other categories (irrigation, livestock, manufacturing, and mining) remain the same as identified in the 2006 Region K Plan.

## Steam-Electric Demands

For the steam-electric water demands, the TWDB provided information and alternative projections from a recent report by the University of Texas Bureau of Economic Geology. TWDB was clear that the Region could choose whether to use these projections or select other projections for submittal to TWDB. The committee evaluated and considered the report-generated demands, but determined that some of the numbers were below actual current and projected usage of existing facilities in the planning area. The committee agreed to use the Region K Planning Group members' knowledge of usage in this category to determine updates to the steam-electric water demands. Projected demands for Navasota Energy in Wharton County and White Stallion in Matagorda County were subsequently added as new demands in this category.

**County Municipal Demands**

LCRA provided the committee with a description of the purpose and methodology behind its recent Water Supply Resource Plan (WSRP) population/demand projections. LCRA met with members of each county within their service area in the region to ask for their assistance in determining available data and trends related to current population growth patterns. LCRA shared with the counties the 2006 Region K Water Plan population projections as a starting place. Some of the counties provided data to LCRA to assist in the projection development, while some counties indicated that they were comfortable with the 2006 Plan projections. Where it was deemed appropriate, the LCRA subsequently developed new county level projections using the process described further below.

LCRA used data from Region K, Texas State Data Center (TSDC), U. S. Census Bureau, the State Demographer, Capitol Area Planning Council of Governments (CAPCOG), Houston-Galveston AreaCouncil (H-GAC), and the counties to estimate county population changes through the year 2040. Each county was evaluated separately and LCRA used on a near term projection basis (2010-2040) the population projections that best correlated with data from the U. S. Census Bureau and/or substantiated county data. LCRA met with the State Demographer to share their results and solicit input on approaches to long range population projections. LCRA extended the projections from 2040 to 2100 using the TSDC's half (1990-2000) migration rate.

The committee compared the LCRA's WSRP county population projections to other methods of projections, including the 2006 Region K Plan numbers and various TSDC migration rates and population projections, to determine which projection would best reflect each county's anticipated growth. The determinations were made on a county by county basis, and where appropriate, the committee's decision for a county was made with input from a committee member having detailed knowledge of that county's growth patterns. For all 14 counties in the Region, the committee decided to use the county population projections from the LCRA WSRP for the revised county population totals. A number of LCRA's WSRP population projections for counties in the planning were consistent with projections in the 2006 Region K Plan.

**Individual WUG Demands**

The revised county population totals were distributed by the committee among the individual water user groups (WUGs) as explained below. The TSDC provided January 1, 2007, population estimates for cities within Region K and these estimates were used to project forward to 2010. The committee considered several approaches and options for how best to distribute any increased county growth to the individual WUGs level and how to project such growth through 2060. Using all this information, the committee then went through, on a county by county basis, and distributed any increased growth, taking into consideration knowledge of when and where growth is occurring in that county. In counties with more significant growth, the committee counseled with persons having detailed knowledge of that particular county's growth patterns to help in making such distributions.

Region K has two new WUGs for this round of planning. The Village of San Leanna in Travis County currently has a population greater than 500, so it is now a WUG rather than being part of County-Other. East Bernard in Wharton County recently incorporated, so it too is a new WUG under TWDB criteria rather than being part of County-Other. Finally, Anderson Mill MUD in Travis County and Williamson County has now been annexed by the City of Austin, and is no longer considered a separate WUG.

The committee also discussed whether or not to revise 2006 Region K Water Plan municipal per capita usage rates (i.e.Gallon Per Capita per Day (GPCD) numbers). The committee decided that since the background water use data from the TWDB which is necessary to calculate new GPCD numbers would not be available in time for this planning cycle, the numbers from the 2006 Region K Water Plan should be used to determine municipal water demands. Water Demand data for the Village of San Leanna was provided by TWDB, but data for East Bernard was not available. To determine East Bernard's water demands, the same GPCD shown for County-Other in the 2006 Region K Water Plan was used.

# INITALLY PREPARED REGION K PROJECTED STEAM-ELECTRIC WATER DEMANDS FOR PUBLIC COMMENT

| COUNTY | STEAM-ELECTRIC WATER DEMAND (AC-FT/YR) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **BASTROP COUNTY** | **12,000** | **14,000** | **16,000** | **18,000** | **19,500** | **19,500** |
| 2006 Plan | 12,000 | 14,000 | 16,000 | 18,000 | 19,500 | 19,500 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **BLANCO COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **BURNET COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **COLORADO COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **FAYETTE COUNTY** | **29,622** | **29,702** | **33,002** | **63,843** | **63,843** | **69,753** |
| 2006 Plan | 42,720 | 43,200 | 52,500 | 63,840 | 63,840 | 69,750 |
| Difference | -13,098 | -13,498 | -19,498 | 3 | 3 | 3 |
| % change | -30.7% | -31.2% | -37.1% | 0.0% | 0.0% | 0.0% |
| **GILLESPIE COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **HAYS COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **LLANO COUNTY** | **1,500** | **1,500** | **1,500** | **15,000** | **15,000** | **15,000** |
| 2006 Plan | 1,057 | 843 | 985 | 1,159 | 1,371 | 1,629 |
| Difference | 443 | 657 | 515 | 13,841 | 13,629 | 13,371 |
| % change | 41.9% | 77.9% | 52.3% | 1194.2% | 994.1% | 820.8% |
| **MATAGORDA COUNTY** | **83,000** | **135,000** | **135,000** | **135,000** | **135,000** | **135,000** |
| 2006 Plan | 80,000 | 80,000 | 102,000 | 102,000 | 102,000 | 102,000 |
| Difference | 3,000 | 55,000 | 33,000 | 33,000 | 33,000 | 33,000 |
| % change | 3.8% | 68.8% | 32.4% | 32.4% | 32.4% | 32.4% |
| **MILLS COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **SAN SABA COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **TRAVIS COUNTY** | **17,500** | **18,500** | **22,500** | **23,500** | **27,500** | **28,500** |
| 2006 Plan | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WHARTON COUNTY** | **2,745** | **5,351** | **5,411** | **5,483** | **5,572** | **5,679** |
| 2006 Plan | 245 | 351 | 411 | 483 | 572 | 679 |
| Difference | 2,500 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| % change | 1020.4% | 1424.5% | 1216.5% | 1035.2% | 874.1% | 736.4% |
| **WILLIAMSON COUNTY** | **0** | **0** | **0** | **0** | **0** | **0** |
| 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **REGION K TOTAL** | **146,367** | **204,053** | **213,413** | **260,826** | **266,415** | **273,432** |
| **2006 PLAN TOTAL** | **153,522** | **156,894** | **194,396** | **208,982** | **214,783** | **222,058** |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| BASTROP COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| AQUA WSC | | **37,503** | **54,835** | **79,571** | **114,680** | **125,895** | **138,307** |
| | 2006 Plan | 36,138 | 44,618 | 54,593 | 65,914 | 80,250 | 98,194 |
| | Difference | 1,365 | 10,217 | 24,978 | 48,766 | 45,645 | 40,113 |
| | % change | 3.8% | 22.9% | 45.8% | 74.0% | 56.9% | 40.9% |
| BASTROP | | **8,890** | **12,999** | **18,862** | **27,185** | **29,843** | **32,786** |
| | 2006 Plan | 6,515 | 7,994 | 9,734 | 11,708 | 14,208 | 17,337 |
| | Difference | 2,375 | 5,005 | 9,128 | 15,477 | 15,635 | 15,449 |
| | % change | 36.5% | 62.6% | 93.8% | 132.2% | 110.0% | 89.1% |
| BASTROP COUNTY WCID #2 | | **2,355** | **3,443** | **4,986** | **7,200** | **7,905** | **8,684** |
| | 2006 Plan | 2,269 | 3,202 | 4,300 | 5,546 | 7,124 | 9,099 |
| | Difference | 86 | 241 | 696 | 1,654 | 781 | -415 |
| | % change | 3.8% | 7.5% | 16.2% | 29.8% | 11.0% | -4.6% |
| COUNTY-OTHER | | **18,441** | **26,964** | **39,127** | **56,391** | **61,906** | **68,009** |
| | 2006 Plan | 17,770 | 26,787 | 37,395 | 49,433 | 64,677 | 83,760 |
| | Difference | 671 | 177 | 1,732 | 6,958 | -2,771 | -15,751 |
| | % change | 3.8% | 0.7% | 4.6% | 14.1% | -4.3% | -18.8% |
| CREEDMOOR-MAHA WSC | | **188** | **275** | **399** | **574** | **631** | **693** |
| | 2006 Plan | 181 | 232 | 292 | 361 | 448 | 557 |
| | Difference | 7 | 43 | 107 | 213 | 183 | 136 |
| | % change | 3.8% | 18.4% | 36.5% | 59.1% | 40.7% | 24.4% |
| ELGIN | | **9,997** | **14,617** | **21,211** | **30,570** | **33,560** | **36,868** |
| | 2006 Plan | 6,411 | 7,348 | 8,450 | 9,701 | 11,285 | 13,267 |
| | Difference | 3,586 | 7,269 | 12,761 | 20,869 | 22,275 | 23,601 |
| | % change | 55.9% | 98.9% | 151.0% | 215.1% | 197.4% | 177.9% |
| LEE COUNTY WSC | | **892** | **1,305** | **1,894** | **2,729** | **2,996** | **3,291** |
| | 2006 Plan | 860 | 1,096 | 1,374 | 1,689 | 2,088 | 2,587 |
| | Difference | 32 | 209 | 520 | 1,040 | 908 | 704 |
| | % change | 3.8% | 19.1% | 37.8% | 61.6% | 43.5% | 27.2% |
| MANVILLE WSC | | **520** | **760** | **1,103** | **1,590** | **1,746** | **1,917** |
| | 2006 Plan | 501 | 717 | 971 | 1,259 | 1,624 | 2,080 |
| | Difference | 19 | 43 | 132 | 331 | 121 | -163 |
| | % change | 3.8% | 6.0% | 13.6% | 26.3% | 7.5% | -7.8% |
| POLONIA WSC | | **209** | **305** | **443** | **638** | **700** | **769** |
| | 2006 Plan | 201 | 263 | 335 | 417 | 521 | 651 |
| | Difference | 8 | 42 | 108 | 221 | 179 | 118 |
| | % change | 3.8% | 16.0% | 32.1% | 53.0% | 34.4% | 18.2% |
| SMITHVILLE | | **5,606** | **8,197** | **11,895** | **17,143** | **18,819** | **20,675** |
| | 2006 Plan | 4,540 | 5,344 | 6,290 | 7,364 | 8,724 | 10,429 |
| | Difference | 1,066 | 2,853 | 5,605 | 9,779 | 10,095 | 10,246 |
| | % change | 23.5% | 53.4% | 89.1% | 132.8% | 115.7% | 98.3% |
| **BASTROP COUNTY TOTAL** | | **84,600** | **123,700** | **179,500** | **258,700** | **284,000** | **312,000** |
| | **2006 PLAN TOTAL** | **75,386** | **97,601** | **123,734** | **153,392** | **190,949** | **237,958** |

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| BASTROP COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| AQUA WSC | | **5,629** | **8,046** | **11,408** | **16,314** | **17,768** | **19,521** |
| | 2006 Plan | 5,424 | 6,547 | 7,827 | 9,377 | 11,326 | 13,859 |
| | Difference | 205 | 1,499 | 3,581 | 6,937 | 6,442 | 5,662 |
| | % change | 3.8% | 22.9% | 45.8% | 74.0% | 56.9% | 40.9% |
| BASTROP | | **1,992** | **2,854** | **4,098** | **5,847** | **6,385** | **7,014** |
| | 2006 Plan | 1,460 | 1,755 | 2,115 | 2,518 | 3,040 | 3,709 |
| | Difference | 532 | 1,099 | 1,983 | 3,329 | 3,345 | 3,305 |
| | % change | 36.5% | 62.6% | 93.8% | 132.2% | 110.0% | 89.1% |
| BASTROP COUNTY WCID #2 | | **354** | **509** | **727** | **1,040** | **1,142** | **1,255** |
| | 2006 Plan | 341 | 473 | 626 | 801 | 1,029 | 1,315 |
| | Difference | 13 | 36 | 101 | 239 | 113 | -60 |
| | % change | 3.8% | 7.5% | 16.2% | 29.8% | 11.0% | -4.6% |
| COUNTY-OTHER | | **2,521** | **3,684** | **5,303** | **7,643** | **8,390** | **9,218** |
| | 2006 Plan | 2,429 | 3,660 | 5,068 | 6,700 | 8,766 | 11,353 |
| | Difference | 92 | 24 | 235 | 943 | -376 | -2,135 |
| | % change | 3.8% | 0.7% | 4.6% | 14.1% | -4.3% | -18.8% |
| CREEDMOOR-MAHA WSC | | **20** | **27** | **40** | **56** | **61** | **67** |
| | 2006 Plan | 19 | 23 | 29 | 35 | 43 | 54 |
| | Difference | 1 | 4 | 11 | 21 | 18 | 13 |
| | % change | 3.8% | 18.4% | 36.5% | 59.1% | 40.7% | 24.4% |
| ELGIN | | **1,658** | **2,373** | **3,374** | **4,793** | **5,225** | **5,741** |
| | 2006 Plan | 1,063 | 1,193 | 1,344 | 1,521 | 1,757 | 2,066 |
| | Difference | 595 | 1,180 | 2,030 | 3,272 | 3,468 | 3,675 |
| | % change | 55.9% | 98.9% | 151.0% | 215.1% | 197.4% | 177.9% |
| LEE COUNTY WSC | | **131** | **186** | **265** | **380** | **412** | **453** |
| | 2006 Plan | 126 | 156 | 192 | 235 | 287 | 356 |
| | Difference | 5 | 30 | 73 | 145 | 125 | 97 |
| | % change | 3.7% | 19.1% | 37.8% | 61.6% | 43.5% | 27.2% |
| MANVILLE WSC | | **70** | **100** | **142** | **203** | **222** | **245** |
| | 2006 Plan | 67 | 94 | 125 | 161 | 207 | 266 |
| | Difference | 3 | 6 | 17 | 42 | 15 | -21 |
| | % change | 3.8% | 6.0% | 13.6% | 26.3% | 7.5% | -7.8% |
| POLONIA WSC | | **19** | **27** | **38** | **54** | **59** | **65** |
| | 2006 Plan | 18 | 23 | 29 | 35 | 44 | 55 |
| | Difference | 1 | 4 | 9 | 19 | 15 | 10 |
| | % change | 3.8% | 16.0% | 32.1% | 53.0% | 34.4% | 18.2% |
| SMITHVILLE | | **904** | **1,286** | **1,838** | **2,612** | **2,845** | **3,127** |
| | 2006 Plan | 732 | 838 | 972 | 1,122 | 1,319 | 1,577 |
| | Difference | 172 | 447 | 866 | 1,490 | 1,526 | 1,550 |
| | % change | 23.5% | 53.4% | 89.1% | 132.8% | 115.7% | 98.3% |
| **BASTROP COUNTY TOTAL** | | **13,296** | **18,091** | **27,233** | **38,941** | **42,510** | **46,706** |
| | **2006 PLAN TOTAL** | **11,679** | **14,762** | **18,327** | **22,505** | **27,818** | **34,610** |

## INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

### PROPOSED POPULATION PROJECTIONS

| BLANCO COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BLANCO | | **2,430** | **3,115** | **3,755** | **4,241** | **4,617** | **5,059** |
| | 2006 Plan | 1,672 | 1,870 | 2,059 | 2,224 | 2,403 | 2,611 |
| | Difference | 758 | 1,245 | 1,696 | 2,017 | 2,214 | 2,448 |
| | % change | 45.3% | 66.6% | 82.4% | 90.7% | 92.1% | 93.8% |
| CANYON LAKE WSC | | **1,260** | **1,774** | **2,287** | **2,698** | **3,164** | **3,705** |
| | 2006 Plan | 1,254 | 1,766 | 2,256 | 2,685 | 3,149 | 3,687 |
| | Difference | 6 | 8 | 11 | 13 | 15 | 18 |
| | % change | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% |
| COUNTY-OTHER | | **5,694** | **7,139** | **8,480** | **9,440** | **10,049** | **10,772** |
| | 2006 Plan | 5,667 | 6,575 | 7,444 | 8,205 | 9,027 | 9,982 |
| | Difference | 27 | 564 | 1,036 | 1,235 | 1,022 | 790 |
| | % change | 0.5% | 8.6% | 13.9% | 15.1% | 11.3% | 7.9% |
| JOHNSON CITY | | **1,616** | **2,071** | **2,497** | **2,821** | **3,070** | **3,364** |
| | 2006 Plan | 1,351 | 1,545 | 1,728 | 1,888 | 2,062 | 2,264 |
| | Difference | 263 | 526 | 769 | 933 | 1,008 | 1,100 |
| | % change | 19.4% | 34.1% | 44.5% | 49.4% | 48.9% | 48.6% |
| **BLANCO COUNTY TOTAL** | | **11,000** | **14,100** | **17,000** | **19,200** | **20,900** | **22,900** |
| | **2006 PLAN TOTAL** | **9,946** | **11,756** | **13,487** | **15,002** | **16,641** | **18,544** |

### PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| BLANCO COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BLANCO | | **440** | **551** | **657** | **727** | **786** | **862** |
| | 2006 Plan | 303 | 331 | 360 | 381 | 409 | 445 |
| | Difference | 137 | 220 | 297 | 346 | 377 | 417 |
| | % change | 45.3% | 66.6% | 82.4% | 90.7% | 92.1% | 93.8% |
| CANYON LAKE WSC | | **189** | **264** | **336** | **399** | **468** | **548** |
| | 2006 Plan | 188 | 263 | 334 | 397 | 466 | 545 |
| | Difference | 1 | 1 | 2 | 2 | 2 | 3 |
| | % change | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% |
| COUNTY-OTHER | | **561** | **680** | **788** | **856** | **901** | **965** |
| | 2006 Plan | 558 | 626 | 692 | 744 | 809 | 894 |
| | Difference | 3 | 54 | 96 | 112 | 92 | 71 |
| | % change | 0.5% | 8.6% | 13.9% | 15.1% | 11.3% | 7.9% |
| JOHNSON CITY | | **382** | **483** | **574** | **641** | **695** | **761** |
| | 2006 Plan | 320 | 360 | 397 | 429 | 467 | 517 |
| | Difference | 62 | 123 | 177 | 212 | 228 | 244 |
| | % change | 19.4% | 34.1% | 44.5% | 49.4% | 48.9% | 48.6% |
| **BLANCO COUNTY TOTAL** | | **1,572** | **1,978** | **2,354** | **2,622** | **2,850** | **3,136** |
| | **2006 PLAN TOTAL** | **1,369** | **1,560** | **1,783** | **1,951** | **2,151** | **2,396** |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| BURNET COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **BERTRAM** | | **1,430** | **1,957** | **2,555** | **3,145** | **3,448** | **3,780** |
| | 2006 Plan | 1,307 | 1,524 | 1,746 | 1,958 | 2,189 | 2,458 |
| | Difference | 123 | 433 | 809 | 1,187 | 1,259 | 1,322 |
| | % change | 9.4% | 28.4% | 46.4% | 60.6% | 57.5% | 53.8% |
| **BURNET** | | **6,358** | **8,697** | **11,358** | **13,980** | **15,324** | **16,802** |
| | 2006 Plan | 5,625 | 6,668 | 7,736 | 8,753 | 9,864 | 11,154 |
| | Difference | 733 | 2,029 | 3,622 | 5,227 | 5,460 | 5,648 |
| | % change | 13.0% | 30.4% | 46.8% | 59.7% | 55.4% | 50.6% |
| **CHISOLM TRAIL SUD** | | **189** | **259** | **338** | **416** | **456** | **500** |
| | 2006 Plan | 178 | 249 | 321 | 390 | 465 | 553 |
| | Difference | 11 | 10 | 17 | 26 | -9 | -53 |
| | % change | 6.3% | 3.9% | 5.3% | 6.6% | -2.0% | -9.6% |
| **COTTONWOOD SHORES** | | **1,169** | **1,599** | **2,088** | **2,570** | **2,817** | **3,089** |
| | 2006 Plan | 1,100 | 1,362 | 1,630 | 1,885 | 2,164 | 2,488 |
| | Difference | 69 | 237 | 458 | 685 | 653 | 601 |
| | % change | 6.3% | 17.4% | 28.1% | 36.3% | 30.2% | 24.1% |
| **COUNTY-OTHER** | | **23,092** | **31,587** | **41,253** | **50,773** | **55,655** | **61,026** |
| | 2006 Plan | 21,733 | 26,913 | 32,218 | 37,265 | 42,781 | 49,189 |
| | Difference | 1,359 | 4,674 | 9,035 | 13,508 | 12,874 | 11,837 |
| | % change | 6.3% | 17.4% | 28.0% | 36.2% | 30.1% | 24.1% |
| **GRANITE SHOALS** | | **2,738** | **3,746** | **4,892** | **6,021** | **6,600** | **7,237** |
| | 2006 Plan | 2,489 | 3,015 | 3,554 | 4,067 | 4,627 | 5,278 |
| | Difference | 249 | 731 | 1,338 | 1,954 | 1,973 | 1,959 |
| | % change | 10.0% | 24.2% | 37.7% | 48.0% | 42.6% | 37.1% |
| **KEMPNER WSC** | | **939** | **1,285** | **1,678** | **2,065** | **2,264** | **2,482** |
| | 2006 Plan | 884 | 1,140 | 1,402 | 1,652 | 1,925 | 2,242 |
| | Difference | 55 | 145 | 276 | 413 | 339 | 240 |
| | % change | 6.3% | 12.7% | 19.7% | 25.0% | 17.6% | 10.7% |
| **KINGSLAND WSC** | | **389** | **532** | **695** | **855** | **937** | **1,028** |
| | 2006 Plan | 366 | 426 | 487 | 545 | 608 | 682 |
| | Difference | 23 | 106 | 208 | 310 | 329 | 346 |
| | % change | 6.3% | 24.9% | 42.7% | 56.9% | 54.2% | 50.7% |
| **LAKE LBJ MUD** | | **868** | **1,187** | **1,551** | **1,909** | **2,092** | **2,294** |
| | 2006 Plan | 817 | 946 | 1,078 | 1,204 | 1,341 | 1,500 |
| | Difference | 51 | 241 | 473 | 705 | 751 | 794 |
| | % change | 6.3% | 25.5% | 43.9% | 58.5% | 56.0% | 52.9% |
| **MARBLE FALLS** | | **7,796** | **10,664** | **13,927** | **17,141** | **18,789** | **20,602** |
| | 2006 Plan | 5,604 | 6,361 | 7,136 | 7,874 | 8,680 | 9,616 |
| | Difference | 2,192 | 4,303 | 6,791 | 9,267 | 10,109 | 10,986 |
| | % change | 39.1% | 67.6% | 95.2% | 117.7% | 116.5% | 114.2% |
| **MEADOWLAKES** | | **2,331** | **3,188** | **4,164** | **5,125** | **5,618** | **6,160** |
| | 2006 Plan | 1,821 | 2,440 | 3,074 | 3,678 | 4,337 | 5,103 |
| | Difference | 510 | 748 | 1,090 | 1,447 | 1,281 | 1,057 |
| | % change | 28.0% | 30.7% | 35.5% | 39.3% | 29.5% | 20.7% |
| **BURNET COUNTY TOTAL** | | **47,300** | **64,700** | **84,500** | **104,000** | **114,000** | **125,000** |
| | **2006 PLAN TOTAL** | **41,924** | **51,044** | **60,382** | **69,271** | **78,981** | **90,283** |

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| BURNET COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **BERTRAM** | | **282** | **379** | **489** | **596** | **649** | **712** |
| | 2006 Plan | 258 | 295 | 334 | 371 | 412 | 463 |
| | Difference | 24 | 84 | 155 | 225 | 237 | 249 |
| | % change | 9.4% | 28.4% | 46.4% | 60.6% | 57.5% | 53.8% |
| **BURNET** | | **1,111** | **1,491** | **1,909** | **2,333** | **2,540** | **2,785** |
| | 2006 Plan | 983 | 1,143 | 1,300 | 1,461 | 1,635 | 1,849 |
| | Difference | 128 | 348 | 609 | 872 | 905 | 936 |
| | % change | 13.0% | 30.4% | 46.8% | 59.7% | 55.4% | 50.6% |
| **CHISOLM TRAIL SUD** | | **30** | **42** | **56** | **70** | **77** | **85** |
| | 2006 Plan | 28 | 40 | 53 | 66 | 79 | 94 |
| | Difference | 2 | 2 | 3 | 4 | -2 | -9 |
| | % change | 6.3% | 3.9% | 5.3% | 6.6% | -2.0% | -9.6% |
| **COTTONWOOD SHORES** | | **156** | **208** | **266** | **326** | **353** | **387** |
| | 2006 Plan | 147 | 177 | 208 | 239 | 271 | 312 |
| | Difference | 9 | 31 | 58 | 87 | 82 | 75 |
| | % change | 6.3% | 17.4% | 28.1% | 36.3% | 30.2% | 24.1% |
| **COUNTY-OTHER** | | **2,069** | **2,760** | **3,512** | **4,266** | **4,613** | **5,059** |
| | 2006 Plan | 1,947 | 2,352 | 2,743 | 3,131 | 3,546 | 4,078 |
| | Difference | 122 | 408 | 769 | 1,135 | 1,067 | 981 |
| | % change | 6.3% | 17.4% | 28.0% | 36.2% | 30.1% | 24.1% |
| **GRANITE SHOALS** | | **424** | **563** | **723** | **876** | **954** | **1,046** |
| | 2006 Plan | 385 | 453 | 525 | 592 | 669 | 763 |
| | Difference | 39 | 110 | 198 | 284 | 285 | 283 |
| | % change | 10.0% | 24.2% | 37.7% | 48.0% | 42.6% | 37.1% |
| **KEMPNER WSC** | | **317** | **429** | **558** | **686** | **748** | **820** |
| | 2006 Plan | 298 | 381 | 466 | 548 | 636 | 741 |
| | Difference | 19 | 48 | 92 | 137 | 112 | 79 |
| | % change | 6.3% | 12.7% | 19.7% | 25.0% | 17.6% | 10.7% |
| **KINGSLAND WSC** | | **58** | **79** | **100** | **121** | **131** | **143** |
| | 2006 Plan | 55 | 63 | 70 | 77 | 85 | 95 |
| | Difference | 3 | 16 | 30 | 44 | 46 | 48 |
| | % change | 6.3% | 24.9% | 42.7% | 56.9% | 54.2% | 50.7% |
| **LAKE LBJ MUD** | | **241** | **328** | **422** | **514** | **560** | **615** |
| | 2006 Plan | 227 | 261 | 293 | 324 | 359 | 402 |
| | Difference | 14 | 67 | 129 | 190 | 201 | 21[illegible] |
| | % change | 6.3% | 25.5% | 43.9% | 58.5% | 56.0% | 52.9% |
| **MARBLE FALLS** | | **2,497** | **3,380** | **4,368** | **5,338** | **5,829** | **6,393** |
| | 2006 Plan | 1,795 | 2,016 | 2,238 | 2,452 | 2,693 | 2,[illegible] |
| | Difference | 702 | 1,364 | 2,130 | 2,886 | 3,136 | 3,[illegible] |
| | % change | 39.1% | 67.6% | 95.2% | 117.7% | 116.5% | 114.2% |
| **MEADOWLAKES** | | **879** | **1,197** | **1,558** | **1,912** | **2,096** | **2,297** |
| | 2006 Plan | 687 | 916 | 1,150 | 1,372 | 1,618 | 1,[illegible] |
| | Difference | 192 | 281 | 408 | 54[illegible] | 478 | 3[illegible] |
| | % change | 28.0% | 30.7% | 35.5% | 39.3% | 29.5% | 20.7% |
| **BURNET COUNTY TOTAL** | | **8,064** | **10,854** | **13,958** | **17,037** | **18,551** | **20,344** |
| | **2006 PLAN TOTAL** | **6,810** | **8,097** | **9,380** | **10,633** | **12,003** | **13,684** |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| COLORADO COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COLUMBUS | | **4,053** | **4,399** | **4,578** | **4,580** | **4,973** | **5,206** |
| | 2006 Plan | 4,053 | 4,231 | 4,331 | 4,371 | 4,379 | 4,333 |
| | Difference | 0 | 168 | 247 | 209 | 594 | 873 |
| | % change | 0.0% | 4.0% | 5.7% | 4.8% | 13.6% | 20.1% |
| COUNTY-OTHER | | **12,622** | **13,700** | **14,258** | **14,262** | **15,488** | **16,213** |
| | 2006 Plan | 11,206 | 11,702 | 11,977 | 12,087 | 12,110 | 11,982 |
| | Difference | 1,416 | 1,998 | 2,281 | 2,175 | 3,378 | 4,231 |
| | % change | 12.6% | 17.1% | 19.0% | 18.0% | 27.9% | 35.3% |
| EAGLE LAKE | | **3,792** | **4,116** | **4,284** | **4,285** | **4,653** | **4,871** |
| | 2006 Plan | 3,792 | 3,959 | 4,052 | 4,090 | 4,097 | 4,0[illegible] |
| | Difference | 0 | 157 | 232 | 195 | 556 | 817 |
| | % change | 0.0% | 4.0% | 5.7% | 4.8% | 13.6% | 20.1% |
| WEIMAR | | **2,188** | **2,375** | **2,472** | **2,472** | **2,585** | **2,810** |
| | 2006 Plan | 2,050 | 2,140 | 2,190 | 2,212 | 2,215 | 2,192 |
| | Difference | 138 | 235 | 282 | 260 | 470 | 618 |
| | % change | 6.7% | 11.0% | 12.9% | 11.8% | 21.2% | 28.2% |
| COLORADO COUNTY TOTAL | | **22,655** | **24,589** | **26,592** | **25,599** | **27,800** | **29,100** |
| | 2006 PLAN TOTAL | **21,101** | **22,032** | **22,550** | **22,760** | **22,801** | **22,561** |

| FAYETTE COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| AQUA WSC | | **602** | **787** | **939** | **1,057** | **1,193** | **1,372** |
| | 2006 Plan | 602 | 787 | 939 | 1,057 | 1,193 | 1,372 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| COUNTY-OTHER | | **5,064** | **3,358** | **2,232** | **1,487** | **992** | **663** |
| | 2006 Plan | 5,064 | 3,358 | 2,232 | 1,487 | 992 | 663 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| FAYETTE WSC | | **7,147** | **10,252** | **12,807** | **14,795** | **17,070** | **20,081** |
| | 2006 Plan | 7,147 | 10,252 | 12,807 | 14,795 | 17,070 | 20,081 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| FLATONIA | | **1,543** | **1,712** | **1,851** | **1,959** | **2,083** | **2,247** |
| | 2006 Plan | 1,543 | 1,712 | 1,851 | 1,959 | 2,083 | 2,247 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LA GRANGE | | **5,546** | **6,629** | **7,520** | **8,213** | **9,007** | **10,057** |
| | 2006 Plan | 5,546 | 6,629 | 7,520 | 8,213 | 9,007 | 10,057 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LEE COUNTY WSC | | **1,730** | **2,375** | **2,906** | **3,319** | **3,792** | **4,418** |
| | 2006 Plan | 1,730 | 2,375 | 2,906 | 3,319 | 3,792 | 4,418 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| SCHULENBERG | | **3,194** | **3,695** | **4,108** | **4,429** | **4,796** | **5,282** |
| | 2006 Plan | 3,194 | 3,695 | 4,108 | 4,429 | 4,796 | 5,282 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| FAYETTE COUNTY TOTAL | | **24,826** | **28,808** | **32,363** | **35,259** | **38,933** | **44,120** |
| | 2006 PLAN TOTAL | **24,826** | **28,808** | **32,363** | **35,259** | **38,933** | **44,120** |

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| COLORADO COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COLUMBUS | | **1,026** | **1,099** | **1,128** | **1,113** | **1,204** | **1,259** |
| | 2006 Plan | 1,026 | 1,057 | 1,067 | 1,062 | 1,060 | 1,048 |
| | Difference | 0 | 42 | 61 | 51 | 144 | 211 |
| | % change | 0.0% | 4.0% | 5.7% | 4.8% | 13.6% | 20.1% |
| COUNTY-OTHER | | **1,344** | **1,412** | **1,423** | **1,375** | **1,475** | **1,544** |
| | 2006 Plan | 1,193 | 1,206 | 1,195 | 1,165 | 1,153 | 1,141 |
| | Difference | 151 | 206 | 228 | 210 | 322 | 403 |
| | % change | 12.6% | 17.1% | 19.0% | 18.0% | 27.9% | 35.3% |
| EAGLE LAKE | | **573** | **604** | **614** | **599** | **646** | **676** |
| | 2006 Plan | 573 | 581 | 581 | 572 | 569 | 563 |
| | Difference | 0 | 23 | 33 | 27 | 77 | 113 |
| | % change | 0.0% | 4.0% | 5.7% | 4.8% | 13.6% | 20.2% |
| WEIMAR | | **363** | **383** | **391** | **382** | **412** | **432** |
| | 2006 Plan | 340 | 345 | 346 | 342 | 340 | 337 |
| | Difference | 23 | 38 | 45 | 40 | 72 | 95 |
| | % change | 6.7% | 11.0% | 12.9% | 11.8% | 21.2% | 28.2% |
| COLORADO COUNTY TOTAL | | **3,306** | **3,498** | **3,655** | **3,469** | **3,737** | **3,912** |
| | 2006 PLAN TOTAL | **3,132** | **3,189** | **3,189** | **3,141** | **3,122** | **3,089** |

| FAYETTE COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| AQUA WSC | | **90** | **115** | **135** | **150** | **168** | **194** |
| | 2006 Plan | 90 | 115 | 135 | 150 | 168 | 194 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| COUNTY-OTHER | | **680** | **436** | **285** | **184** | **122** | **82** |
| | 2006 Plan | 680 | 436 | 285 | 184 | 122 | 82 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| FAYETTE WSC | | **920** | **1,298** | **1,593** | **1,823** | **2,103** | **2,474** |
| | 2006 Plan | 920 | 1,298 | 1,593 | 1,823 | 2,103 | 2,474 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| FLATONIA | | **339** | **368** | **394** | **411** | **434** | **468** |
| | 2006 Plan | 339 | 368 | 394 | 411 | 434 | 468 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LA GRANGE | | **963** | **1,129** | **1,264** | **1,362** | **1,483** | **1,656** |
| | 2006 Plan | 963 | 1,129 | 1,264 | 1,362 | 1,483 | 1,656 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LEE COUNTY WSC | | **254** | **338** | **407** | **461** | **522** | **609** |
| | 2006 Plan | 254 | 338 | 407 | 461 | 522 | 609 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| SCHULENBERG | | **644** | **733** | **801** | **853** | **919** | **1,012** |
| | 2006 Plan | 644 | 733 | 801 | 853 | 919 | 1,012 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| FAYETTE COUNTY TOTAL | | **3,890** | **4,417** | **4,879** | **5,244** | **5,751** | **6,495** |
| | 2006 PLAN TOTAL | **3,890** | **4,417** | **4,879** | **5,244** | **5,751** | **6,495** |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| GILLESPIE COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | 13,245 | 15,441 | 16,571 | 15,972 | 16,712 | 17,516 |
| | 2006 Plan | 13,776 | 15,732 | 16,496 | 16,496 | 16,496 | 16,496 |
| | Difference | -531 | -291 | 75 | -524 | 216 | 1,020 |
| | % change | -3.9% | -1.8% | 0.5% | -3.2% | 1.3% | 6.2% |
| FREDERICKSBURG | | 11,482 | 13,385 | 14,365 | 13,846 | 14,488 | 15,184 |
| | 2006 Plan | 10,313 | 11,778 | 12,349 | 12,349 | 12,349 | 12,349 |
| | Difference | 1,169 | 1,607 | 2,016 | 1,497 | 2,139 | 2,835 |
| | % change | 11.3% | 13.6% | 16.3% | 12.1% | 17.3% | 23.0% |
| GILLESPIE COUNTY TOTAL | | 24,727 | 28,826 | 30,936 | 29,818 | 31,200 | 32,700 |
| | 2006 PLAN TOTAL | 24,089 | 27,510 | 28,845 | 28,845 | 28,845 | 28,845 |

| HAYS COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BUDA | | 9,338 | 13,971 | 17,341 | 20,728 | 24,797 | 27,997 |
| | 2006 Plan | 8,042 | 13,971 | 17,341 | 20,728 | 24,797 | 27,997 |
| | Difference | 1,296 | 0 | 0 | 0 | 0 | 0 |
| | % change | 16.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CIMARRON PARK WATER COMPANY | | 2,417 | 3,013 | 3,631 | 4,252 | 4,998 | 5,584 |
| | 2006 Plan | 2,417 | 3,013 | 3,631 | 4,252 | 4,998 | 5,584 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| COUNTY-OTHER | | 22,722 | 33,658 | 43,641 | 53,675 | 65,729 | 75,207 |
| | 2006 Plan | 24,018 | 33,658 | 43,641 | 53,675 | 65,729 | 75,207 |
| | Difference | -1,296 | 0 | 0 | 0 | 0 | 0 |
| | % change | -5.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| DRIPPING SPRINGS | | 5,325 | 9,308 | 11,651 | 14,005 | 16,834 | 19,058 |
| | 2006 Plan | 5,325 | 9,308 | 11,651 | 14,005 | 16,834 | 19,058 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| DRIPPING SPRINGS WSC | | 2,487 | 3,639 | 4,832 | 6,031 | 7,471 | 8,604 |
| | 2006 Plan | 2,487 | 3,639 | 4,832 | 6,031 | 7,471 | 8,604 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| HILL COUNTRY WSC | | 3,117 | 5,051 | 7,054 | 9,067 | 11,485 | 13,387 |
| | 2006 Plan | 3,117 | 5,051 | 7,054 | 9,067 | 11,485 | 13,387 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| MOUNTAIN CITY | | 737 | 737 | 737 | 737 | 737 | 737 |
| | 2006 Plan | 737 | 737 | 737 | 737 | 737 | 737 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| HAYS COUNTY TOTAL | | 46,143 | 69,377 | 88,887 | 108,495 | 132,051 | 150,574 |
| | 2006 PLAN TOTAL | 46,143 | 69,377 | 88,887 | 108,495 | 132,051 | 150,574 |

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| GILLESPIE COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | 1,573 | 1,781 | 1,856 | 1,753 | 1,815 | 1,903 |
| | 2006 Plan | 1,636 | 1,815 | 1,848 | 1,811 | 1,792 | 1,792 |
| | Difference | -63 | -34 | 8 | -58 | 23 | 111 |
| | % change | -3.9% | -1.8% | 0.5% | -3.2% | 1.3% | 6.2% |
| FREDERICKSBURG | | 3,113 | 3,583 | 3,798 | 3,629 | 3,781 | 3,963 |
| | 2006 Plan | 2,796 | 3,153 | 3,265 | 3,237 | 3,223 | 3,223 |
| | Difference | 317 | 430 | 533 | 392 | 558 | 740 |
| | % change | 11.3% | 13.6% | 16.3% | 12.1% | 17.3% | 23.0% |
| GILLESPIE COUNTY TOTAL | | 4,686 | 5,365 | 5,654 | 5,383 | 5,597 | 5,866 |
| | 2006 PLAN TOTAL | 4,432 | 4,968 | 5,113 | 5,048 | 5,015 | 5,015 |

| HAYS COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BUDA | | 1,454 | 2,128 | 2,603 | 3,088 | 3,666 | 4,140 |
| | 2006 Plan | 1,252 | 2,128 | 2,603 | 3,088 | 3,666 | 4,140 |
| | Difference | 202 | 0 | 0 | 0 | 0 | 0 |
| | % change | 16.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CIMARRON PARK WATER COMPANY | | 403 | 489 | 582 | 676 | 789 | 882 |
| | 2006 Plan | 403 | 489 | 582 | 676 | 789 | 882 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| COUNTY-OTHER | | 3,359 | 4,864 | 6,208 | 7,576 | 9,277 | 10,615 |
| | 2006 Plan | 3,551 | 4,864 | 6,208 | 7,576 | 9,277 | 10,615 |
| | Difference | -192 | 0 | 0 | 0 | 0 | 0 |
| | % change | -5.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| DRIPPING SPRINGS | | 1,080 | 1,856 | 2,297 | 2,745 | 3,300 | 3,736 |
| | 2006 Plan | 1,080 | 1,856 | 2,297 | 2,745 | 3,300 | 3,736 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| DRIPPING SPRINGS WSC | | 348 | 501 | 660 | 817 | 1,013 | 1,166 |
| | 2006 Plan | 348 | 501 | 660 | 817 | 1,013 | 1,166 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| HILL COUNTRY WSC | | 440 | 702 | 980 | 1,249 | 1,582 | 1,844 |
| | 2006 Plan | 440 | 702 | 980 | 1,249 | 1,582 | 1,844 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| MOUNTAIN CITY | | 118 | 116 | 116 | 115 | 115 | 115 |
| | 2006 Plan | 118 | 116 | 116 | 115 | 115 | 115 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| HAYS COUNTY TOTAL | | 7,202 | 10,656 | 13,446 | 16,266 | 19,742 | 22,498 |
| | 2006 PLAN TOTAL | 7,192 | 10,656 | 13,446 | 16,266 | 19,742 | 22,498 |

## INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

### PROPOSED POPULATION PROJECTIONS

| LLANO COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | **7,058** | **9,209** | **9,789** | **10,365** | **10,941** | **11,517** |
| | 2006 Plan | 4,745 | 4,745 | 4,745 | 4,745 | 4,745 | 4,745 |
| | Difference | 2,313 | 4,464 | 5,044 | 5,620 | 6,196 | 6,772 |
| | % change | 48.7% | 94.1% | 106.3% | 118.4% | 130.6% | 142.7% |
| KINGSLAND WSC | | **5,492** | **7,165** | **7,617** | **8,065** | **8,513** | **8,961** |
| | 2006 Plan | 3,692 | 3,692 | 3,692 | 3,692 | 3,692 | 3,692 |
| | Difference | 1,800 | 3,473 | 3,925 | 4,373 | 4,821 | 5,269 |
| | % change | 48.7% | 94.1% | 106.3% | 118.4% | 130.6% | 142.7% |
| LAKE LBJ MUD | | **7,168** | **9,352** | **9,942** | **10,527** | **11,112** | **11,696** |
| | 2006 Plan | 4,819 | 4,819 | 4,819 | 4,819 | 4,819 | 4,819 |
| | Difference | 2,349 | 4,533 | 5,123 | 5,708 | 6,293 | 6,877 |
| | % change | 48.7% | 94.1% | 106.3% | 118.4% | 130.6% | 142.7% |
| LLANO | | **3,967** | **5,176** | **5,502** | **5,826** | **6,149** | **6,473** |
| | 2006 Plan | 3,387 | 3,387 | 3,387 | 3,387 | 3,387 | 3,387 |
| | Difference | 580 | 1,789 | 2,115 | 2,439 | 2,762 | 3,086 |
| | % change | 17.1% | 52.8% | 62.4% | 72.0% | 81.6% | 91.1% |
| SUNRISE BEACH VILLAGE | | **829** | **1,082** | **1,150** | **1,217** | **1,285** | **1,353** |
| | 2006 Plan | 717 | 717 | 717 | 717 | 717 | 717 |
| | Difference | 112 | 365 | 433 | 500 | 568 | 636 |
| | % change | 15.6% | 50.9% | 60.4% | 69.8% | 79.2% | 88.7% |
| **LLANO COUNTY TOTAL** | | **24,514** | **31,984** | **34,000** | **36,000** | **38,000** | **40,000** |
| | **2006 PLAN TOTAL** | **17,360** | **17,360** | **17,360** | **17,360** | **17,360** | **17,360** |

| MATAGORDA COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BAY CITY | | **19,921** | **21,587** | **22,666** | **22,982** | **24,851** | **26,087** |
| | 2006 Plan | 19,921 | 21,292 | 22,126 | 22,586 | 22,521 | 22,316 |
| | Difference | 0 | 295 | 540 | 396 | 2,330 | 3,771 |
| | % change | 0.0% | 1.4% | 2.4% | 1.8% | 10.3% | 16.9% |
| COUNTY-OTHER | | **15,690** | **17,004** | **17,854** | **18,102** | **19,577** | **20,551** |
| | 2006 Plan | 14,340 | 15,328 | 15,929 | 16,258 | 16,212 | 16,065 |
| | Difference | 1,350 | 1,676 | 1,925 | 1,844 | 3,365 | 4,486 |
| | % change | 9.4% | 10.9% | 12.1% | 11.3% | 20.8% | 27.9% |
| ORBIT SYSTEMS INC. | | **26** | **27** | **28** | **29** | **29** | **29** |
| | 2006 Plan | 26 | 27 | 28 | 29 | 29 | 29 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| PALACIOS | | **5,499** | **5,959** | **6,257** | **6,344** | **6,860** | **7,201** |
| | 2006 Plan | 5,499 | 5,878 | 6,108 | 6,235 | 6,217 | 6,160 |
| | Difference | 0 | 81 | 149 | 109 | 643 | 1,041 |
| | % change | 0.0% | 1.4% | 2.4% | 1.7% | 10.3% | 16.9% |
| SOUTHWEST UTILITIES | | **788** | **854** | **896** | **909** | **983** | **1,032** |
| | 2006 Plan | 720 | 770 | 800 | 817 | 814 | 807 |
| | Difference | 68 | 84 | 96 | 92 | 169 | 225 |
| | % change | 9.4% | 10.9% | 12.1% | 11.2% | 20.8% | 27.9% |
| **MATAGORDA COUNTY TOTAL** | | **41,924** | **45,431** | **47,701** | **48,365** | **52,300** | **54,900** |
| | **2006 PLAN TOTAL** | **40,506** | **43,295** | **44,991** | **45,925** | **45,793** | **45,377** |

### PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| LLANO COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | **1,462** | **1,898** | **2,018** | **2,125** | **2,230** | **2,347** |
| | 2006 Plan | 983 | 978 | 978 | 973 | 967 | 967 |
| | Difference | 479 | 920 | 1,040 | 1,152 | 1,263 | 1,380 |
| | % change | 48.7% | 94.1% | 106.3% | 118.4% | 130.6% | 142.7% |
| KINGSLAND WSC | | **824** | **1,060** | **1,100** | **1,138** | **1,192** | **1,255** |
| | 2006 Plan | 554 | 546 | 533 | 521 | 517 | 517 |
| | Difference | 270 | 514 | 567 | 617 | 675 | 738 |
| | % change | 48.7% | 94.1% | 106.3% | 118.4% | 130.6% | 142.7% |
| LAKE LBJ MUD | | **1,992** | **2,577** | **2,707** | **2,831** | **2,974** | **3,131** |
| | 2006 Plan | 1,339 | 1,328 | 1,312 | 1,296 | 1,290 | 1,290 |
| | Difference | 653 | 1,249 | 1,395 | 1,535 | 1,684 | 1,841 |
| | % change | 48.7% | 94.1% | 106.3% | 118.4% | 130.6% | 142.7% |
| LLANO | | **1,177** | **1,519** | **1,597** | **1,670** | **1,750** | **1,842** |
| | 2006 Plan | 1,005 | 994 | 983 | 971 | 964 | 964 |
| | Difference | 172 | 525 | 614 | 699 | 786 | 878 |
| | % change | 17.1% | 52.8% | 62.4% | 72.0% | 81.6% | 91.1% |
| SUNRISE BEACH VILLAGE | | **200** | **259** | **273** | **285** | **299** | **315** |
| | 2006 Plan | 173 | 172 | 170 | 168 | 167 | 167 |
| | Difference | 27 | 87 | 103 | 117 | 132 | 148 |
| | % change | 15.6% | 50.9% | 60.4% | 69.8% | 79.2% | 88.7% |
| **LLANO COUNTY TOTAL** | | **5,655** | **7,313** | **7,694** | **8,050** | **8,446** | **8,890** |
| | **2006 PLAN TOTAL** | **4,054** | **4,018** | **3,976** | **3,929** | **3,905** | **3,905** |

| MATAGORDA COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BAY CITY | | **3,236** | **3,434** | **3,529** | **3,501** | **3,758** | **3,945** |
| | 2006 Plan | 3,236 | 3,387 | 3,445 | 3,441 | 3,406 | 3,375 |
| | Difference | 0 | 47 | 84 | 60 | 352 | 570 |
| | % change | 0.0% | 1.4% | 2.4% | 1.8% | 10.3% | 16.9% |
| COUNTY-OTHER | | **1,670** | **1,753** | **1,779** | **1,744** | **1,863** | **1,956** |
| | 2006 Plan | 1,526 | 1,580 | 1,587 | 1,566 | 1,543 | 1,529 |
| | Difference | 144 | 173 | 192 | 178 | 320 | 427 |
| | % change | 9.4% | 10.9% | 12.1% | 11.3% | 20.8% | 27.9% |
| ORBIT SYSTEMS INC. | | **2** | **2** | **2** | **2** | **2** | **2** |
| | 2006 Plan | 2 | 2 | 2 | 2 | 2 | 2 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| PALACIOS | | **745** | **788** | **806** | **803** | **861** | **904** |
| | 2006 Plan | 745 | 777 | 787 | 789 | 780 | 773 |
| | Difference | 0 | 11 | 19 | 14 | 81 | 131 |
| | % change | 0.0% | 1.4% | 2.4% | 1.7% | 10.3% | 16.9% |
| SOUTHWEST UTILITIES | | **89** | **93** | **95** | **95** | **101** | **106** |
| | 2006 Plan | 81 | 84 | 85 | 85 | 84 | 83 |
| | Difference | 8 | 9 | 10 | 10 | 17 | 23 |
| | % change | 9.4% | 10.9% | 12.1% | 11.2% | 20.8% | 27.9% |
| **MATAGORDA COUNTY TOTAL** | | **5,741** | **6,070** | **6,211** | **6,144** | **6,558** | **6,913** |
| | **2006 PLAN TOTAL** | **5,590** | **5,830** | **5,906** | **5,883** | **5,815** | **5,762** |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| MILLS COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BROOKSMITH SUD | | 39 | 53 | 54 | 51 | 56 | 59 |
| | 2006 Plan | 39 | 45 | 46 | 47 | 46 | 44 |
| | Difference | 0 | 8 | 8 | 4 | 10 | 15 |
| | % change | 0.0% | 17.1% | 17.1% | 7.8% | 22.1% | 33.3% |
| COUNTY-OTHER | | 3,935 | 4,339 | 4,435 | 4,170 | 4,625 | 4,829 |
| | 2006 Plan | 3,299 | 3,506 | 3,553 | 3,599 | 3,569 | 3,494 |
| | Difference | 636 | 833 | 882 | 571 | 1,056 | 1,335 |
| | % change | 19.3% | 23.8% | 24.8% | 15.9% | 29.6% | 38.2% |
| GOLDTHWAITE | | 1,799 | 1,988 | 2,032 | 1,911 | 2,119 | 2,213 |
| | 2006 Plan | 1,799 | 1,863 | 1,877 | 1,891 | 1,882 | 1,859 |
| | Difference | 0 | 125 | 155 | 20 | 237 | 354 |
| | % change | 0.0% | 6.7% | 8.3% | 1.1% | 12.6% | 19.0% |
| MILLS COUNTY TOTAL | | 5,773 | 6,380 | 6,521 | 6,132 | 6,800 | 7,100 |
| | 2006 PLAN TOTAL | 5,137 | 5,414 | 5,476 | 5,537 | 5,497 | 5,397 |

| SAN SABA COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | 2,965 | 3,324 | 3,533 | 3,587 | 3,933 | 4,190 |
| | 2006 Plan | 2,697 | 2,971 | 3,210 | 3,418 | 3,444 | 3,477 |
| | Difference | 268 | 353 | 323 | 169 | 489 | 713 |
| | % change | 9.9% | 11.9% | 10.1% | 4.9% | 14.2% | 20.5% |
| RICHLAND SUD | | 1,154 | 1,294 | 1,376 | 1,396 | 1,531 | 1,631 |
| | 2006 Plan | 1,050 | 1,130 | 1,200 | 1,261 | 1,268 | 1,278 |
| | Difference | 104 | 164 | 176 | 135 | 263 | 353 |
| | % change | 9.9% | 14.5% | 14.6% | 10.7% | 20.8% | 27.6% |
| SAN SABA | | 2,816 | 3,157 | 3,356 | 3,407 | 3,736 | 3,979 |
| | 2006 Plan | 2,640 | 2,645 | 2,649 | 2,653 | 2,653 | 2,654 |
| | Difference | 176 | 512 | 707 | 754 | 1,083 | 1,325 |
| | % change | 6.7% | 19.4% | 26.7% | 28.4% | 40.8% | 49.9% |
| SAN SABA COUNTY TOTAL | | 6,935 | 7,775 | 8,265 | 8,390 | 9,200 | 9,800 |
| | 2006 PLAN TOTAL | 6,387 | 6,746 | 7,059 | 7,332 | 7,365 | 7,409 |

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| MILLS COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BROOKSMITH SUD | | 7 | 9 | 9 | 9 | 10 | 9 |
| | 2006 Plan | 7 | 8 | 8 | 8 | 8 | 7 |
| | Difference | 0 | 1 | 1 | 1 | 2 | 2 |
| | % change | 0.0% | 17.1% | 17.1% | 7.8% | 22.1% | 33.0% |
| COUNTY-OTHER | | 471 | 506 | 502 | 458 | 502 | 525 |
| | 2006 Plan | 396 | 409 | 402 | 395 | 387 | 380 |
| | Difference | 76 | 97 | 100 | 63 | 115 | 145 |
| | % change | 19.3% | 23.8% | 24.8% | 15.9% | 29.6% | 38.2% |
| GOLDTHWAITE | | 569 | 621 | 629 | 585 | 643 | 671 |
| | 2006 Plan | 569 | 582 | 581 | 579 | 571 | 564 |
| | Difference | 0 | 39 | 48 | 6 | 72 | 107 |
| | % change | 0.0% | 6.7% | 8.3% | 1.1% | 12.6% | 19.0% |
| MILLS COUNTY TOTAL | | 1,047 | 1,137 | 1,140 | 1,061 | 1,154 | 1,206 |
| | 2006 PLAN TOTAL | 971 | 999 | 991 | 982 | 966 | 951 |

| SAN SABA COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | 250 | 269 | 277 | 277 | 299 | 319 |
| | 2006 Plan | 227 | 240 | 252 | 264 | 262 | 265 |
| | Difference | 23 | 29 | 25 | 13 | 37 | 54 |
| | % change | 9.9% | 11.9% | 10.1% | 4.9% | 14.2% | 20.5% |
| RICHLAND SUD | | 207 | 228 | 237 | 236 | 257 | 274 |
| | 2006 Plan | 188 | 199 | 207 | 213 | 213 | 215 |
| | Difference | 19 | 29 | 30 | 23 | 44 | 59 |
| | % change | 9.9% | 14.5% | 14.6% | 10.7% | 20.8% | 27.6% |
| SAN SABA | | 943 | 1,047 | 1,101 | 1,107 | 1,205 | 1,283 |
| | 2006 Plan | 884 | 877 | 869 | 862 | 856 | 856 |
| | Difference | 59 | 170 | 232 | 245 | 349 | 427 |
| | % change | 6.7% | 19.4% | 26.7% | 28.4% | 40.8% | 49.9% |
| SAN SABA COUNTY TOTAL | | 1,399 | 1,543 | 1,618 | 1,620 | 1,762 | 1,877 |
| | 2006 PLAN TOTAL | 1,299 | 1,316 | 1,328 | 1,339 | 1,331 | 1,336 |

## INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

### PROPOSED POPULATION PROJECTIONS

| TRAVIS COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| ANDERSON MILL MUD* | | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| AQUA WSC | | 9,470 | 11,407 | 13,532 | 15,854 | 17,173 | 18,494 |
| | 2006 Plan | 7,251 | 8,523 | 9,698 | 10,432 | 11,208 | 12,007 |
| | Difference | 2,219 | 2,884 | 3,834 | 5,422 | 5,965 | 6,487 |
| | % change | 30.6% | 33.8% | 39.5% | 52.0% | 53.2% | 54.0% |
| AUSTIN | | 770,529 | 928,151 | 1,101,052 | 1,310,002 | 1,436,191 | 1,556,708 |
| | 2006 Plan | 770,529 | 946,974 | 1,111,996 | 1,258,580 | 1,409,808 | 1,548,275 |
| | Difference | 0 | -18,823 | -10,944 | 51,422 | 26,383 | 8,433 |
| | % change | 0.0% | -2.0% | -1.0% | 4.1% | 1.9% | 0.5% |
| BARTON CREEK WEST WSC | | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 |
| | 2006 Plan | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 | 1,456 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BEE CAVE VILLAGE | | 2,264 | 2,727 | 3,236 | 3,791 | 4,106 | 4,422 |
| | 2006 Plan | 948 | 1,339 | 1,700 | 1,926 | 2,165 | 2,411 |
| | Difference | 1,316 | 1,388 | 1,536 | 1,865 | 1,941 | 2,011 |
| | % change | 138.8% | 103.7% | 90.4% | 96.8% | 89.7% | 83.4% |
| BRIARCLIFF VILLAGE | | 1,289 | 1,817 | 2,305 | 2,609 | 2,931 | 3,263 |
| | 2006 Plan | 1,289 | 1,817 | 2,305 | 2,609 | 2,931 | 3,263 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CEDAR PARK | | 922 | 1,432 | 1,903 | 2,197 | 2,508 | 2,828 |
| | 2006 Plan | 922 | 1,432 | 1,903 | 2,197 | 2,508 | 2,828 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| COUNTY-OTHER | | 35,486 | 33,595 | 35,161 | 32,975 | 25,035 | 22,612 |
| | 2006 Plan | 33,665 | 27,853 | 23,127 | 17,213 | 12,127 | 12,636 |
| | Difference | 1,821 | 5,742 | 12,034 | 15,762 | 12,908 | 9,976 |
| | % change | 5.4% | 20.6% | 52.0% | 91.6% | 106.4% | 78.9% |
| CREEDMOOR-MAHA WSC | | 6,284 | 8,318 | 10,668 | 12,100 | 12,412 | 12,734 |
| | 2006 Plan | 5,962 | 7,301 | 8,537 | 9,309 | 10,126 | 10,967 |
| | Difference | 322 | 1,017 | 2,131 | 2,791 | 2,286 | 1,767 |
| | % change | 5.4% | 13.9% | 25.0% | 30.0% | 22.6% | 16.1% |
| ELGIN | | 87 | 105 | 125 | 146 | 158 | 171 |
| | 2006 Plan | 56 | 87 | 116 | 134 | 153 | 173 |
| | Difference | 31 | 18 | 9 | 12 | 5 | -2 |
| | % change | 55.4% | 20.7% | 7.8% | 9.0% | 3.3% | -1.2% |

### PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| TRAVIS COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| ANDERSON MILL MUD* | | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| AQUA WSC | | 1,421 | 1,674 | 1,940 | 2,255 | 2,424 | 2,611 |
| | 2006 Plan | 1,088 | 1,251 | 1,390 | 1,484 | 1,582 | 1,695 |
| | Difference | 333 | 423 | 550 | 771 | 842 | 916 |
| | % change | 30.6% | 33.8% | 39.5% | 52.0% | 53.2% | 54.0% |
| AUSTIN | | 150,180 | 179,861 | 212,133 | 250,924 | 273,486 | 294,691 |
| | 2006 Plan | 150,180 | 183,509 | 214,242 | 241,074 | 268,462 | 293,095 |
| | Difference | 0 | -3,648 | -2,109 | 9,850 | 5,024 | 1,596 |
| | % change | 0.0% | -2.0% | -1.0% | 4.1% | 1.9% | 0.5% |
| BARTON CREEK WEST WSC | | 401 | 398 | 395 | 393 | 391 | 391 |
| | 2006 Plan | 401 | 398 | 395 | 393 | 391 | 391 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| BEE CAVE VILLAGE | | 1,177 | 1,413 | 1,675 | 1,958 | 2,120 | 2,283 |
| | 2006 Plan | 493 | 694 | 880 | 995 | 1,118 | 1,245 |
| | Difference | 684 | 719 | 795 | 963 | 1,002 | 1,038 |
| | % change | 138.8% | 103.7% | 90.4% | 96.8% | 89.7% | 83.4% |
| BRIARCLIFF VILLAGE | | 254 | 350 | 439 | 494 | 552 | 614 |
| | 2006 Plan | 254 | 350 | 439 | 494 | 552 | 614 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CEDAR PARK | | 188 | 290 | 384 | 443 | 506 | 570 |
| | 2006 Plan | 188 | 290 | 384 | 443 | 506 | 570 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| COUNTY-OTHER | | 6,916 | 6,510 | 6,773 | 6,316 | 4,767 | 4,280 |
| | 2006 Plan | 6,561 | 5,397 | 4,455 | 3,297 | 2,309 | 2,392 |
| | Difference | 355 | 1,113 | 2,318 | 3,010 | 2,458 | 1,888 |
| | % change | 5.4% | 20.6% | 52.0% | 91.6% | 106.4% | 78.9% |
| CREEDMOOR-MAHA WSC | | 662 | 839 | 1,051 | 1,179 | 1,196 | 1,227 |
| | 2006 Plan | 628 | 736 | 841 | 907 | 976 | 1,057 |
| | Difference | 34 | 103 | 210 | 272 | 220 | 170 |
| | % change | 5.4% | 13.9% | 25.0% | 30.0% | 22.6% | 16.1% |
| ELGIN | | 14 | 17 | 19 | 23 | 25 | 27 |
| | 2006 Plan | 9 | 14 | 18 | 21 | 24 | 27 |
| | Difference | 5 | 3 | 1 | 2 | 1 | 0 |
| | % change | 55.9% | 20.9% | 7.6% | 9.1% | 3.5% | -1.4% |

## INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

### PROPOSED POPULATION PROJECTIONS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| GOFORTH WSC | | 304 | 432 | 574 | 661 | 694 | 729 |
| | 2006 Plan | 288 | 383 | 471 | 526 | 584 | 644 |
| | Difference | 16 | 49 | 103 | 135 | 110 | 85 |
| | % change | 5.6% | 12.8% | 21.9% | 25.7% | 18.8% | 13.2% |
| HILL COUNTRY WSC | | 1,780 | 2,911 | 4,090 | 4,816 | 5,243 | 5,683 |
| | 2006 Plan | 1,689 | 2,623 | 3,486 | 4,025 | 4,595 | 5,182 |
| | Difference | 91 | 288 | 604 | 791 | 648 | 501 |
| | % change | 5.4% | 11.0% | 17.3% | 19.7% | 14.1% | 9.7% |
| JONESTOWN | | 3,309 | 3,985 | 4,728 | 5,539 | 6,000 | 6,462 |
| | 2006 Plan | 1,985 | 2,391 | 2,766 | 3,000 | 3,248 | 3,503 |
| | Difference | 1,324 | 1,594 | 1,962 | 2,539 | 2,752 | 2,959 |
| | % change | 66.7% | 66.7% | 70.9% | 84.6% | 84.7% | 84.5% |
| JONESTOWN WSC | | 976 | 1,281 | 1,636 | 1,853 | 1,894 | 1,937 |
| | 2006 Plan | 926 | 1,123 | 1,305 | 1,419 | 1,539 | 1,663 |
| | Difference | 50 | 158 | 331 | 434 | 355 | 274 |
| | % change | 5.4% | 14.1% | 25.4% | 30.6% | 23.1% | 16.5% |
| LAGO VISTA | | 6,132 | 8,307 | 10,316 | 11,571 | 12,898 | 14,265 |
| | 2006 Plan | 6,132 | 8,307 | 10,316 | 11,571 | 12,898 | 14,265 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LAKEWAY | | 14,522 | 17,493 | 20,752 | 24,313 | 26,336 | 28,361 |
| | 2006 Plan | 10,789 | 14,519 | 17,965 | 20,117 | 22,394 | 24,738 |
| | Difference | 3,733 | 2,974 | 2,787 | 4,196 | 3,942 | 3,623 |
| | % change | 34.6% | 20.5% | 15.5% | 20.9% | 17.6% | 14.6% |
| LOOP 360 WSC | | 2,803 | 2,803 | 2,803 | 2,803 | 2,803 | 2,803 |
| | 2006 Plan | 2,803 | 2,803 | 2,803 | 2,803 | 2,803 | 2,803 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LOST CREEK MUD | | 4,372 | 4,372 | 4,372 | 4,372 | 4,372 | 4,372 |
| | 2006 Plan | 4,372 | 4,372 | 4,372 | 4,372 | 4,372 | 4,372 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| MANOR | | 6,275 | 7,558 | 8,966 | 10,505 | 11,379 | 12,255 |
| | 2006 Plan | 1,319 | 1,473 | 1,615 | 1,704 | 1,798 | 1,895 |
| | Difference | 4,956 | 6,085 | 7,351 | 8,801 | 9,581 | 10,360 |
| | % change | 375.7% | 413.1% | 455.2% | 516.5% | 532.9% | 546.7% |
| MANVILLE WSC | | 13,689 | 20,146 | 27,140 | 31,430 | 33,346 | 35,323 |
| | 2006 Plan | 12,987 | 17,931 | 22,498 | 25,350 | 28,367 | 31,474 |
| | Difference | 702 | 2,215 | 4,642 | 6,080 | 4,979 | 3,849 |
| | % change | 5.4% | 12.4% | 20.6% | 24.0% | 17.6% | 12.2% |

### PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| GOFORTH WSC | | 32 | 44 | 57 | 65 | 69 | 71 |
| | 2006 Plan | 30 | 39 | 47 | 52 | 58 | 63 |
| | Difference | 2 | 5 | 10 | 13 | 11 | 8 |
| | % change | 5.6% | 12.8% | 21.9% | 25.7% | 18.8% | 13.2% |
| HILL COUNTRY WSC | | 251 | 404 | 568 | 664 | 722 | 783 |
| | 2006 Plan | 238 | 364 | 484 | 555 | 633 | 714 |
| | Difference | 13 | 40 | 84 | 109 | 89 | 69 |
| | % change | 5.4% | 11.0% | 17.3% | 19.7% | 14.1% | 9.7% |
| JONESTOWN | | 467 | 548 | 636 | 739 | 792 | 854 |
| | 2006 Plan | 280 | 329 | 372 | 400 | 429 | 463 |
| | Difference | 187 | 219 | 264 | 339 | 363 | 391 |
| | % change | 66.7% | 66.7% | 70.9% | 84.6% | 84.7% | 84.5% |
| JONESTOWN WSC | | 129 | 165 | 206 | 230 | 234 | 239 |
| | 2006 Plan | 122 | 145 | 164 | 176 | 190 | 205 |
| | Difference | 7 | 20 | 42 | 54 | 44 | 34 |
| | % change | 5.4% | 14.1% | 25.4% | 30.6% | 23.1% | 16.5% |
| LAGO VISTA | | 2,006 | 2,698 | 3,340 | 3,733 | 4,161 | 4,602 |
| | 2006 Plan | 2,006 | 2,698 | 3,340 | 3,733 | 4,161 | 4,602 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LAKEWAY | | 4,750 | 5,682 | 6,695 | 7,816 | 8,466 | 9,118 |
| | 2006 Plan | 3,529 | 4,716 | 5,796 | 6,467 | 7,199 | 7,953 |
| | Difference | 1,221 | 966 | 899 | 1,349 | 1,267 | 1,165 |
| | % change | 34.6% | 20.5% | 15.5% | 20.9% | 17.6% | 14.6% |
| LOOP 360 WSC | | 1,228 | 1,225 | 1,221 | 1,218 | 1,218 | 1,218 |
| | 2006 Plan | 1,228 | 1,225 | 1,221 | 1,218 | 1,218 | 1,218 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| LOST CREEK MUD | | 935 | 921 | 906 | 891 | 882 | 882 |
| | 2006 Plan | 935 | 921 | 906 | 891 | 882 | 882 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| MANOR | | 1,356 | 1,601 | 1,865 | 2,164 | 2,335 | 2,509 |
| | 2006 Plan | 285 | 312 | 336 | 351 | 369 | 388 |
| | Difference | 1,071 | 1,289 | 1,529 | 1,813 | 1,966 | 2,121 |
| | % change | 375.7% | 413.1% | 455.2% | 516.5% | 532.9% | 546.7% |
| MANVILLE WSC | | 1,825 | 2,640 | 3,496 | 4,013 | 4,258 | 4,510 |
| | 2006 Plan | 1,731 | 2,350 | 2,898 | 3,237 | 3,622 | 4,019 |
| | Difference | 94 | 290 | 598 | 776 | 636 | 491 |
| | % change | 5.4% | 12.4% | 20.6% | 24.0% | 17.6% | 12.2% |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **MUSTANG RIDGE** | | **486** | **590** | **686** | **746** | **809** | **874** |
| | 2006 Plan | 486 | 590 | 686 | 746 | 809 | 874 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **NORTH AUSTIN MUD #1** | | **780** | **780** | **780** | **780** | **780** | **780** |
| | 2006 Plan | 780 | 780 | 780 | 780 | 780 | 780 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **NORTH TRAVIS COUNTY MUD #5** | | **3,810** | **6,231** | **8,752** | **10,306** | **11,219** | **12,160** |
| | 2006 Plan | 3,615 | 5,614 | 7,460 | 8,613 | 9,833 | 11,089 |
| | Difference | 195 | 617 | 1,292 | 1,693 | 1,386 | 1,071 |
| | % change | 5.4% | 11.0% | 17.3% | 19.7% | 14.1% | 9.7% |
| **PFLUGERVILLE** | | **39,480** | **47,557** | **56,416** | **66,097** | **71,597** | **77,104** |
| | 2006 Plan | 24,709 | 35,916 | 46,268 | 52,733 | 59,572 | 66,614 |
| | Difference | 14,771 | 11,641 | 10,148 | 13,364 | 12,025 | 10,490 |
| | % change | 59.8% | 32.4% | 21.9% | 25.3% | 20.2% | 15.7% |
| **RIVER PLACE ON LAKE AUSTIN** | | **4,449** | **5,250** | **5,250** | **5,250** | **5,250** | **5,250** |
| | 2006 Plan | 4,449 | 5,250 | 5,250 | 5,250 | 5,250 | 5,250 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **ROLLINGWOOD** | | **1,414** | **1,428** | **1,441** | **1,449** | **1,458** | **1,467** |
| | 2006 Plan | 1,414 | 1,428 | 1,441 | 1,449 | 1,458 | 1,467 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **ROUND ROCK** | | **1,806** | **2,782** | **3,684** | **4,247** | **4,843** | **5,456** |
| | 2006 Plan | 1,806 | 2,782 | 3,684 | 4,247 | 4,843 | 5,456 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **SAN LEANNA**** | | **546** | **658** | **781** | **915** | **991** | **1,067** |
| | 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| | Difference | 546 | 658 | 781 | 915 | 991 | 1,067 |
| | % change | N/A | N/A | N/A | N/A | N/A | N/A |
| **SHADY HOLLOW MUD** | | **4,732** | **4,732** | **4,732** | **4,732** | **4,732** | **4,732** |
| | 2006 Plan | 4,732 | 4,732 | 4,732 | 4,732 | 4,732 | 4,732 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **THE HILLS** | | **2,301** | **3,000** | **3,000** | **3,000** | **3,000** | **3,000** |
| | 2006 Plan | 2,301 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **MUSTANG RIDGE** | | **118** | **141** | **162** | **176** | **190** | **205** |
| | 2006 Plan | 118 | 141 | 162 | 176 | 190 | 205 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **NORTH AUSTIN MUD #1** | | **109** | **107** | **106** | **103** | **102** | **102** |
| | 2006 Plan | 109 | 107 | 106 | 103 | 102 | 102 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **NORTH TRAVIS COUNTY MUD #5** | | **542** | **879** | **1,226** | **1,431** | **1,559** | **1,689** |
| | 2006 Plan | 514 | 792 | 1,045 | 1,196 | 1,366 | 1,540 |
| | Difference | 28 | 87 | 181 | 235 | 193 | 149 |
| | % change | 5.4% | 11.0% | 17.3% | 19.7% | 14.1% | 9.7% |
| **PFLUGERVILLE** | | **6,899** | **8,204** | **9,669** | **11,253** | **12,190** | **13,128** |
| | 2006 Plan | 4,318 | 6,196 | 7,930 | 8,978 | 10,143 | 11,342 |
| | Difference | 2,581 | 2,008 | 1,739 | 2,275 | 2,047 | 1,786 |
| | % change | 59.8% | 32.4% | 21.9% | 25.3% | 20.2% | 15.7% |
| **RIVER PLACE ON LAKE AUSTIN** | | **1,470** | **1,723** | **1,723** | **1,717** | **1,717** | **1,717** |
| | 2006 Plan | 1,470 | 1,723 | 1,723 | 1,717 | 1,717 | 1,717 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **ROLLINGWOOD** | | **377** | **376** | **374** | **372** | **371** | **373** |
| | 2006 Plan | 377 | 376 | 374 | 372 | 371 | 373 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **ROUND ROCK** | | **399** | **605** | **792** | **909** | **1,036** | **1,167** |
| | 2006 Plan | 399 | 605 | 792 | 909 | 1,036 | 1,167 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **SAN LEANNA**** | | **100** | **120** | **143** | **167** | **181** | **195** |
| | 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| | Difference | 100 | 120 | 142 | 167 | 181 | 195 |
| | % change | N/A | N/A | N/A | N/A | N/A | N/A |
| **SHADY HOLLOW MUD** | | **747** | **731** | **716** | **700** | **694** | **694** |
| | 2006 Plan | 747 | 731 | 716 | 700 | 694 | 694 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **THE HILLS** | | **567** | **733** | **733** | **729** | **729** | **729** |
| | 2006 Plan | 567 | 733 | 733 | 729 | 729 | 729 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| | | | | | | |
|---|---|---|---|---|---|---|
| **TRAVIS COUNTY WCID #17** | **16,694** | **24,984** | **33,898** | **39,369** | **41,959** | **44,629** |
| 2006 Plan | 15,838 | 22,283 | 28,236 | 31,954 | 35,887 | 39,936 |
| Difference | 856 | 2,701 | 5,662 | 7,415 | 6,072 | 4,693 |
| % change | 5.4% | 12.1% | 20.1% | 23.2% | 16.9% | 11.8% |
| **TRAVIS COUNTY WCID #18** | **6,631** | **9,206** | **12,083** | **13,841** | **14,432** | **15,041** |
| 2006 Plan | 6,291 | 8,133 | 9,834 | 10,896 | 12,020 | 13,177 |
| Difference | 340 | 1,073 | 2,249 | 2,945 | 2,412 | 1,864 |
| % change | 5.4% | 13.2% | 22.9% | 27.0% | 20.1% | 14.1% |
| **TRAVIS COUNTY WCID #19** | **716** | **716** | **716** | **716** | **716** | **716** |
| 2006 Plan | 716 | 716 | 716 | 716 | 716 | 716 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **TRAVIS COUNTY WCID #20** | **1,140** | **1,140** | **1,140** | **1,140** | **1,140** | **1,140** |
| 2006 Plan | 1,140 | 1,140 | 1,140 | 1,140 | 1,140 | 1,140 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WELLS BRANCH MUD** | **8,211** | **8,211** | **8,211** | **8,211** | **8,211** | **8,211** |
| 2006 Plan | 8,211 | 8,211 | 8,211 | 8,211 | 8,211 | 8,211 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WEST LAKE HILLS** | **3,520** | **4,061** | **4,561** | **4,873** | **5,203** | **5,543** |
| 2006 Plan | 3,520 | 4,061 | 4,561 | 4,873 | 5,203 | 5,543 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WEST TRAVIS COUNTY REGIONAL WS** | **5,145** | **7,883** | **10,800** | **12,592** | **13,502** | **14,440** |
| 2006 Plan | 4,881 | 7,051 | 9,055 | 10,307 | 11,631 | 12,994 |
| Difference | 264 | 832 | 1,745 | 2,285 | 1,871 | 1,446 |
| % change | 5.4% | 11.8% | 19.3% | 22.2% | 16.1% | 11.1% |
| **WILLIAMSON-TRAVIS COUNTY MUD #1** | **1,791** | **2,685** | **3,644** | **4,233** | **4,513** | **4,802** |
| 2006 Plan | 1,699 | 2,395 | 3,037 | 3,438 | 3,862 | 4,299 |
| Difference | 92 | 290 | 607 | 795 | 651 | 503 |
| % change | 5.4% | 12.1% | 20.0% | 23.1% | 16.9% | 11.7% |
| **WINDEMERE UTILITY COMPANY** | **17,999** | **18,710** | **18,710** | **18,710** | **18,710** | **18,710** |
| 2006 Plan | 17,999 | 18,710 | 18,710 | 18,710 | 18,710 | 18,710 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **TRAVIS COUNTY TOTAL** | **1,003,800** | **1,208,800** | **1,434,100** | **1,680,200** | **1,820,000** | **1,880,000** |
| **2006 PLAN TOTAL** | **969,955** | **1,186,499** | **1,385,236** | **1,550,538** | **1,722,737** | **1,888,543** |

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** New WUG for 2011 Plan

## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| | | | | | | |
|---|---|---|---|---|---|---|
| **TRAVIS COUNTY WCID #17** | **3,010** | **4,422** | **5,962** | **6,880** | **7,332** | **7,799** |
| 2006 Plan | 2,856 | 3,944 | 4,966 | 5,584 | 6,271 | 6,979 |
| Difference | 154 | 478 | 996 | 1,296 | 1,061 | 820 |
| % change | 5.4% | 12.1% | 20.1% | 23.2% | 16.9% | 11.8% |
| **TRAVIS COUNTY WCID #18** | **899** | **1,217** | **1,570** | **1,783** | **1,843** | **1,921** |
| 2006 Plan | 853 | 1,075 | 1,278 | 1,404 | 1,535 | 1,683 |
| Difference | 46 | 142 | 292 | 379 | 308 | 238 |
| % change | 5.4% | 13.2% | 22.9% | 27.0% | 20.1% | 14.1% |
| **TRAVIS COUNTY WCID #19** | **376** | **374** | **372** | **371** | **371** | **371** |
| 2006 Plan | 376 | 374 | 372 | 371 | 371 | 371 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **TRAVIS COUNTY WCID #20** | **462** | **460** | **457** | **456** | **455** | **455** |
| 2006 Plan | 462 | 460 | 457 | 456 | 455 | 455 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WELLS BRANCH MUD** | **1,508** | **1,490** | **1,472** | **1,444** | **1,435** | **1,435** |
| 2006 Plan | 1,508 | 1,490 | 1,472 | 1,444 | 1,435 | 1,435 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WEST LAKE HILLS** | **1,605** | **1,833** | **2,049** | **2,178** | **2,320** | **2,471** |
| 2006 Plan | 1,605 | 1,833 | 2,049 | 2,178 | 2,320 | 2,471 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **WEST TRAVIS COUNTY REGIONAL WS** | **824** | **1,245** | **1,694** | **1,961** | **2,102** | **2,248** |
| 2006 Plan | 782 | 1,114 | 1,420 | 1,605 | 1,811 | 2,023 |
| Difference | 42 | 131 | 274 | 356 | 291 | 225 |
| % change | 5.4% | 11.8% | 19.3% | 22.2% | 16.1% | 11.1% |
| **WILLIAMSON-TRAVIS COUNTY MUD #1** | **209** | **307** | **413** | **474** | **506** | **538** |
| 2006 Plan | 198 | 274 | 344 | 385 | 433 | 482 |
| Difference | 11 | 33 | 69 | 89 | 73 | 56 |
| % change | 5.4% | 12.1% | 20.0% | 23.1% | 16.9% | 11.7% |
| **WINDEMERE UTILITY COMPANY** | **2,157** | **2,222** | **2,201** | **2,180** | **2,180** | **2,180** |
| 2006 Plan | 2,157 | 2,222 | 2,201 | 2,180 | 2,180 | 2,180 |
| Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **TRAVIS COUNTY TOTAL** | **196,569** | **234,471** | **275,633** | **320,603** | **345,918** | **370,899** |
| **2006 PLAN TOTAL** | **189,602** | **229,928** | **266,748** | **296,675** | **327,840** | **357,541** |

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** New WUG for 2011 Plan

# INITIALLY PREPARED REGION K PROJECTED POPULATIONS AND MUNICIPAL WATER DEMANDS

## PROPOSED POPULATION PROJECTIONS

| WHARTON COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | 16,063 | 16,978 | 17,570 | 17,909 | 17,918 | 17,726 |
| | 2006 Plan | 18,491 | 19,545 | 20,226 | 20,616 | 20,626 | 20,406 |
| | Difference | -2,428 | -2,567 | -2,656 | -2,707 | -2,708 | -2,680 |
| | % change | -13.1% | -13.1% | -13.1% | -13.1% | -13.1% | -13.1% |
| EAST BERNARD* | | 2,428 | 2,567 | 2,656 | 2,707 | 2,708 | 2,680 |
| | 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| | Difference | 2,428 | 2,566 | 2,656 | 2,707 | 2,708 | 2,680 |
| | % change | N/A | N/A | N/A | N/A | N/A | N/A |
| WHARTON | | 9,769 | 10,327 | 10,686 | 10,892 | 10,897 | 10,782 |
| | 2006 Plan | 9,769 | 10,327 | 10,685 | 10,892 | 10,897 | 10,782 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| WHARTON COUNTY TOTAL | | 28,260 | 29,872 | 30,911 | 31,508 | 31,523 | 31,188 |
| | 2006 PLAN TOTAL | 28,260 | 29,872 | 30,911 | 31,508 | 31,523 | 31,188 |

* New WUG for 2011 Plan

| WILLIAMSON COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| ANDERSON MILL MUD* | | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2006 Plan | 8,831 | 8,831 | 8,831 | 8,831 | 8,831 | 8,831 |
| | Difference | -8,831 | -8,831 | -8,831 | -8,831 | -8,831 | -8,831 |
| | % change | -100.0% | -100.0% | -100.0% | -100.0% | -100.0% | -100.0% |
| AUSTIN | | 29,317 | 39,606 | 51,839 | 65,141 | 79,613 | 95,134 |
| | 2006 Plan | 20,486 | 30,775 | 43,008 | 56,310 | 70,782 | 86,303 |
| | Difference | 8,831 | 8,831 | 8,831 | 8,831 | 8,831 | 8,831 |
| | % change | 43.1% | 28.7% | 20.5% | 15.7% | 12.5% | 10.2% |
| COUNTY-OTHER (COA) | | 12,317 | 14,082 | 16,181 | 18,463 | 20,946 | 23,609 |
| | 2006 Plan | 12,317 | 14,082 | 16,181 | 18,463 | 20,946 | 23,609 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| NORTH AUSTIN MUD #1 | | 7,023 | 7,023 | 7,023 | 7,023 | 7,023 | 7,023 |
| | 2006 Plan | 7,023 | 7,023 | 7,023 | 7,023 | 7,023 | 7,023 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| WILLIAMSON COUNTY TOTAL | | 48,657 | 60,711 | 75,043 | 90,627 | 107,582 | 125,766 |
| | 2006 PLAN TOTAL | 48,657 | 60,711 | 75,043 | 90,627 | 107,582 | 125,766 |

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## PROPOSED MUNICIPAL WATER DEMAND PROJECTIONS (AC-FT/YR)

| WHARTON COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| COUNTY-OTHER | | 1,836 | 1,883 | 1,889 | 1,865 | 1,847 | 1,827 |
| | 2006 Plan | 2,113 | 2,168 | 2,175 | 2,147 | 2,126 | 2,103 |
| | Difference | -277 | -285 | -286 | -282 | -279 | -276 |
| | % change | -13.1% | -13.1% | -13.1% | -13.1% | -13.1% | -13.1% |
| EAST BERNARD* | | 277 | 285 | 286 | 282 | 279 | 276 |
| | 2006 Plan | 0 | 0 | 0 | 0 | 0 | 0 |
| | Difference | 277 | 285 | 285 | 282 | 279 | 276 |
| | % change | N/A | N/A | N/A | N/A | N/A | N/A |
| WHARTON | | 1,663 | 1,712 | 1,735 | 1,733 | 1,721 | 1,703 |
| | 2006 Plan | 1,663 | 1,712 | 1,735 | 1,733 | 1,721 | 1,703 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| WHARTON COUNTY TOTAL | | 3,776 | 3,880 | 3,910 | 3,880 | 3,847 | 3,806 |
| | 2006 PLAN TOTAL | 3,776 | 3,880 | 3,910 | 3,880 | 3,847 | 3,806 |

* New WUG for 2011 Plan

| WILLIAMSON COUNTY | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| ANDERSON MILL MUD* | | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2006 Plan | 1,464 | 1,434 | 1,405 | 1,375 | 1,355 | 1,355 |
| | Difference | -1,464 | -1,434 | -1,405 | -1,375 | -1,355 | -1,355 |
| | % change | -100.0% | -100.0% | -100.0% | -100.0% | -100.0% | -100.0% |
| AUSTIN | | 5,457 | 7,398 | 9,691 | 12,161 | 14,834 | 17,693 |
| | 2006 Plan | 3,993 | 5,964 | 8,286 | 10,786 | 13,479 | 16,338 |
| | Difference | 1,464 | 1,434 | 1,405 | 1,375 | 1,355 | 1,355 |
| | % change | 36.7% | 24.0% | 17.0% | 12.7% | 10.1% | 8.3% |
| COUNTY-OTHER (COA) | | 2,401 | 2,729 | 3,118 | 3,536 | 3,989 | 4,469 |
| | 2006 Plan | 2,401 | 2,729 | 3,118 | 3,536 | 3,989 | 4,469 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| NORTH AUSTIN MUD #1 | | 983 | 968 | 952 | 928 | 920 | 920 |
| | 2006 Plan | 983 | 968 | 952 | 928 | 920 | 920 |
| | Difference | 0 | 0 | 0 | 0 | 0 | 0 |
| | % change | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| WILLIAMSON COUNTY TOTAL | | 8,841 | 11,095 | 13,761 | 16,625 | 19,743 | 23,082 |
| | 2006 PLAN TOTAL | 8,841 | 11,095 | 13,761 | 16,625 | 19,743 | 23,082 |

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# ATTACHMENT 2

## COMPARISON BETWEEN REGION K'S MARCH 2009 AND MAY 2009 POPULATION PROJECTIONS

| | PROJECTIONS | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| REGION K TOTAL | 2006 Plan Total | 1,359,677 | 1,657,025 | 1,936,324 | 2,181,851 | 2,447,058 | 2,713,905 |
| | **March 2009 Projections** | **1,420,914** | **1,745,153** | **2,095,319** | **2,482,293** | **2,714,289** | **2,945,148** |
| | % change with March 2009 | 4.50% | 5.32% | 8.21% | 13.77% | 10.92% | 8.52% |
| | **May 2009 Projections** | **1,399,256** | **1,709,437** | **2,007,980** | **2,295,236** | **2,580,534** | **2,831,937** |
| | % change with May 2009 | 2.91% | 3.16% | 3.70% | 5.20% | 5.45% | 4.35% |
| | **May 2009 minus March 2009 Total** | **-21,658** | **-35,716** | **-87,339** | **-187,057** | **-133,755** | **-113,211** |

| COUNTY | PROJECTIONS | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| BASTROP COUNTY TOTAL | 2006 Plan Total | 75,386 | 97,601 | 123,734 | 153,392 | 190,949 | 237,958 |
| | **March 2009 Projections** | **84,600** | **123,700** | **179,500** | **258,700** | **284,000** | **312,000** |
| | % change with March 2009 | 12.22% | 26.74% | 45.07% | 68.65% | 48.73% | 31.12% |
| | **May 2009 Projections** | **84,449** | **120,739** | **151,364** | **199,548** | **239,589** | **288,683** |
| | % change with May 2009 | 12.02% | 23.71% | 22.33% | 30.09% | 25.47% | 21.32% |
| | **May 2009 minus March 2009 Total** | **-151** | **-2,961** | **-28,136** | **-59,152** | **-44,411** | **-23,317** |
| BLANCO COUNTY TOTAL | 2006 Plan Total | 9,946 | 11,756 | 13,487 | 15,002 | 16,641 | 18,544 |
| | **March 2009 Projections** | **11,000** | **14,100** | **17,000** | **19,200** | **20,900** | **22,900** |
| | % change with March 2009 | 10.60% | 19.94% | 26.05% | 27.98% | 25.59% | 23.49% |
| | **May 2009 Projections** | **9,946** | **11,756** | **13,487** | **15,002** | **16,641** | **18,544** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 minus March 2009 Total** | **-1,054** | **-2,344** | **-3,513** | **-4,198** | **-4,259** | **-4,356** |
| BURNET COUNTY TOTAL | 2006 Plan Total | 41,924 | 51,044 | 60,382 | 69,271 | 78,981 | 90,263 |
| | **March 2009 Projections** | **47,300** | **64,700** | **84,500** | **104,000** | **114,000** | **125,000** |
| | % change with March 2009 | 12.82% | 26.75% | 39.94% | 50.13% | 44.34% | 38.48% |
| | **May 2009 Projections** | **47,160** | **61,191** | **78,133** | **94,716** | **105,095** | **115,056** |
| | % change with May 2009 | 12.49% | 19.88% | 29.40% | 36.73% | 33.06% | 27.47% |
| | **May 2009 minus March 2009 Total** | **-140** | **-3,509** | **-6,367** | **-9,284** | **-8,905** | **-9,944** |
| COLORADO COUNTY TOTAL | 2006 Plan Total | 21,101 | 22,032 | 22,550 | 22,760 | 22,801 | 22,561 |
| | **March 2009 Projections** | **22,655** | **24,589** | **25,592** | **25,599** | **27,800** | **29,100** |
| | % change with March 2009 | 7.36% | 11.61% | 13.49% | 12.47% | 21.92% | 28.98% |
| | **May 2009 Projections** | **21,239** | **22,591** | **23,311** | **23,424** | **23,900** | **24,324** |
| | % change with May 2009 | 0.65% | 2.54% | 3.37% | 2.92% | 4.82% | 7.81% |
| | **May 2009 minus March 2009 Total** | **-1,416** | **-1,998** | **-2,281** | **-2,175** | **-3,900** | **-4,776** |

# ATTACHMENT 2

## COMPARISON BETWEEN REGION K'S MARCH 2009 AND MAY 2009 POPULATION PROJECTIONS

| COUNTY | PROJECTIONS | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| FAYETTE COUNTY TOTAL | 2006 Plan Total | 24,826 | 28,808 | 32,363 | 35,259 | 38,933 | 44,120 |
| | **March 2009 Projections** | **24,826** | **28,808** | **32,363** | **35,259** | **38,933** | **44,120** |
| | % change with March 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 Projections** | **24,826** | **28,808** | **32,363** | **35,259** | **38,933** | **44,120** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 minus March 2009 Total** | **0** | **0** | **0** | **0** | **0** | **0** |
| GILLESPIE COUNTY TOTAL | 2006 Plan Total | 24,089 | 27,510 | 28,845 | 28,845 | 28,845 | 28,845 |
| | **March 2009 Projections** | **24,727** | **28,826** | **30,936** | **29,818** | **31,200** | **32,700** |
| | % change with March 2009 | 2.65% | 4.78% | 7.25% | 3.37% | 8.16% | 13.36% |
| | **May 2009 Projections** | **25,258** | **29,117** | **30,861** | **30,861** | **30,861** | **30,861** |
| | % change with May 2009 | 4.85% | 5.84% | 6.99% | 6.99% | 6.99% | 6.99% |
| | **May 2009 minus March 2009 Total** | **531** | **291** | **-75** | **1,043** | **-339** | **-1,839** |
| HAYS COUNTY TOTAL | 2006 Plan Total | 46,143 | 69,377 | 88,887 | 108,495 | 132,051 | 150,574 |
| | **March 2009 Projections** | **46,143** | **69,377** | **88,887** | **108,495** | **132,051** | **150,574** |
| | % change with March 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 Projections** | **46,143** | **69,377** | **88,887** | **108,495** | **132,051** | **150,574** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 minus March 2009 Total** | **0** | **0** | **0** | **0** | **0** | **0** |
| LLANO COUNTY TOTAL | 2006 Plan Total | 17,360 | 17,360 | 17,360 | 17,360 | 17,360 | 17,360 |
| | **March 2009 Projections** | **24,514** | **31,984** | **34,000** | **36,000** | **38,000** | **40,000** |
| | % change with March 2009 | 41.21% | 84.24% | 95.85% | 107.37% | 118.89% | 130.41% |
| | **May 2009 Projections** | **21,284** | **23,007** | **23,471** | **23,932** | **24,393** | **24,855** |
| | % change with May 2009 | 22.60% | 32.53% | 35.20% | 37.86% | 40.51% | 43.17% |
| | **May 2009 minus March 2009 Total** | **-3,230** | **-8,977** | **-10,529** | **-12,068** | **-13,607** | **-15,145** |
| MATAGORDA COUNTY TOTAL | 2006 Plan Total | 40,506 | 43,295 | 44,991 | 45,925 | 45,793 | 45,377 |
| | **March 2009 Projections** | **41,924** | **45,431** | **47,701** | **48,365** | **52,300** | **54,900** |
| | % change with March 2009 | 3.50% | 4.93% | 6.02% | 5.31% | 14.21% | 20.99% |
| | **May 2009 Projections** | **40,506** | **43,295** | **44,991** | **45,926** | **45,926** | **45,925** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.29% | 1.21% |
| | **May 2009 minus March 2009 Total** | **-1,418** | **-2,136** | **-2,710** | **-2,440** | **-6,375** | **-8,975** |
| MILLS COUNTY TOTAL | 2006 Plan Total | 5,137 | 5,414 | 5,476 | 5,537 | 5,497 | 5,397 |
| | **March 2009 Projections** | **5,773** | **6,380** | **6,521** | **6,132** | **6,800** | **7,100** |
| | % change with March 2009 | 12.38% | 17.84% | 19.08% | 10.75% | 23.70% | 31.55% |
| | **May 2009 Projections** | **5,466** | **5,815** | **6,107** | **5,930** | **6,329** | **6,497** |
| | % change with May 2009 | 6.40% | 7.41% | 11.52% | 7.10% | 15.14% | 20.38% |
| | **May 2009 minus March 2009 Total** | **-307** | **-565** | **-414** | **-202** | **-471** | **-603** |

# ATTACHMENT 2

## COMPARISON BETWEEN REGION K'S MARCH 2009 AND MAY 2009 POPULATION PROJECTIONS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SAN SABA COUNTY TOTAL | 2006 Plan Total | 6,387 | 6,746 | 7,059 | 7,332 | 7,365 | 7,409 |
| | **March 2009 Projections** | **6,935** | **7,775** | **8,265** | **8,390** | **9,200** | **9,800** |
| | % change with March 2009 | 8.58% | 15.25% | 17.08% | 14.43% | 24.92% | 32.27% |
| | **May 2009 Projections** | **6,387** | **6,746** | **7,059** | **7,332** | **7,365** | **7,409** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 minus March 2009 Total** | **-548** | **-1,029** | **-1,206** | **-1,058** | **-1,835** | **-2,391** |
| TRAVIS COUNTY TOTAL | 2006 Plan Total | 969,955 | 1,185,499 | 1,385,236 | 1,550,538 | 1,722,737 | 1,888,543 |
| | **March 2009 Projections** | **1,003,600** | **1,208,900** | **1,434,100** | **1,680,200** | **1,820,000** | **1,960,000** |
| | % change with March 2009 | 3.47% | 1.97% | 3.53% | 8.36% | 5.65% | 3.78% |
| | **May 2009 Projections** | **1,003,253** | **1,201,256** | **1,402,153** | **1,583,068** | **1,770,347** | **1,918,135** |
| | % change with May 2009 | 3.43% | 1.33% | 1.22% | 2.10% | 2.76% | 1.57% |
| | **May 2009 minus March 2009 Total** | **-347** | **-7,644** | **-31,947** | **-97,132** | **-49,653** | **-41,865** |
| WHARTON COUNTY TOTAL | 2006 Plan Total | 28,260 | 29,872 | 30,911 | 31,508 | 31,523 | 31,188 |
| | **March 2009 Projections** | **28,260** | **29,872** | **30,911** | **31,508** | **31,523** | **31,188** |
| | % change with March 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 Projections** | **28,260** | **29,872** | **30,911** | **31,508** | **31,523** | **31,188** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 minus March 2009 Total** | **0** | **0** | **0** | **0** | **0** | **0** |
| WILLIAMSON COUNTY TOTAL | 2006 Plan Total | 48,657 | 60,711 | 75,043 | 90,627 | 107,582 | 125,766 |
| | **March 2009 Projections** | **48,657** | **60,711** | **75,043** | **90,627** | **107,582** | **125,766** |
| | % change with March 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 Projections** | **48,657** | **60,711** | **75,043** | **90,627** | **107,582** | **125,766** |
| | % change with May 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| | **May 2009 minus March 2009 Total** | **0** | **0** | **0** | **0** | **0** | **0** |

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# CHAPTER 3.0: IDENTIFICATION OF CURRENTLY AVAILABLE WATER SUPPLIES

A key task in the preparation of the Lower Colorado Regional Water Plan (LCRWP) is to determine the current available water supplies within the region. This information, when compared to the population and water demand projections, is critical in projecting water supply shortfalls and surpluses for the region, including the amount of shortfall, when a shortfall is expected to occur, and the county in which the shortfall is expected.

As presented in Chapter 2, the expected water demand in the Lower Colorado Regional Water Planning Area (LCRWPA) is projected to increase by approximately 38 percent while the population is projected to more than double over the next 50 years. Therefore, the need to accurately identify available water supplies is a critical component of developing the regional plan.

The following sections of the chapter describe the methodologies utilized in developing estimates of currently available water supplies for the LCRWPA. This chapter also presents regional water supplies by county, wholesale water providers of municipal water, and the six Texas Water Development Board (TWDB) specified water-use categories.

## 3.1 TWDB GUIDELINES FOR REVISIONS TO WATER SUPPLIES

The Texas Water Development Board (TWDB) has promulgated rules for regional planning and has provided specific guidance to Regional Water Planning Groups (RWPGs) concerning the development of estimates of currently available water supplies. The guidance clearly indicates that the estimates of currently available water supplies shall reflect water that is reliably available to the area during a repeat of the "drought-of-record" (DOR) conditions. The specific methods used in determining the amount of currently available water vary depending upon whether it is a groundwater or surface water resource. A summary of TWDB guidelines and methods for estimating currently available water supply is presented below.

## 3.2 AVAILABLE WATER SOURCES TO THE LCRWPA

In accordance with the TWDB guidelines, five basic types of water supply exist within the LCRWPA. The types are as follows:

- Surface water supplies
- Groundwater supplies
- Supplies available through contractual arrangements
- Supplies available through the operation of a system of reservoirs or other supplies
- Reclaimed water

Since supplies available through the last three categories originated from either surface or groundwater sources, all available water supplies will be discussed in terms of being either of surface water origin or groundwater origin. The following sections present information concerning the available supply of water within the LCRWPA. That is to say, water that is physically present within the LCRWPA, whether it is present due to natural circumstances or it is present as a result of facilities constructed by one or more water users within the LCRWPA.

### 3.2.1 Surface Water Availability

Surface water sources include any water resource where water is obtained directly from a surface water body. This would include rivers, streams, creeks, lakes, ponds, and tanks. In the State of Texas, all waters contained in a watercourse (rivers, natural streams, and lakes, and the storm water, flood water, and rainwater of every river, natural stream, canyon, ravine, depression, and watershed) are waters of the State and thus belong to the State. The State grants individuals, municipalities, water suppliers, and industries the right to divert and use this water through water rights permits. Water rights are considered property rights and can be bought, sold, or transferred with state approval. These permits are issued based on the concept of prior appropriation, or "first-in-time, first-in-right." Water rights issued by the State generally fall into two major categories:

- Run-of-River (ROR) Rights – Allow diversions of water directly from a water body as long as there is water in the stream and that water is not needed to meet a senior downstream water right. ROR rights are greatly impacted by drought conditions, particularly in the upper portions of a river basin.

- Stored Water Rights – Allow the impoundment of water by a permittee in a reservoir. Water can be held for storage as long as the inflow is not needed to meet a senior downstream water right. Water stored in the reservoir can be withdrawn by the permittee at a later date to meet its or its customers water demands. The storage of water in a reservoir gives the permittee a buffer against drought conditions.

A list of active water rights within the LCRWPA is contained in *Appendix 3A*.

In addition to the water rights permits issued by the State, individual landowners may use state waters without a specific permit for certain types of use. The most common of these uses is domestic and livestock use. Landowners are also allowed to construct impoundments on their own property with up to 200 acre-feet (ac-ft) of storage for domestic and livestock or certain wildlife management purposes (see Section 11.142, Texas Water Code). These types of water sources are generally referred to in this plan as "Local Supply Sources." Many individuals with land along a river or stream that still have an old riparian right can also divert a reasonable amount of water for domestic and livestock uses without a permit.

Water availability in Region K will be determined for the purposes of regional planning as prescribed by the TWDB water planning guidelines. The TWDB guidance requires that the amount of surface water available from each source be determined with the following assumptions:

- Water availability will be estimated based on a "firm yield" analysis. For a reservoir system, this analysis would produce the average annual withdrawals available during a repeat of the drought of record considering the long-term storage capabilities, projected inflows, and evaporation. For water rights based solely on run-of-river, the drought of record corresponds to the driest period on record. Without available storage, water is no longer available if the river goes dry. In addition, a run-of-river right may not be able to divert even if there is water in the river or stream due to the constraints of the prior appropriation system or environmental flow limitations under such water right.

- Water availability will be based on the assumption that all senior water rights in the basin are being fully utilized. That is, water user groups cannot depend on "borrowing" water from unused water rights.

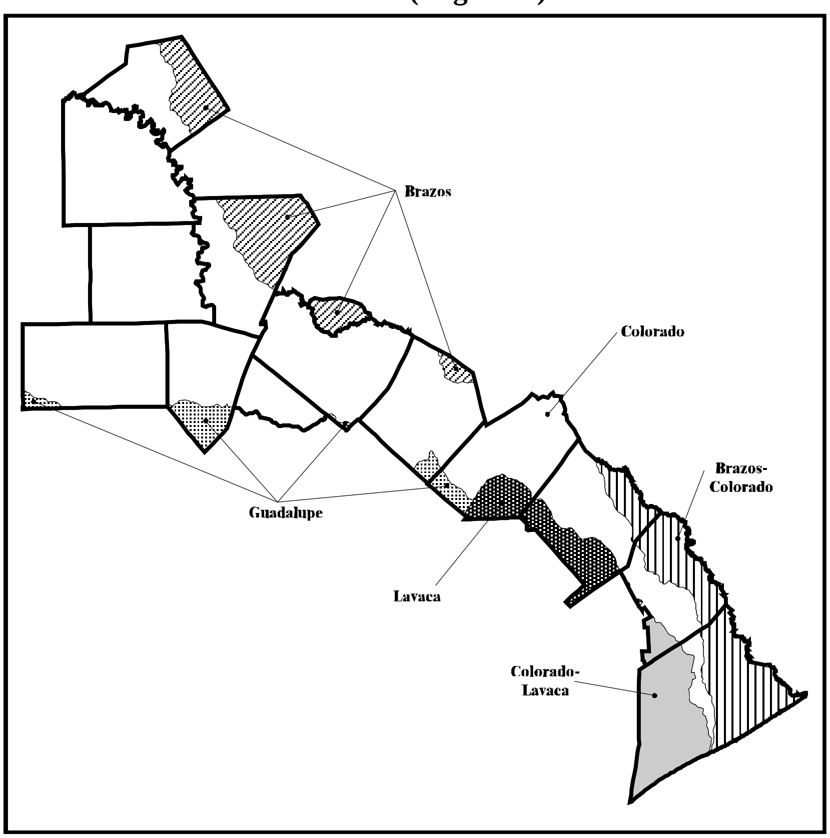
- Water supply is based on the infrastructure that is in place. For example, water would not be considered to be a supply from a reservoir if a user still needed to construct the water intake and pipeline to convey the water from the reservoir to the area of need.

It should be noted that state directives (summarized above) to regional water planners on how they are to determine water availability in meeting future water supply needs may impose unrealistic assumptions on how water is actually used or will be used over the planning period. This methodology requires local water planners to assume that every water right holder will simultaneously divert and totally consume the water up to their full authorizations. These directives have the potential to overestimate water shortages.

Although “worst case” conservative assumptions may be appropriate to avoid the theoretical “over permitting” of water, it may be unrealistic to use this methodology alone for planning purposes. Rather local and regional planners should be allowed, and are to some extent by the existing process, to bring their knowledge, experience, and common sense to the “planning effort” to determine realistic water availability assumptions, something Senate Bill 1 was intended to provide by establishing a “bottom-up” approach to replace the previous “top-down” state planning approach.

The LCRWPA traverses six different river basins, including the Brazos, Brazos-Colorado Coastal, Colorado, Colorado-Lavaca Coastal, Lavaca, and Guadalupe River Basins. *Figure 3.1* illustrates the location of each of these basins. The following sections discuss the available water sources in each river basin within the LCRWPA.

**Figure 3.1: River Basins Within the LCRWPA (Region K)**



### *3.2.1.1 Colorado River Basin*

The majority of the LCRWPA is contained in the Colorado River Basin. The primary sources of water within this basin are the Highland Lakes and run-of-river water from the Colorado River. However, several water user groups obtain water from tributaries or off-channel ponds.

#### *3.2.1.1.1 Water Availability Modeling for the 2006 Region K Water Plan*

In the January 2006 Region K Water Plan, the availability of existing surface water supplies in the Colorado River Basin were originally calculated using the Run 3 Version of the Texas Commission on Environmental Quality's (TCEQ) Colorado River Basin Water Availability Model (WAM), dated November 2004. The results of that analysis were presented in *Tables 3.1* through *3.3* in the 2006 Region K Water Plan.

In addition to the standard TCEQ WAM Run 3, the LCRWPG also authorized the development of an alternative WAM run which was referred to as the "No Call" WAM. The No Call WAM was developed as a result of a request from the Region F Planning Group. The results of that analysis were presented in *Tables 3.1a* through *3.3b* in the 2006 LCRWPG Water Plan.

The water availability modeling using the November 2004 TCEQ Run 3 WAM showed a significant increase in the amount of firm yield and run of river water in the Lower Basin as compared to the amount shown as being available in the 2001 plan. There are a number of possible explanations for these differences. Region F, which includes the upstream portion of the Colorado Basin, also used the November 2004 Colorado Basin WAM for 2006 water plan development. Under the Run 3 scenario, many of the reservoirs in Region F showed little to no firm yield. These reservoirs are the only source of supply to numerous communities in Region F, and the water supply scarcities were such that there were few additional economically viable alternatives for supply. The issue of a "no call" approach to assessing water supply in Region K and why it was used in the last planning cycle is addressed in the 2006 LCRWPG Water Plan.

The issues noted above were presented to the LCRWPG. Both the Region F and Region K groups in the 2006 planning cycle recognized the need for coordination between the two regions. Due to the lack of time and funding, it was suggested that the impacts of temporarily implementing a "No Call" assumption could be examined as a potential "quick fix" in order to meet the mandatory deadlines of the 2006 planning cycle. Consequently, Planning Group members voted to proceed with a joint modeling effort on the part of Region F and Region K consultants. The modeling that was to be conducted would be a "WHAT IF" scenario which would generally assume that, during the 50-year planning period, certain large downstream senior water rights holders would not call for water they were legally entitled to by virtue of their priority and would instead allow that water to be impounded in upstream Region F reservoirs.

The joint modeling effort proposal was presented to the Region K group in the following manner:

1. Region K would be able to review the numbers produced from the joint modeling effort and determine whether to use those revised numbers for the shortages and surpluses analysis in place of the numbers calculated by the November 2004 WAM.

2. The effort would be a planning exercise only. No legal positions would be changed or waived as a result of this exercise. No downstream water right holders would be asked or required to formally cede or amend any of their water rights as a result of this planning exercise. In other words, the availability adjustments would have no legal effect and would be temporary in order to complete the 2006 regional water plans for Regions K and F.

While the Region K group adopted the adjusted numbers for use in determining Region K surpluses and shortages for the 2006 planning cycle, significant concerns remained:

1. Due to the time frame and technique employed, the numbers that were developed were approximations that may still have some amount of error in them. One clear example of this is that junior water rights in Region K that were not subject to the No Call assumption appeared to experience an increase in reliability, which should not have occurred. Further, the Planning group had remaining questions about the assumptions used by Region F's consultants for allocation of water among various users within Region F itself and the use of safe yield, which could have affected availability of water in Region K to some degree.

2. Overall, the No Call modeling approach resulted in an allocation of stored water among LCRA firm customers and environmental commitments that does not represent the LCRA's likely operations to meet existing legal commitments to provide firm water. Some of the inaccuracies that were experienced in the model were a result of the model using a monthly time step and other simplifying assumptions embedded in the underlying WAM. The WAM's treatment of environmental flow requirements in LCRA's Water Management Plan, for example, appeared to send additional flow during a month even if the commitment was satisfied mid-month. Further, the modeling approach assumed that the biggest impact should be borne by the most junior of these water rights; that being the LCRA's rights for Lakes Buchanan and Travis. This assumption resulted in apparent shortages in Highland Lakes' firm commitments largely as a result of the manner in which the WAM allocates firm supply from the Highland Lakes to LCRA's various customers and the environment. LCRA, in reality, does not operate its system of various water rights today in that manner. Because LCRA's irrigation customers are largely served through annual interruptible contracts instead of long-term, firm contracts, a No Call assumption that takes more water from the LCRA's irrigation run-of-river rights while preserving more of the Highland Lakes firm yield would probably have been more appropriate if time had allowed for further refinement of the No Call model approach.

3. There was concern among the group members regarding the impact of the No Call assumption on environmental flows. Two critical issues of concern are as follows. First, the timing of the request and the availability of the numbers was such that there was neither time nor budget for a thorough review of the impact on the environmental flows in the basin. Second, the No Call assumption appeared to suggest that LCRA would not have any interruptible water supply available to meet environmental flow needs. While the group recognized that a full water rights and contract demand without return flows is not projected to occur for some time and consequently, interruptible supply and return flows would, in fact, be available during this planning period to meet some level of environmental flow needs, members felt that a thorough review and analysis of the impact of the No Call assumption on instream flows and bay and estuary inflows was needed as soon as possible.

4. There had been a lengthy debate among the planning group members concerning the inclusion of the No Call adjustments in the water availability chapter in the 2006 LCRWPG Water Plan. Region K normally operates on a consensus basis, with all members agreeing to move forward with actions,

although some may have reservations. With this issue, there was a clear division among the group. Some members expressed frustration that the short timeframe of the joint-modeling effort made it very difficult to develop a thorough understanding of the results and impacts. Further, members struggled with whether the No Call adjustments should be handled as a management strategy instead of an adjustment to the availability in Region K.

5. During the process, the group identified several technical issues with the WAM (discussed below) that could affect the magnitude or ultimate need for a No Call assumption. Due to the lack of time and funding, it was not possible to fully explore these issues in time for them to be addressed in the 2006 plan. The Region K group recommended, however, that these issues be further examined during future rounds of planning. These issues generally include enhancements to the WAM routines, updates to the datasets, and a review of fundamental assumptions. Some specific examples of issues that were identified for further review include:

    a. The WAM's approach to modeling environmental flow restrictions on water rights

    b. The naturalized flows used in the WAM

    c. The WAM's incorporation (or lack thereof) of channel gains and losses

    d. The WAM's treatment (or lack thereof) of "futile call" issues

    e. The WAM's incorporation of existing subordination or similar agreements and ability to model these types of agreements

    f. The WAM's backup of Austin's steam electric water rights with LCRA stored water

    g. The WAM's backup of STPNOC's steam electric water rights with LCRA stored water

    h. The WAM's representation of a zero firm yield for several major reservoirs in the basin

   It is recognized that a few of the above listed issues have been under investigation for betterment of the model. For example, during May 2005, TCEQ revised some of the naturalized flow estimates for the Lower Basin; however, it was not feasible to incorporate the revision in the datasets in the last round of planning.

The No Call WAM was not used for the 2011 Region K Water Plan. A modified version of the TCEQ Colorado River WAM, called the Region K Cutoff Model, was used. The Region K Cutoff Model is described in the next section.

#### *3.2.1.1.2 Water Availability Modeling for the 2011 Region K Water Plan*

In the first biennium of the 2011 planning cycle, one of the tasks for the planning group was to review the technical issues listed above as part of a re-evaluation of the TCEQ Colorado River WAM, and to determine whether a more appropriate alternative version of the WAM could be created to more accurately determine the surface water availabilities of the Lower Colorado River. An alternative model was developed and chosen by the planning group and is being used in the current round of planning to determine availabilities and evaluate water management strategies. A description of the revised WAM model, termed the Region K WAM Run 3 Cutoff Model (Region K Cutoff Model), can be found in *Appendix 3B*, along with the request and approval letters for allowing the use of the Region K Cutoff Model by TWDB.

The model is a modified version of the TCEQ WAM Run 3, where the basin is essentially divided into two parts, an upper basin and a lower basin. The dividing point is the dams for Ivie Reservoir and Lake Brownwood. All of the water rights are managed according to Prior Appropriation Doctrine, except that the water rights in the upper basin are considered senior to the water rights in the lower basin. The City of Junction and Brady Creek Lake water rights are not included in the Region K Cutoff Model under this assumption, due to the fact that they do not have existing formal agreements in place. The LCRWPG acknowledges that Region K has existing supplies and recommended strategies that can make available the water needed by these two water right holders, regardless of how they are included in the Region K Cutoff Model. All of the water rights are represented with their full authorization amounts. This model better reflects the actual and historical operating conditions and existing contractual agreements between LCRA and certain upper basin water right holders and is a better representation than the TCEQ WAM and even the “No Call” WAM developed for the 2006 Region K Water Plan.

3.2.1.1.2.1 Highland Lakes System

The Highland Lakes System is composed of two major water storage reservoirs – Lakes Buchanan and Travis. These lakes are owned and operated by the LCRA. In addition, the system contains three intermediary lakes owned and operated by the LCRA – Inks Lake, Lake LBJ, and Lake Marble Falls. Lake Austin, the last in the Highland Lakes System, is owned by the City of Austin and is operated by the LCRA through an agreement.

The LCRA operates the Highland Lakes as a system to provide a reliable source of water to downstream customers. The LCRA developed a “Water Management Plan for the Lower Colorado River Basin” in response to requirements contained in a final order of adjudication of water rights to the LCRA for the Highland Lakes. The Water Management Plan (WMP) was originally adopted in 1989 and has been amended several times, most recently in March 1999, and proposed amendments to the WMP submitted in May 2003 were recently adopted in January 2010, however, these amendments were not used in the 2011 planning cycle due to its approval after the planning effort was well underway. As part of the original WMP, LCRA determined the combined firm yield of Lakes Buchanan and Travis based on a detailed analysis of the water availability for Lakes Buchanan and Travis during a repeat of the drought of record. The WMP also contains a management strategy for meeting the 10-year projected demands of its firm municipal and industrial customers, while continuing to provide water for environmental needs and agricultural purposes, largely on an interruptible basis. The LCRA’s WMP determines the amount of interruptible water supply that can be made available while continuing to ensure the availability of water for firm demands in a repeat of a drought of records using a system of curtailment triggers that are linked to actual water in storage on January 1 of each year. The interruptible supply is generally comprised of uncommitted firm supply, committed firm supply that is not projected to be used in the ten year planning period covered by the plan, and flood flows. As firm commitments and demands for water under those commitments increase over time, interruptible supplies must be reduced more often even at higher storage levels to ensure the availability of water to firm customers in a DOR. The Region K Cutoff Model was developed using the LCRA 1999 WMP, and therefore that is the version of the WMP that was used for the development of water availability in this regional water plan.

The firm yield of the Highland Lakes System was determined by using the Region K Cutoff Model and adding up the various components of the Highland Lakes System. Some of the assumptions in the model for determining the firm yield of the system are described below:

- Water rights are protected based on prior appropriation doctrine;
- The hydrologic conditions in the 1940-1998 period are repeated;
- Downstream, senior water rights are being fully utilized during this period. The water rights in the Lower Colorado Region are included in *Appendix 3A;*
- The LCRA cannot impose its priority rights for Lakes Buchanan and Travis against any upstream, junior water right with a priority date senior to November 1, 1987, so long as interruptible supplies are not curtailed;
- Historical net evaporation rates for the period of 1940 through 1998;
- Downstream water demands are assumed to be met with inflows to the river below the Highland Lakes, to the extent possible; and
- The total system yield decreases over time due to sedimentation of the reservoirs.

**Table 3.1 Components of the Highland Lakes System Firm Yield**

| Entity or Use | Region K Cutoff Model Results (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Backup of City of Austin Water Rights [1] | 79,114 | 87,237 | 87,237 | 87,237 | 87,237 | 87,224 |
| Highland Lakes Contracts | 85,789 | 85,789 | 85,789 | 85,789 | 85,789 | 85,789 |
| LCRA Cooling Water [1] | 64,551 | 64,551 | 64,551 | 64,551 | 64,551 | 64,551 |
| STP Nuclear Operating Company [1, 2] | 27,507 | 32,480 | 32,480 | 32,480 | 32,480 | 32,360 |
| Instream Flow Requirements [1] | 24,935 | 19,595 | 19,595 | 19,595 | 19,595 | 19,595 |
| Bay and Estuary Flow Requirements [1] | 28,193 | 5,967 | 5,967 | 5,967 | 5,967 | 5,967 |
| Additional Highland Lakes Contracts [1] | 79,672 | 79,671 | 79,671 | 79,671 | 76,582 | 70,982 |
| | | | | | | |
| Total System Commitment | 389,761 | 375,290 | 375,290 | 375,290 | 372,201 | 366,468 |
| | | | | | | |
| Uncommitted System Yield | 12,411 | 14,711 | 8,711 | 2,811 | 0 | 0 |
| | | | | | | |
| **Total System Yield** | **402,172** | **390,001** | **384,001** | **378,101** | **372,201** | **366,468** |

Notes: Colorado WAM provided by TCEQ, August 2007, Run 3. WRAP program by Dr. Ralph Wurbs, Texas A&M University, January 2009
Drought-of-Record (DOR) is May 1945 to April 1957 (12 years) for 2010; May 1947 to April 1957 (10 years) for all other decades
[1] These values were averaged over the DOR

*Table 3.1* above shows the components that make up the firm yield of the Highland Lakes System. The Region K Cutoff Model was used to determine the values in the table. The results were viewed using the January 2009 version of the WRAP modeling program. The firm yields were calculated for the 12-year

DOR period (May 1945 to April 1957) for the 2010 analysis, and the 10-year DOR period (May 1947 to April 1957) for the 2020 through 2060 analyses, which is identified as the most severe drought period since 1898. The firm yield commitments are releases from system storage; they do not consist of run-of-river water. The following describes the methods used to determine the values in *Table 3.1*.

*Backup of City of Austin Water Rights*
The three LCRA backup amounts for the City of Austin municipal water rights were summed. These water rights are 61405471005RMBU, 61405471005LMBU, and 61405489003MBU.

*Highland Lakes Contracts*
The amount listed in the 1999 LCRA Water Management Plan was used.

*LCRA Cooling Water*
The availability for water rights 61405480001, 61405473001, and 61405474001 was summed.

*South Texas Nuclear Project*
This is water right 61405437001BU. The available supply of backup water for STP from LCRA supplies is limited to 20,000 ac-ft/yr (as a 5-year rolling average) with two generating units in operation (as is the case through 2015) and to 40,000 ac-ft/yr (as a 5-year rolling average) with any additional generating units in operation (beginning in the year 2016).

*Instream Flow Requirements*
In 1992, LCRA, working with the state natural resource agencies, completed an instream flow needs study. The study was later approved by the Texas Water Commission, predecessor agency to the TCEQ, as incorporated into LCRA's Water Management Plan. The results of that study included two sets of instream flow needs: Critical and Target instream flow needs. The quantity of water committed by the LCRA Highland Lakes System under the Water Management Plan to instream flows consists of (1) the passage of inflows to meet the Target and Critical instream flow criteria that might otherwise be available to store in the Highland lakes; and, (2) the release of stored water to help meet the Critical instream flow criteria. In order to determine the quantity of inflow the LCRA Highland Lakes System bypassed for instream flows in the WAM, the quantity of inflow available to the LCRA's Highland Lakes System before and after an environmental need is engaged, is computed, and the inflow reduction to the LCRA Highland Lakes System due to each environmental need is attributed as water bypassed for each environmental need. To determine the quantity of additional stored water released for critical instream flows, the exact quantity of water released from the LCRA Highland Lakes System Storage to help meet each environmental need is extracted from the WAM output and attributed as stored water released for each environmental need. Once all of these components have been extracted and tabulated, the total quantity of water dedicated to instream flows is determined.

The 1999 LCRA Water Management Plan states:
"Total commitments of the Combined Firm Yield from the Highland Lakes for instream flow maintenance will be an average of 12,860 acre-feet per year, with a maximum of 36,720 acre-feet in any one year; 58,700 acre-feet in any two consecutive years; 76,800 acre-feet in any three or four consecutive years; 106,100 acre-feet in any five consecutive years and 128,600 acre-feet in any six to ten consecutive years."

*Bay and Estuary Flow Requirements*
This amount was the DOR average of BEC-IN (Bay and Estuary Critical In) minus BEC-OT (Bay and Estuary Critical Out) plus the DOR average of BET-IN (Bay and Estuary Target In) minus BET-OT (Bay and Estuary Target Out) from the model output.

Critical inflow is the amount of water needed to provide a fishery sanctuary habitat near the mouth of the Colorado River during times of drought. From this sanctuary, fish, shellfish and oysters could be expected to recover and repopulate the bay when more normal weather conditions return.

The 1999 LCRA Water Management Plan states:
"Total commitments of the Combined Firm Yield from the Highland Lakes for bays and estuaries (estuarine inflows) will be an average of 3,090 acre-feet per year, with a maximum of 11,200 acre-feet in any one year; 19,700 in any two consecutive years; 24,200 acre-feet in any three or four consecutive years; 28,200 acre-feet in any five consecutive years and 30,900 acre-feet in any 6 to 10 consecutive years.

The total firm stored water commitment for both purposes (instream flow and bays and estuaries) will be an average of 15,950 acre-feet per year. Estimated interruptible stored water supplied during the critical drought for both purposes will be an additional 40,060 acre-feet per year."

*Additional Highland Lakes Contracts*
This amount includes contracts LCRA is maintaining that were not included in the 1999 Water Management Plan that have separate water rights associated with them. The components are the Cities of Cedar Park, Leander, Lometa, Pflugerville, and the Brazos River Authority.

*Uncommitted System Yield*
This was determined by subtracting the Highland Lakes Contracts amount (85,789 ac-ft) from the LCRA remaining firm yield (61405482001C) in the Region K Cutoff Model. This amount includes any additional firm commitments LCRA has made since the 1999 WMP was approved that do not have separate water rights associated with them.

*Highland Lakes*
The total system yield will decrease over time due to sedimentation of the reservoirs. The Highland Lakes firm yield is equal to the Total System Yield (or the Total System Commitment plus the Uncommitted System Yield), and is shown in *Table 3.2*.

3.2.1.1.2.2 Reservoirs

The estimated firm yields for all reservoirs within the Colorado River Basin are presented in *Table 3.2*.

**Table 3.2 Reservoir Yields in the Colorado Basin (ac-ft/yr)**

| Entity or Use | Region K Cutoff Model Results (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| **Highland Lakes** | **402,172** | **390,001** | **384,001** | **378,101** | **372,201** | **366,468** |
| | | | | | | |
| City of Goldthwaite | 0 | 0 | 0 | 0 | 0 | 0 |
| City of Llano | 0 | 0 | 0 | 0 | 0 | 0 |
| Walter E. Long (Decker Lake) | 0 | 0 | 0 | 0 | 0 | 0 |
| Lake Bastrop | 0 | 0 | 0 | 0 | 0 | 0 |
| Lake Fayette | 0 | 0 | 0 | 0 | 0 | 0 |
| City of Lometa | 0 | 0 | 0 | 0 | 0 | 0 |
| STP Reservoir | 0 | 0 | 0 | 0 | 0 | 0 |
| **Minor Reservoir Subtotal** | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | |
| **TOTAL** | **402,172** | **390,001** | **384,001** | **378,101** | **372,201** | **366,468** |

Notes:

Colorado WAM provided by TCEQ, August 2007, Run 3. WRAP program by Dr. Ralph Wurbs, Texas A&M University, January 2009

Drought-of-Record (DOR) is May 1945 to April 1957 (12 years) for 2010; May 1947 to April 1957 (10 years) for all other decades

The Highland Lakes firm yield is discussed in detail in Section 3.2.1.1.1. Several smaller reservoirs in the LCRWPA are also located within the Colorado River Basin. Estimates for the firm yield of these reservoirs are based on the Region K Cutoff Model runs and a detailed discussion is provided below.

- The **City of Goldthwaite** owns and operates a two-reservoir system as part of its water supply facilities. The reservoirs include a small reservoir with a capacity of 40 ac-ft adjacent to the river and a larger reservoir with a capacity of 200 ac-ft, which is located off-channel. The city pumps water from the Colorado River into the smaller reservoir and then pumps it into the larger reservoir, from which water is drawn for treatment. The size of the reservoirs are relatively small in comparison to the city's water demand, which is projected to increase from approximately 569 ac-ft in the year 2010 scenario to 616 ac-ft in the year 2060. Based on the limited storage available, the firm yields of the reservoirs are dependent upon continued river flows throughout the year. It is estimated that the available storage would be depleted within four months once the river ceases flowing. Based on the Region K Cutoff Model, it was determined that the Goldthwaite reservoir system has a firm yield of 0 ac-ft/yr (water rights 61402553401, 61402553402, and 61402553001).

- The **City of Llano** owns and operates two reservoirs on the Llano River: City Lake and City Park Lake, both of which are small channel dams. The two reservoirs were estimated to have a combined capacity of 503 ac-ft in 1988. This is significantly less than the original design capacity of 700 ac-ft. The decreased capacity is due to sedimentation rates in the two reservoirs. The firm yield estimated by the TCEQ WAM was 0 ac-ft/yr (water rights 61401650001 and 61401650002).

- **Lake Walter E. Long (Decker Lake)** is owned and operated by the City of Austin. The lake is formed by a dam on Decker Creek, which is a tributary to the Colorado River in Travis County. The City of Austin uses Decker to supply cooling water for an electrical generating plant. The City of Austin supplements the water supply to Decker by pumping water from the Colorado River based on run-of-river rights and a water supply contract with LCRA for stored water from the Highland Lakes. Therefore, because the water from Decker Lake has already been accounted for in run-of-river and LCRA backup amounts, the firm yield of the lake itself due to the TCEQ WAM is considered 0 ac-ft/yr.

- **Lake Bastrop** is owned and operated by the LCRA. The lake is formed by a dam on Spicey Creek, which is a tributary to Piney Creek and the Colorado River in Bastrop County. The LCRA uses water from Lake Bastrop for cooling purposes at its Sam Gideon Power Generating Station. The LCRA supplements the water supply at this lake by pumping water into the lake from the Colorado River. The water pumped into the lake is stored water from the Highland Lakes. Therefore, because the water from Lake Bastrop has already been accounted for in run-of-river and LCRA backup amounts, the firm yield of the lake itself due to the TCEQ WAM is considered 0 ac-ft/yr.

- **Lake Fayette** is owned and operated by the LCRA. The lake is formed by a dam on Cedar Creek, which is a tributary to the Colorado River in Fayette County. The LCRA uses water from Lake Fayette for cooling purposes at the Fayette Power Project. The LCRA supplements the water supply at this lake by pumping water into the reservoir from the Colorado River. A portion of the water pumped is run-of-river water rights held by the City of Austin, which is co-owner in the Fayette Power Project. The remainder of the water pumped into the reservoir is stored water from the Highland Lakes. Therefore, because the water from Lake Fayette has already been accounted for in run-of-river and LCRA backup amounts, the firm yield of the lake itself due to the TCEQ WAM is considered 0 ac-ft/yr.

- **Lometa Reservoir** is owned and operated by the LCRA. The reservoir is formed by a dam on Salt Creek, which is a tributary to the Colorado River in Lampasas County. The LCRA uses water from Lometa Reservoir for municipal purposes within the service area of the Lometa Water System. The reservoir has a normal maximum operating capacity of 554.6 ac-ft. A maximum of 882 ac-ft of water is available for diversion from the Colorado River, including 476 ac-ft for municipal demands and 406 ac-ft to offset evaporative losses. Because this amount is included as part of the Highland Lakes firm yield, the reported firm yield of the Lometa Reservoir is 0 ac-ft/yr.

- **South Texas Project Reservoir**: The Main Cooling Reservoir associated with the South Texas Project Electric Generating Station is a 7,000-acre (surface area) off-channel reservoir located in Matagorda County. At the maximum design operating level, the reservoir has a capacity of 202,600 ac-ft, or 9.6 percent of the total capacity of Lakes Travis and Buchanan as stated in the LCRA Water Management Plan. The firm yield from the TCEQ WAM is considered to be 0 ac-ft/yr since the reservoir firm yield is supplied by the STP run-of-river right (STP Nuclear Operating Co. et al.) and LCRA stored water from Lakes Buchanan and Travis, and the amount of water from the run-of-river right and LCRA's Highland Lakes has already been included in the water availability analysis for Region K (refer to *Tables 3.1* and *3.3*). If both the run-of-river right and the reservoir firm yield were included, then the water would be double counted since the water available to the reservoir is based on the diversions from the river.

  Reservoir water is withdrawn from the Colorado River adjacent to the site. Pumping from the river is intermittent, and this diversion normally occurs during periods of high river flow. The reservoir design incorporates storage to account for periods during which river water is unavailable for the reservoir in order to support operation through a repeat of the drought of record.

3.2.1.1.2.3 Run-of-River Water

Historically, the State of Texas has granted many of the run-of-river rights through an adjudication process that considered historical uses. As a result, some run-of-river rights may have been granted for more water than is available in a river during drought conditions. The use of water during drought conditions is controlled by the priority system, with the oldest water rights having first call on whatever water is in the river. The TCEQ Colorado River Basin WAM was developed to simulate the amount of water available in the Colorado River under the basin water management scenarios. Major factors used to calculate available water include:

- Senior downstream water rights are assumed to be fully utilized
- Stored waters are released to the river based on the drought conditions
- Inflows to the Highland Lakes are passed through the lakes to the extent that the water is needed to satisfy senior water rights downstream.

The results of this analysis for major run-of-river rights holders are presented in *Table 3.3*. The water availability presented in the table for most of the major run-of-river rights is based on the amount of run-of-river water that would be available during the driest year of the DOR (1952 in the Region K Cutoff Model). The water availability for the City of Austin and STP Nuclear Operating Company water rights is based on the average annual water availability during the entire DOR period. This average availability was used since the City of Austin has contracted with LCRA to supply stored water to firm up its water rights during drought conditions. The STP Nuclear Operating Company has also contracted for backup from LCRA, in addition to having a reservoir that allows for potential storage of water over the DOR period instead of having to use all of the water that is received in a particular year.

*Table 3.3* below shows the water availability during the DOR for the major run-of-river rights. The Region K Cutoff Model was used to determine the values in the table. The following describes the methods used to determine the values in *Table 3.3*.

*Irrigators*
The Garwood, Lakeside (#1 & 2), Gulf Coast, and Pierce Ranch operations each have several water supplies, both run-of-river and supplemental interruptible supplies from the Highland Lakes. The run-of-river rights are listed in *Table 3.3*. The run-of-river water rights were summed for each irrigation operation to determine which year in the model had the minimum total diversion. The water right amounts for that year are listed in the table.

*City of Austin*
The City of Austin has four municipal water rights shown in the table. These are 61405471005SMRR, 61405471005SBU, 61405471005LMRR, and 61405489003M. Because these water rights are backed up by LCRA each year, an average during the DOR was used.

The City of Austin has steam-electric water rights as shown in the table. These are 61405471001P, 61405471002P, and 61405489003P (61405489003PBU). The water availability for these rights was determined by using the minimum amount of water available in any year during the DOR.

**Table 3.3 Major Run-of-the-River Rights in the Colorado Basin (ac-ft/yr)**

| Water Right ID Number | Water Rights Holder | Maximum Permitted Diversion | Priority Date | Region K Cutoff Model | |
|---|---|---|---|---|---|
| | | | | 2010 | 2060 |
| 61405434201RR | LCRA - Garwood | 133,000 | Nov 1, 1900 | 130,141 | 130,141 |
| 61405434201BU | | | Nov 1, 1987 | 0 | 0 |
| 61405475001LRRS | LCRA - Lakeside #1 | 52,500 | Jan 4, 1901 | 10,405 | 10,405 |
| 61405475001LRRL | | | Jun 29, 1913 | 1,573 | 1,573 |
| 61405475001LRRR | | | Mar 8, 1938 | 0 | 0 |
| 61405475001LSBU | | | Nov 1, 1987 | 0 | 0 |
| 61405475001LRRJ | | 78,750 | Nov 1, 1987 | 553 | 520 |
| 61405475001LJBU | | | Nov 1, 1987 | 0 | 0 |
| 61405476003RRS | LCRA - Gulf Coast | 228,570 | Dec 1, 1900 | 14,476 | 14,476 |
| 61405476003RRL | | | Jun 29, 1913 | 28,987 | 28,909 |
| 61405476003RRR | | | Mar 8, 1938 | 0 | 0 |
| 61405476003SBU | | | Nov 1, 1987 | 0 | 0 |
| 61405476003RRJ | | 33,930 | Nov 1, 1987 | 1,365 | 155 |
| 61405476003JBU | | | Nov 1, 1987 | 0 | 0 |
| 61405477001RR | LCRA - Pierce Ranch | 55,000 | Sep 1, 1907 | 12,468 | 12,525 |
| 61405477001RRL | | | Jun 29, 1913 | 1,648 | 1,648 |
| 61405477001RRR | | | Mar 8, 1938 | 0 | 0 |
| 61405477001BU | | | Nov 1, 1987 | 0 | 0 |
| 61405475001WRR | LCRA - Lakeside #2 | 55,000 | Sep 2, 1907 | 8,791 | 8,791 |
| 61405475001WRRL | | | Jun 29, 1913 | 1,648 | 1,648 |
| 61405475001RRRR | | | Mar 8, 1938 | 0 | 0 |
| 61405475001WBU | | | Nov 1, 1987 | 0 | 0 |
| 61405471005SMRR | City of Austin - (mun.) [1] | 250,000 | Jun 30, 1913 | 148,431 | 143,846 |
| 61405471005SBU | City of Austin - (mun.) [1] | | Jun 30, 1913 | 49,845 | 48,034 |
| 61405471005LMRR | City of Austin - (mun.) [1] | 21,403 | Jun 27, 1914 | 9,949 | 8,413 |
| 61405471001P | City of Austin - (stm.) | 24,000 | Jun 27, 1914 | 6,171 | 6,171 |
| 61405471002P | City of Austin - (stm.) | | Jun 27, 1914 | 1,267 | 1,267 |
| 61405489003M | City of Austin - (mun.) [1] | 20,300 | Aug 20, 1945 | 4,365 | 4,173 |
| 61405489003P | City of Austin - (stm.) | 16,156 | Aug 20, 1945 | 0 | 0 |
| 61405489003PBU | City of Austin - (stm.) | | Aug 20, 1945 | 982 | 982 |
| 61405437001RIV | STPNOC and LCRA [1, 2] | 102,000 | Jun 10, 1974 | 51,857 | 46,072 |
| 61405434102 | City of Corpus Christi [3] | 35,000 | Nov 2, 1900 | 22,884 | 22,884 |
| **Totals** | | **1,105,609** | | **507,806** | **492,634** |

Notes:

Colorado WAM provided by TCEQ, August 2007, Run 3. WRAP program by Dr. Ralph Wurbs, Texas A&M University, January 2009

Drought-of-Record (DOR) is May 1945 to April 1957 (12 years) for 2010; May 1947 to April 1957 (10 years) for all other decades

[1] These values were averaged over the DOR

[2] Annual results vary from 0 ac-ft/yr to 102,000 ac-ft/yr during the DOR

[3] The water availability for this run-of-river water right was determined by using the minimum amount of water available in any year during the DOR. After discussions with Region N, the water availability entered into the TWDB database was not the one determined using the Region K Cutoff Model. Region N has a local multi-basin system model with different drought-of-record periods. By working as a system, the sources can be optimized to provide a minimum amount of water each year. Therefore, using the minimum annual amount as the availability for each source in their system may not be accurate. The availability entered into the TWDB database was the full authorized diversion of 35,000 ac-ft/yr.

*STP Nuclear Operating Company*

The run-of-river water right, 61405437001RIV, jointly owned by STPNOC and LCRA, was determined by taking the average over the DOR period. This was done because there is a contract for backup from LCRA, and there is a reservoir that allows for storage of water over the DOR period, rather than having to use the entire amount of water received in a particular year. One of the STPNOC diversion points is within the tidal reaches of the Gulf of Mexico. Required diversions at low flow rates during the DOR period will have a negative effect on the water quality diverted at this point.

*Corpus Christi*

The water availability for this run-of-river water right was determined by using the minimum amount of water available in any year during the DOR. After discussions with Region N, the water availability entered into the TWDB database was not the one determined using the Region K Cutoff Model. Region N has a local multi-basin system model with different drought-of-record periods. By working as a system, the sources can be optimized to provide a minimum amount of water each year. Therefore, using the minimum annual amount as the availability for each source in their system may not be accurate. The availability entered into the TWDB database was the full authorized diversion of 35,000 ac-ft/yr.

3.2.1.1.2.4 Local Surface Water Sources

The final category of available surface water is local supply sources. This category includes small diversions from the river or tributaries to the river, as well as stock ponds that have captured diffuse surface water located on individual's property. Information concerning these sources is limited. As a result, the information available from the TWDB developed during the first planning cycle was used as an initial estimate of the water availability. However, in several instances the availability numbers were increased to match the projected demands with the assumption that the supply and demand for local water will be self-limiting. The results of this process are presented in *Table 3.4* and are organized by county. These numbers were developed for the 2001 Region K Plan and since better information has not become available they have remained unchanged.

**Table 3.4 Other Surface Water Sources in the Colorado Basin (ac-ft/yr)**

| Local Supply Source Name | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Livestock - basinwide | 6,262 | 6,262 | 6,262 | 6,262 | 6,262 | 6,262 |
| Other - basinwide | 19,282 | 20,890 | 22,717 | 24,883 | 27,470 | 27,470 |
| Irrig. - Bastrop Co. | 786 | 786 | 786 | 786 | 786 | 786 |
| Irrig. - Blanco Co. | 67 | 67 | 67 | 67 | 67 | 67 |
| Irrig. - Burnet Co. | 276 | 276 | 276 | 276 | 276 | 276 |
| Irrig. - Colorado Co. | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Irrig. - Fayette Co. | 534 | 534 | 534 | 534 | 534 | 534 |
| Irrig. - Gillespie Co. | 880 | 880 | 880 | 880 | 880 | 880 |
| Irrig. - Hays Co. | 41 | 41 | 41 | 41 | 41 | 41 |
| Irrig. - Llano Co. | 440 | 440 | 440 | 440 | 440 | 440 |
| Irrig. - Matagorda Co. | 900 | 900 | 900 | 900 | 900 | 900 |
| Irrig. - Mills Co. | 2,378 | 2,378 | 2,378 | 2,378 | 2,378 | 2,378 |
| Irrig. - San Saba Co. | 8,800 | 8,800 | 8,800 | 8,800 | 8,800 | 8,800 |
| Irrig. - Travis Co. | 880 | 880 | 880 | 880 | 880 | 880 |
| Irrig. - Wharton Co. | 7,650 | 7,650 | 7,650 | 7,650 | 7,650 | 7,650 |
| **Totals** | **52,176** | **53,784** | **55,611** | **57,777** | **60,364** | **60,364** |

Note: All of the sources listed in the table above are Local Supply Sources, which were determined in the 2001 Plan.

It was assumed that the 2060 supplies were equal to the 2050 supplies due to the lack of better information or tools to determine availability in 2060.

### *3.2.1.2 Brazos River Basin*

A portion of the LCRWPA is located within the Brazos River Basin. This area is limited to portions of Bastrop, Burnet, Fayette, Mills, Travis, and Williamson Counties. The portion of Williamson County in Region K is completely contained within the City of Austin service area. The remainder of Williamson County is located in Region G.

Surface water sources for these areas are limited to local sources. There are no major reservoirs within the LCRWPA portion of the Brazos River Basin. *Table 3.5* contains a summary of the surface water available to the LCRWPA from the Brazos River Basin.

**Table 3.5 Surface Water Sources in the Brazos River Basin (ac-ft/yr)**

| Source Name | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Livestock - basinwide | 566 | 566 | 566 | 566 | 566 | 566 |
| **Totals** | **566** | **566** | **566** | **566** | **566** | **566** |

Note: All of the sources listed in the table above are Local Supply Sources, which were determined in the 2001 Plan.

It was assumed that the 2060 supplies were equal to the 2050 supplies due to the lack of better information or tools to determine availability in 2060.

### *3.2.1.3 Brazos-Colorado Coastal Basin*

A portion of the LCRWPA is located within the Brazos-Colorado Coastal Basin. This area is limited to portions of Colorado, Matagorda, and Wharton Counties. Surface water sources for these areas are limited to local sources and a run-of-river water right from the San Bernard River. There are no major reservoirs within the LCRWPA portion of the Brazos-Colorado Coastal Basin. *Table 3.6* contains a summary of the surface water available to the LCRWPA from the Brazos-Colorado Coastal Basin.

**Table 3.6 Surface Water Sources in the Brazos-Colorado Coastal Basin (ac-ft/yr)**

| Source Name | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| San Bernard ROR | 665 | 597 | 597 | 597 | 597 | 597 |
| Livestock - basinwide | 394 | 394 | 394 | 394 | 394 | 394 |
| Other - basinwide | 1,696 | 1,746 | 1,793 | 1,844 | 1,900 | 1,900 |
| Irrig. - Matagorda Co. | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| Irrig. - Wharton Co. | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| **Totals** | **8,755** | **8,737** | **8,784** | **8,835** | **8,891** | **8,891** |

Note: All of the sources listed in the table above except for the San Bernard ROR are Local Supply Sources, which were determined in the 2001 Plan.

It was assumed that the 2060 local supplies were equal to the 2050 local supplies due to the lack of better information or tools to determine availability in 2060.

### *3.2.1.4 Colorado-Lavaca Coastal Basin*

A portion of the LCRWPA is located within the Colorado-Lavaca Coastal Basin. This area is limited to portions of Matagorda and Wharton Counties. Surface water sources for these areas are limited to local sources. There are no major reservoirs within the LCRWPA portion of the Colorado-Lavaca Coastal Basin, and there are no WUGs with rights to water from reservoirs in the Colorado-Lavaca Coastal Basin. Return flows originating in the Colorado Basin from agriculture are sent to the Colorado-Lavaca Coastal Basin for use, but since the Region K Cutoff Model assumes full utilization of water rights and no return unless explicitly stated in the water right, these return flows were not taken into consideration for the Region K water availability analysis. *Table 3.7* contains a summary of the surface water available to the LCRWPA from the Colorado-Lavaca Coastal Basin.

**Table 3.7 Surface Water Sources in the Colorado-Lavaca Coastal Basin (ac-ft/yr)**

| Source Name | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Livestock - basinwide | 289 | 289 | 289 | 289 | 289 | 289 |
| Irrig. - Matagorda Co. | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| **Totals** | **4,289** | **4,289** | **4,289** | **4,289** | **4,289** | **4,289** |

Note: All of the sources listed in the table above are Local Supply Sources, which were determined in the 2001 Plan.

It was assumed that the 2060 supplies were equal to the 2050 supplies due to the lack of better information or tools to determine availability in 2060.

### *3.2.1.5 Lavaca River Basin*

A portion of the LCRWPA is located within the Lavaca River Basin. This area is limited to portions of Colorado and Fayette Counties. Surface water sources for these areas are limited to local sources. There are no major reservoirs within the LCRWPA portion of the Lavaca River Basin, and there are no WUGs with rights to water from reservoirs in the Lavaca River Basin. *Table 3.8* contains a summary of the surface water available to the LCRWPA from the Lavaca River Basin.

**Table 3.8 Surface Water Sources in the Lavaca River Basin (ac-ft/yr)**

| Source Name | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Livestock - basinwide | 649 | 649 | 649 | 649 | 649 | 649 |
| Irrig. - Colorado Co. | 4,002 | 4,002 | 4,002 | 4,002 | 4,002 | 4,002 |
| Irrig. - Fayette Co. | 20 | 20 | 20 | 20 | 20 | 20 |
| **Totals** | **4,671** | **4,671** | **4,671** | **4,671** | **4,671** | **4,671** |

Note: All of the sources listed in the table above are Local Supply Sources, which were determined in the 2001 Plan.

It was assumed that the 2060 supplies were equal to the 2050 supplies due to the lack of better information or tools to determine availability in 2060.

### *3.2.1.6 Guadalupe River Basin*

A portion of the LCRWPA is located within the Guadalupe River Basin. This area is limited to portions of Bastrop, Blanco, Fayette, Hays, and Travis Counties. Most of the surface water sources for these areas are limited to local sources. There are no major reservoirs within the LCRWPA portion of the Guadalupe River Basin. However, the City of Blanco owns and operates two, small, on-channel reservoirs on the Blanco River. The two reservoirs have a combined storage capacity of 168 ac-ft.

Anecdotal information provided by the City of Blanco indicates that the Blanco River has ceased flowing in the past, most notably during the summer of 1996. Information provided by the City of Blanco indicates that flow in the Blanco River ceased for a three-month period during that summer. The relatively small storage capacity of the two reservoirs will not sustain the projected demands from the City of Blanco for more than a four-month period when the river has ceased flowing.

Based on the Guadalupe River Basin WAM from TCEQ, dated February 2005, Run 3, the firm yield of the reservoir system is 596 ac-ft (water right C3877_1).

*Table 3.9* contains a summary of the surface water available to the LCRWPA from the Guadalupe River Basin.

**Table 3.9 Surface Water Sources in the Guadalupe River Basin (ac-ft/yr)**

| Source Name | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 | Data Source |
|---|---|---|---|---|---|---|---|
| Livestock - basinwide [1] | 298 | 298 | 298 | 298 | 298 | 298 | 2001 Plan |
| Irrig. - Blanco Co. [1] | 9 | 9 | 9 | 9 | 9 | 9 | 2001 Plan |
| Blanco Reservoirs [2] | 596 | 596 | 596 | 596 | 596 | 596 | TCEQ WAM |
| **Totals** | **903** | **903** | **903** | **903** | **903** | **903** | |

[1] Local Supply Sources determined in the 2001 Plan
[2] Firm Yield Data Source: Guadalupe River Basin WAM provided by TCEQ, February 2005, Run 3. WRAP modeling program provided by Dr. Ralph Wurbs, Texas A&M University, July 2004 version.

It was assumed that the 2060 local supplies were equal to the 2050 local supplies due to the lack of better information or tools to determine availability in 2060.

### 3.2.2 Groundwater Availability

Available groundwater is the volume of groundwater that can be withdrawn from an individual aquifer in accordance with the principle by which the aquifer is being managed or an assumed management approach. That managing principle, typically stated as a sustainability goal, can be stated in various ways, and the mechanism through which availabilities are being stated throughout Texas is evolving.

Before the advent of Groundwater Management Areas (GMAs)(HB 1763, 79th Legislature), an aquifer, or portion of an aquifer, may or may not have had a governmental entity managing the way that aquifer was being managed. If an aquifer, or portion of an aquifer, was managed, it was by a Groundwater Conservation District whose jurisdiction can coincide with the boundary or boundaries of one or more counties or an aquifer. Most aquifers span multiple counties, and in that case the entire aquifer can be managed by one or more GCDs, with some portions not managed at all. There are also several Priority Groundwater Management Areas (PGMA) around the State, with portions of the Hill Country PGMA located within Region K. PGMAs are areas where critical groundwater problems exist. Region K has a GCD in every county located within the PGMA with the exception of Travis County. The Hill Country UWCD in Gillespie County was created prior to the designation of the PGMA. The Blanco-Pedernales GCD was created after the PGMA designation, as was the Hays-Trinity GCD. These GCDs give notice to the area residents that the declaration of the PGMA means that their water availability and quality will be at risk within the next 50 years. The Hays County Development Regulations have specific requirements listed for subdivisions served by individual water wells producing local groundwater within the PGMA. These requirements can be found in *Chapter 715, Sub-Chapter 3, Section 3.06* of the Hays County Development Regulations. GMAs are a different concept in that every county in the State is in one or more of sixteen GMAs, for the most part the major aquifers are not split across multiple GMAs, and the goal is to manage entire aquifer systems across political subdivisions in a consistent way. GCDs and GMAs are discussed in Chapter 1 of this plan and on the TWDB website at http://www.twdb.state.tx.us/GwRD/pages/gwrdindex.html.

The GMA program is still in its formative stages: most of the GMAs in the LCRWPA have not adopted their Desired Future Condition (DFC) for their aquifers and the TWDB has not yet established the Managed Available Groundwater (MAG) values for such aquifers. The GCDs within the PGMA have the same responsibility to adopt their DFC and establish a MAG for the aquifers in their district. The result is that some aquifers in some counties have MAGs, some have availabilities established by a GCD, and the rest have the availability established in the 2006 LCRWP. The sources of groundwater availability data in this plan, in descending order of priority, are:

1. Managed Available Groundwater (MAG) values established by TWDB;
2. Preferred availability reported to the LCRWPA by a Groundwater Conservation District (GCD). Even where a GCD has a TWDB certified management plan, they may have been in the process of establishing a new availability, and were given the opportunity to have that availability included in this plan;
3. GCD availabilities adopted in a groundwater management plan, and;
4. In absence of any of the above, the availabilities established in the 2006 LCRWP.

The groundwater resources located in the region have been traditionally divided into those aquifers that yield large quantities of water over a relatively large area (major aquifers) and those aquifers yielding smaller quantities of water over smaller areas (minor aquifers). In the LCRWPA there are five major aquifers and six minor aquifers that provide usable groundwater supplies. The following discussion of the groundwater resources of the LCRWPA is divided into these two categories.

### *3.2.2.1 Major Aquifers*

The major aquifers in the LCRWPA are the Edwards-Trinity (Plateau), Trinity Group, Edwards, Carrizo-Wilcox, and the Gulf Coast. These five aquifers provide a significant component of the water supply used within the LCRWPA beyond that provided by the Colorado River.

Most of the cities in the planning region draw their water supply from one of the five major aquifers. Due to the differences in each aquifer and the amount of information available for each aquifer, different approaches were applied to determine the water available from each aquifer (where a GAM is not available or no GCD exists). The technical approach applied to a specific aquifer is described in the section pertaining to each of the aquifers below.

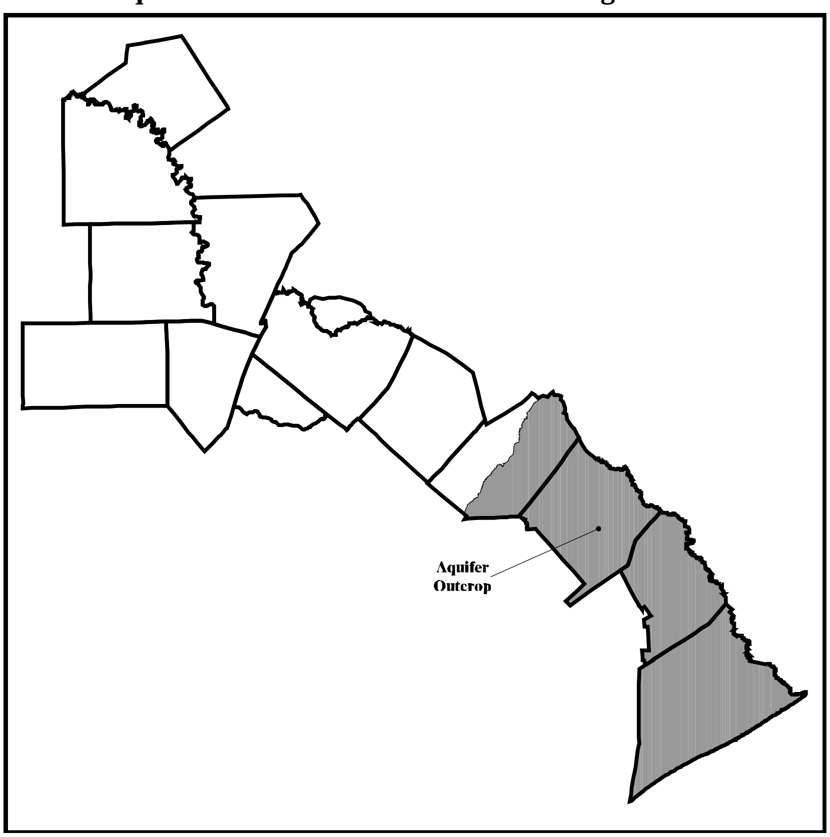
3.2.2.1.1 Gulf Coast Aquifer

*Location and Use*

The Gulf Coast aquifer forms an irregularly shaped belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties and extends from the Rio Grande northeastward to the Louisiana-Texas border.

Groundwater use from the Gulf Coast aquifer within the LCRWPA occurs in Colorado, Fayette, Matagorda, and Wharton Counties. TWDB records indicate that total groundwater pumpage from the Gulf Coast aquifer in these counties was 195,761 ac-ft for the year 2000. Municipal uses accounted for 10 percent of the total, manufacturing accounted for 1 percent, power plants accounted for 1 percent, mining accounted for 1 percent, irrigation accounted for 86 percent, and livestock accounted for 1 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.2*.

**Figure 3.2: Gulf Coast Aquifer Within the Lower Colorado Regional Water Planning Area**



*Hydrogeology*

The Gulf Coast aquifer consists of complex interbedded clays, silts, sands, and gravels, which are hydrologically connected to form a large, leaky artesian aquifer system. The system has four major subdivisions in the LCRWPA. The Jasper aquifer is the lowermost or most landward component of the aquifer system. The Jasper aquifer is composed of the Oakville Sand and may also include upper portions of the Catahoula Sandstone. The Burkeville confining layer separates the top of the Jasper aquifer from the bottom of the Evangeline aquifer. The Evangeline aquifer is composed of the Fleming and Goliad Sands. The Chicot aquifer, or upper component of the Gulf Coast aquifer system, consists of the Lissie, Willis, and Beaumont Formations; and overlying alluvial deposits. Maximum total sand thickness ranges from about 700 feet in the south to 1,300 feet in the northern extent.

*Water Quality*

Water quality is generally good in the shallower portion of the aquifer. Groundwater containing less than 500 mg/l dissolved solids is usually encountered to a maximum depth of 3,200 feet in the aquifer from the San Antonio River Basin northeastward to Louisiana.

*Recent Planning Efforts*

Since the adoption of the 2006 Plan, there have been several studies and planning efforts that have been evaluated by the LCRWPG to determine if there is a basis for modifying the groundwater availability numbers for the Gulf Coast Aquifer within the LCRWPA.

- Completion of the Central Gulf Coast Aquifer Groundwater Availability Model (GAM) by the TWDB;
- A legislative mandate for GCDs to submit Desired Future Conditions (DFCs) by September 1, 2010, allowing TWDB to supply GMAs with Managed Available Groundwater (MAG) numbers;
- The LCRA-SAWS Water Project (LSWP) groundwater study is ongoing.

The Central Gulf Coast Aquifer GAM was not available in time to be used in the 2006 Plan, but was available for use in this Plan. Additionally, since the 2006 Plan was prepared, the State legislature established a requirement that the GCDs, through their respective GMAs, "shall consider groundwater availability models and other data or information for the management area and shall establish desired future conditions (DFCs) for the relevant aquifers within the management area." The initial deadline for DFC submittal is September 1, 2010. Colorado, Fayette, Matagorda, and Wharton counties are represented by single-county GCDs and are part of GMA 15. GMA 15 is in the process of developing their DFCs.

LCRA and SAWS are in the sixth year of a study period to determine if a joint project is feasible. One component of the study period plan is the use of groundwater from the Gulf Coast aquifer to supplement agricultural water needs during periods when surface water supplies are not sufficient to meet such needs.

The LCRWPG Scoping committee felt that the GMA 15 DFC development and the LSWP groundwater study might be completed in time for this information to be incorporated into this Plan as revised Gulf Coast Aquifer availabilities. The LCRWPG evaluated the status of GMA 15, LSWP, and any management plan updates by the four GCDs as part of the development of this Plan, and found the following (as of July 2009):

- GMA 15 has not submitted their DFC statements to TWDB. GMA 15 is evaluating aquifer conditions using the TWDB Central Gulf Coast Aquifer GAM.
- GMA 15 has indicated that, at this stage, their preferred level of aquifer use is very close to the 2006 Plan availabilities for the Gulf Coast Aquifer.
- A Lower Colorado River Groundwater Availability Model (GAM) was completed, however, the LSWP groundwater studies are ongoing.
- GMA 15 will continue to use the TWDB Central Gulf Coast Aquifer GAM for its DFC evaluation.
- Both Coastal Bend GCD and Coastal Plains GCD have management plan updates due to TWDB by September 2009. Neither District is planning to change their availability numbers.
- Fayette County GCD was comfortable with the Gulf Coast Aquifer availability in the 2006 Plan.
- The Colorado County GCD has a deadline of November 2010 to submit their first management plan. The GCD was contacted by the LCRWPG to discuss their existing Gulf Coast Aquifer availability and whether they had any desire to change it. The GCD indicated that the availability in the 2006 Plan closely matched their preferred level of pumpage that was being modeled in GMA 15, and that they were comfortable with the existing number.

The information collected above indicates that there is no basis to change the Gulf Coast Aquifer availability numbers in this Plan. It was the LCRWPG's recommendation that the availability numbers that come out of the GMA 15 process in 2010 be considered for incorporation into the 2016 Plan.

*Availability*

The availability values for the Gulf Coast aquifer in Fayette, Matagorda and Wharton Counties were taken from the groundwater management plans adopted by the Fayette County Groundwater Conservation District, Coastal Plains Groundwater Conservation District (Matagorda County), and Coastal Bend Groundwater Conservation District (Wharton County). Each of these groundwater management plans have been approved by TWDB. The Colorado County GCD was created since the 2006 Plan was adopted and has a deadline of November 2010 to submit a groundwater management plan. The groundwater availability values adopted for the Gulf Coast aquifer in Colorado County in the 2001 and 2006 Plans remain unchanged.

During planning cycle one, the LCRWPG established a policy for determining the availability of groundwater within the LCRWPA. The policy was that the long-term depletion of groundwater within the region is not consistent with the LCRWPG's sustainability goals. The groundwater availability from the Gulf Coast aquifer was based on an estimate of maximum usage in the year 2050 by WUGs that were currently using the aquifer as a source plus the average water use for future conjunctive water use at the Lakeside, Gulf Coast, and Pierce Ranch Irrigation Operations.

Based on the GCDs and the 2001 Plan criteria, the water availability for the Gulf Coast aquifer was defined as presented in *Table 3.10.*

**Table 3.10 Water Availability in the Gulf Coast Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Colorado | Brazos-Colorado | 11,506 | 11,506 | 11,506 | 11,506 | 11,506 | 11,506 |
| Colorado | Colorado | 17,436 | 17,436 | 17,436 | 17,436 | 17,436 | 17,436 |
| Colorado | Lavaca | 18,915 | 18,915 | 18,915 | 18,915 | 18,915 | 18,915 |
| | ***County Total*** | ***47,857*** | ***47,857*** | ***47,857*** | ***47,857*** | ***47,857*** | ***47,857*** |
| Fayette | Brazos | 65 | 65 | 65 | 65 | 65 | 65 |
| Fayette | Colorado | 3,300 | 3,300 | 3,300 | 3,300 | 3,300 | 3,300 |
| Fayette | Guadalupe | 144 | 144 | 144 | 144 | 144 | 144 |
| Fayette | Lavaca | 5,188 | 5,188 | 5,188 | 5,188 | 5,188 | 5,188 |
| | ***County Total*** | ***8,697*** | ***8,697*** | ***8,697*** | ***8,697*** | ***8,697*** | ***8,697*** |
| Matagorda | Brazos-Colorado | 22,423 | 22,423 | 22,423 | 22,423 | 22,423 | 22,423 |
| Matagorda | Colorado | 3,218 | 3,218 | 3,218 | 3,218 | 3,218 | 3,218 |
| Matagorda | Colorado-Lavaca | 23,580 | 23,580 | 23,580 | 23,580 | 23,580 | 23,580 |
| | ***County Total*** | ***49,221*** | ***49,221*** | ***49,221*** | ***49,221*** | ***49,221*** | ***49,221*** |
| Wharton | Brazos-Colorado | 42,295 | 42,295 | 42,295 | 42,295 | 42,295 | 42,295 |
| Wharton | Colorado | 41,812 | 41,812 | 41,812 | 41,812 | 41,812 | 41,812 |
| Wharton | Colorado-Lavaca | 8,543 | 8,543 | 8,543 | 8,543 | 8,543 | 8,543 |
| | ***County Total*** | ***92,650*** | ***92,650*** | ***92,650*** | ***92,650*** | ***92,650*** | ***92,650*** |
| **Region K** | **Region Total** | **198,425** | **198,425** | **198,425** | **198,425** | **198,425** | **198,425** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.1.1 *Availability*.

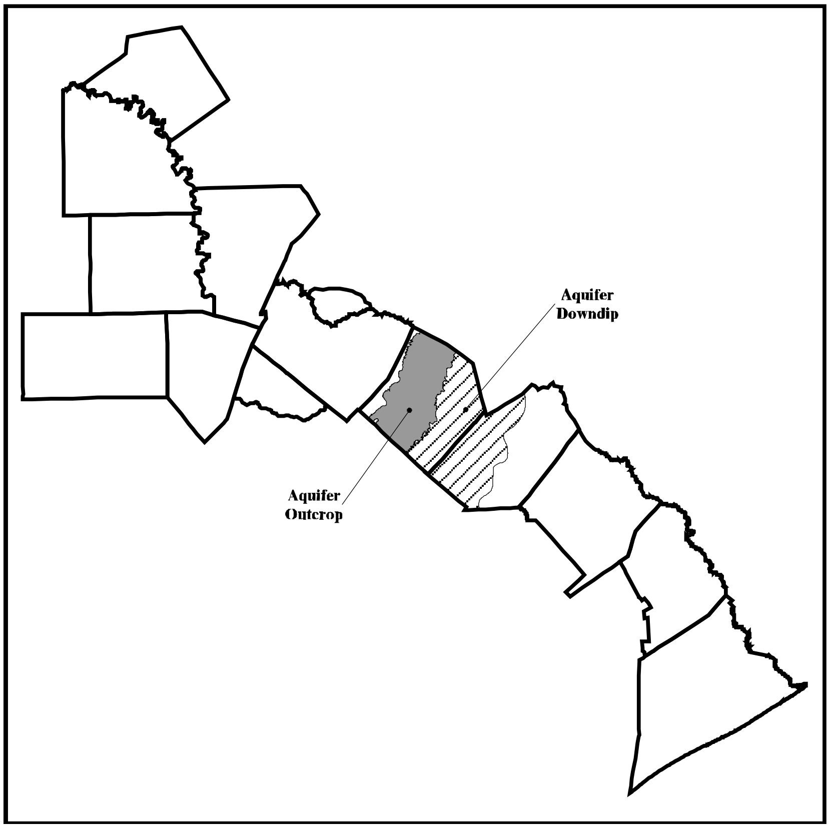
3.2.2.1.2 Carrizo-Wilcox Aquifer

*Location and Use*

The Wilcox Group and the overlying Carrizo Formation of the Claiborne Group form a hydrologically connected system known as the Carrizo-Wilcox aquifer. This aquifer extends from the Rio Grande in South Texas northeastward into Arkansas and Louisiana, providing water to all or parts of 60 counties in Texas. The Carrizo Sand and Wilcox Group occur at the surface along an outcrop band that parallels the Gulf Coast and dip beneath the land surface toward the coast except in the East Texas structural basin adjacent to the Sabine Uplift where the formations form a trough.

Use of water from the Carrizo-Wilcox aquifer in the LCRWPA occurs in Bastrop County and a portion of Fayette County. TWDB records indicate that the total groundwater pumpage from the Carrizo-Wilcox in the study area for 2000 was 10,533 ac-ft. Municipal uses accounted for 87 percent of the total, manufacturing uses accounted for 0.4 percent, mining accounted for 0.2 percent, irrigation accounted for 9 percent, and livestock accounted for 4 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.3*.

**Figure 3.3: Carrizo-Wilcox Aquifer Within the Colorado Regional Water Planning Area**




*Hydrogeology*

The Carrizo-Wilcox aquifer is predominantly composed of sand, locally interbedded with gravel, silt, clay, and lignite deposited during the Tertiary Period. North of the Colorado River, the Wilcox Group is generally divided into three distinct subdivisions. From the oldest and deepest to youngest these are the Hooper, Simsboro, and Calvert Bluff Formations. Of the three, the Simsboro Formation typically contains the most massive and coarsest sands and produces the largest quantities of water. South of the Colorado River, the Simsboro is absent as a distinct unit. The Wilcox portion of the aquifer varies significantly in thickness in the downdip artesian portion from 400 feet in portions of Fayette County (south of the Colorado River) to as much as 1,600 feet in Bastrop County. The Carrizo portion of the aquifer also varies in thickness in the downdip artesian portion from 200 feet to 400 feet across the LCRWPA.

*Water Quality*

Water from the Carrizo-Wilcox is fresh to slightly saline with quality problems limited to localized areas. In the outcrop the water is hard yet usually low in dissolved solids. Downdip, the water is softer, has a higher temperature, and contains increasing amounts of dissolved solids down-gradient. Hydrogen sulfide and methane may occur locally.

*Availability*

As previously discussed, the LCRWPG has established the sustainable use of groundwater resources as a policy for the region. The availability of the Carrizo-Wilcox aquifer in Bastrop County is taken from the Lost Pines Groundwater Conservation District Groundwater Management Plan. The availability in Fayette County is taken from the Fayette County Groundwater Conservation District Groundwater Management Plan. The available water, by river basin was established by proportioning the total availability value based on the area located in each river basin in a county using GIS. The availability estimates are presented in *Table 3.11*.

**Table 3.11 Water Availability in the Carrizo-Wilcox Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | Brazos | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 |
| Bastrop | Colorado | 24,916 | 24,916 | 24,916 | 24,916 | 24,916 | 24,916 |
| Bastrop | Guadalupe | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 |
| | ***County Total*** | ***28,000*** | ***28,000*** | ***28,000*** | ***28,000*** | ***28,000*** | ***28,000*** |
| Fayette | Colorado | 290 | 290 | 290 | 290 | 290 | 290 |
| Fayette | Guadalupe | 66 | 66 | 66 | 66 | 66 | 66 |
| Fayette | Lavaca | 44 | 44 | 44 | 44 | 44 | 44 |
| | ***County Total*** | ***400*** | ***400*** | ***400*** | ***400*** | ***400*** | ***400*** |
| **Region K** | **Region Total** | **28,400** | **28,400** | **28,400** | **28,400** | **28,400** | **28,400** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.1.2 *Availability*.

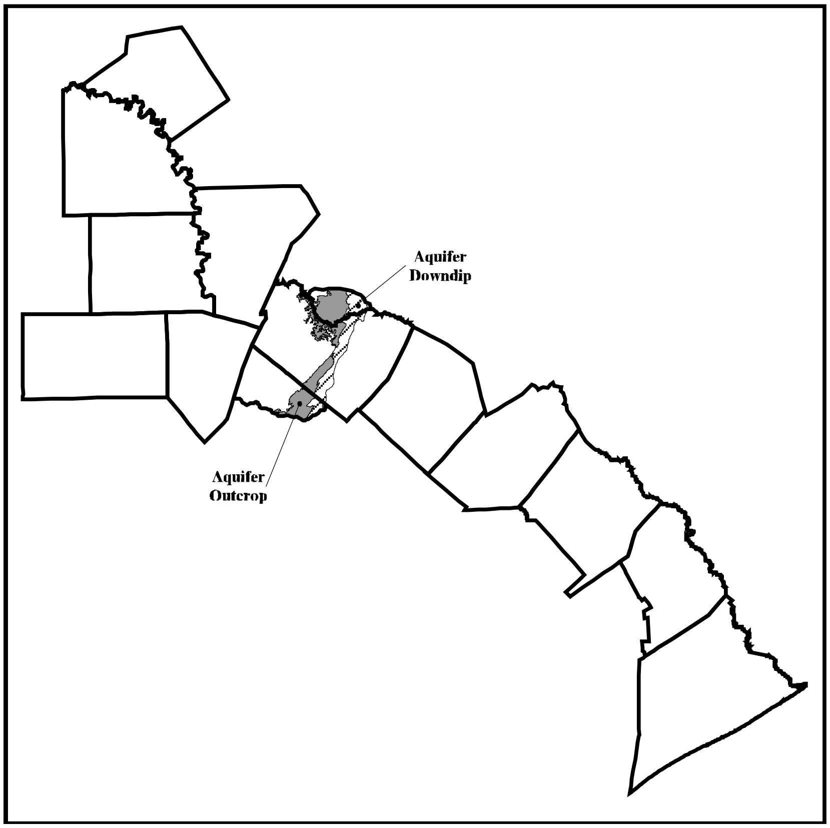
3.2.2.1.3 Edwards Aquifer (Balcones Fault Zone)

*Location and Use*

The Edwards aquifer (Balcones Fault Zone, or BFZ) covers approximately 4,350 square miles in parts of 11 counties. It forms a narrow belt extending along the base of the Balcones Escarpment from Kinney County through the San Antonio area northeastward to the Leon River in Bell County. A groundwater divide near Kyle in Hays County hydrologically separates the aquifer into the San Antonio and Barton Springs segments. The Colorado River divides the Barton Springs and Northern segments which are also considered hydrologically separate. The name Edwards aquifer (BFZ) distinguishes this aquifer from the Edwards-Trinity (Plateau) and Edwards-Trinity (High Plains) aquifers.

Groundwater use from the Edwards aquifer (BFZ) within the LCRWPA occurs in Hays, Travis, and Williamson Counties. TWDB records indicate that the total groundwater pumpage from the Edwards aquifer (BFZ) in these counties for 2000 was 32,464 ac-ft. Municipal uses accounted for 90 percent of the total, manufacturing accounted for 4 percent, mining accounted for 5 percent, and livestock accounted for 0.4 percent. Large springs feed several recreational areas and serve as habitat to several endangered species of plants and animals. Major river systems derive a significant amount of baseflow from Edwards aquifer (BFZ) spring flows that are utilized outside the Edwards region mainly for industrial and agricultural needs. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.4*.

**Figure 3.4: Edwards Aquifer (BFZ) Within the Lower Colorado Regional Water Planning Area**




*Hydrogeology*

The Edwards aquifer (BFZ) is composed of limestone and dolomite deposited during the Cretaceous Period. The aquifer exists under water-table conditions in the outcrop and under artesian conditions where it dips into the subsurface and is confined below the overlying Del Rio Clay. The Edwards aquifer (BFZ) consists of the Georgetown Limestone and formations of the Edwards Group within the LCRWPA. Across the Edwards aquifer (BFZ) region, the aquifer thickness ranges from 200 to 600 feet.

Aquifer recharge occurs by the percolation of water on the aquifer outcrop (recharge zone). The recharge may occur by several methods: surface water percolating from streams and rivers draining the Edwards Plateau and which cross the outcrop; the percolation of rainfall runoff in ephemeral streams crossing the outcrop; and by direct infiltration of precipitation on the outcrop. This recharge reaches the aquifer through solution cavities, fracture crevices, faults, and sinkholes in the recharge zone. Unknown amounts of groundwater may enter the aquifer as lateral underflow from the Glen Rose Formation. Water in the aquifer generally moves from the recharge zone down-gradient and laterally toward natural discharge points such as Comal, San Marcos, Barton, and Salado springs.

A hydrologic divide occurs in the aquifer near Kyle in Hays County that separates the San Antonio segment of the aquifer from the Barton Springs and Northern segments of the aquifer. The Barton Springs segment is hydrologically bounded to the north by the Colorado River. The northern segment of the aquifer includes the area north of the Colorado River to Bell County. The area included in the

LCRWPA is the area north of the Kyle groundwater divide and includes a portion of the Northern segment.

Groundwater moving through the aquifer system has dissolved large amounts of rock to create highly permeable zones in certain aquifer subdivisions and solution channels. Highly fractured areas near faults may be preferentially enhanced by solutioning to form conduits capable of transmitting large amounts of water. The solution features may facilitate rapid flow and augment the relatively high storage capacity of the aquifer. Due to the honeycombed and cavernous character of the aquifer, well yields are moderate to large. Several wells yield in excess of 16,000 gal/min and one well drilled in Bexar County flowed 37,000 gal/min from a 30-inch-diameter casing. The aquifer is significantly less permeable farther downdip where the concentration of dissolved solids in the water may abruptly exceed 1,000 mg/l.

*Water Quality*

The chemical quality of water in the aquifer is typically fresh, although hard, with dissolved solids concentrations averaging less than 500 mg/l. The downdip's relatively sharp interface between fresh and slightly saline water represents the extent of water containing less than 1,000 mg/l and is popularly known as the Bad Water Line (BWL). Within a relatively short distance down-gradient of the BWL, the groundwater becomes increasingly mineralized. The position of the bad water line generally coincides with the alignment of IH 35 in the LCRWPA.

*Availability*

Due to its highly permeable nature in the fresh water zone, the Edwards aquifer (BFZ) responds quickly to changes and extremes in stress placed upon the system. This is indicated by the rapid fluctuations in water levels over relatively short periods of time. During times of adequate rainfall and recharge, the Edwards aquifer (BFZ) is able to supply sufficient amounts of water for all demands as well as sustain springflows at many locations throughout its extent. However, when recharge is low, water withdrawn from wells and water discharged at the springs comes mainly from aquifer storage. If these conditions persist, water in storage within the aquifer continues to be depleted with corresponding water-level declines and reduced spring flows.

Availability for the northern segment of the Edwards aquifer (BFZ) was established by the TWDB based on DFCs submitted by GMA 8. The DFCs for Travis and Williamson counties are as follows:

- Maintain at least 42 acre-feet per month of aggregated stream/spring flow during a repeat of the Drought of Record in Travis County.
- Maintain at least 60 acre-feet per month of aggregated stream/spring flow during a repeat of the Drought of Record in Williamson County.

The availability of the Barton Springs segment of the Edwards aquifer (BFZ) was determined by the Barton Springs Edwards Aquifer Conservation District (BSEACD) staff using the Barton Springs Edwards aquifer GAM. The BSEACD staff made revisions to the existing GAM (Scanlon et al, 2001) through an extensive cooperative process that included a technical advisory group with members from the Texas Water Development Board, the United States Geologic Survey, the City of Austin, the Bureau of Economic Geology, and the University of Texas at Austin. Through this cooperative process, the existing GAM was revised to better predict aquifer water levels and spring flow during the drought of record conditions. The approach to determining the availability value for the Barton Springs segment of the

Edwards aquifer (BFZ) was to maintain a mean monthly spring flow of approximately 1 cubic foot per second (cfs) at Barton Springs. This level may not provide adequate flows for protection of endangered species. Further studies are required to establish minimum required flows. The total availability of the Barton Springs segment of the Edwards aquifer (BFZ) within the jurisdiction of BSEACD was proportioned by the BSEACD staff to provide the appropriate values for the area of Hays and Travis Counties within the LCRWPA. The Travis County availability value for the Edwards aquifer (BFZ) is a sum of the BSEACD value for the Travis County portion of the Barton Springs segment and the Travis County portion of the northern segment derived from the Northern Edwards aquifer GAM. The availability values for Edwards aquifer (BFZ) obtained from different GAMs are presented in *Table 3.12.*

**Table 3.12 Summary of Groundwater Availability Values for the Edwards Aquifer (BFZ) (ac-ft/yr)**

| Source County | Data Source | Water Availability (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
| Hays | BSEACD | 2,576 | 2,576 | 2,576 | 2,576 | 2,576 | 2,576 |
| Travis | GMA-8 MAG | 5,237 | 5,237 | 5,237 | 5,237 | 5,237 | 5,237 |
| Travis | BSEACD | 1,673 | 1,673 | 1,673 | 1,673 | 1,673 | 1,673 |
| | ***Travis County Total*** | ***6,910*** | ***6,910*** | ***6,910*** | ***6,910*** | ***6,910*** | ***6,910*** |
| Williamson | GMA-8 MAG | 10 | 10 | 10 | 10 | 10 | 10 |
| **Region K** | **Region Total** | **9,496** | **9,496** | **9,496** | **9,496** | **9,496** | **9,496** |

The available water, by river basin was established by proportioning the total availability value based on the area located in each river basin in a county using GIS. This information is presented in *Table 3.13.*

**Table 3.13 Water Availability (by River Basin) in the Edwards Aquifer (BFZ) (ac-ft/yr)**

| Source County | Source Basin | Water Availability (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
| Hays | Colorado | 2,576 | 2,576 | 2,576 | 2,576 | 2,576 | 2,576 |
| Travis | Brazos | 275 | 275 | 275 | 275 | 275 | 275 |
| Travis | Colorado | 6,608 | 6,608 | 6,608 | 6,608 | 6,608 | 6,608 |
| Travis | Guadalupe | 27 | 27 | 27 | 27 | 27 | 27 |
| | ***Travis County Total*** | ***6,910*** | ***6,910*** | ***6,910*** | ***6,910*** | ***6,910*** | ***6,910*** |
| Williamson | Brazos | 6 | 6 | 6 | 6 | 6 | 6 |
| Williamson | Colorado | 4 | 4 | 4 | 4 | 4 | 4 |
| | ***Williamson County Total*** | ***10*** | ***10*** | ***10*** | ***10*** | ***10*** | ***10*** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.1.3 *Availability*.

In the Colorado River Basin of Travis County, groundwater availability from Edwards aquifer (BFZ) (6,910 ac-ft/yr) is lower than water usage during the year 2000 (8,304 ac-ft/yr) as indicated in the TWDB Water Use Survey. The availability value was obtained from BSEACD and Northern Edwards (BFZ) aquifer GAM. The BSEACD availability number is consistent with the pumpage in its area of jurisdiction as the conservation district enforces permitting. However, it appears that the usage of groundwater in the northern part of Travis County is higher than the Edwards aquifer (BFZ) MAG number established by GMA-8, where the desired future condition was set to minimize adverse effect on stream flow during drought of record. It is anticipated that several current users of groundwater from

Edwards aquifer (BFZ) in the northern part of Travis County will switch to surface water usage in the future due to the expected growth of the City of Austin service/retail area.

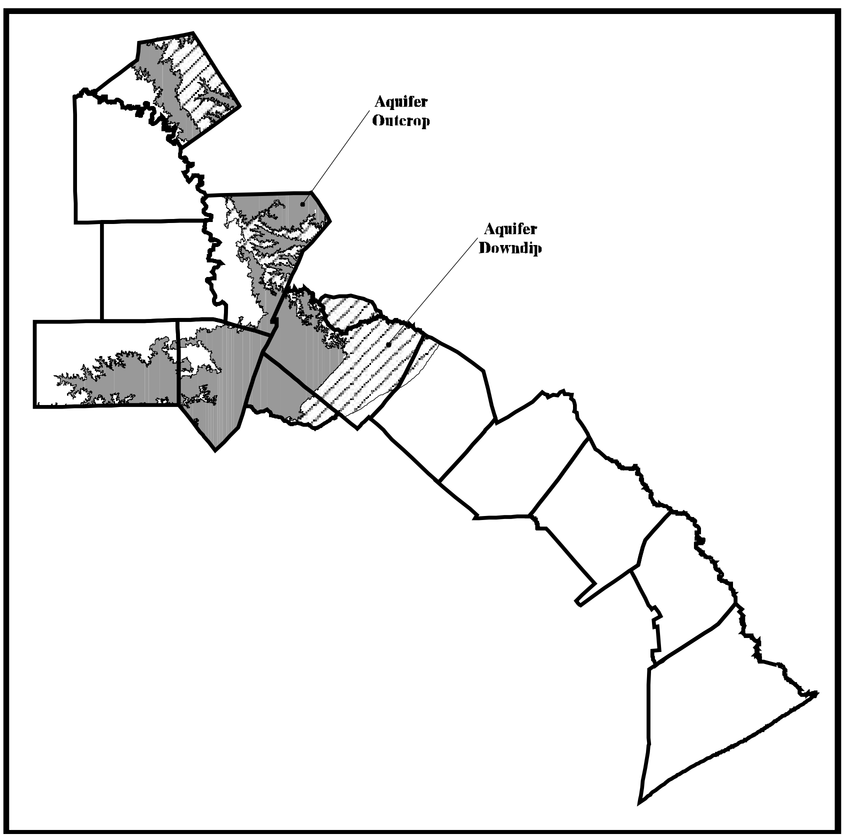
3.2.2.1.4 Trinity Aquifer

*Location and Use*

The Trinity aquifer consists of Cretaceous age rocks of the Trinity Group. The formations of the Trinity Group crop out in a band from the Red River in northern Texas to the Hill Country of South-Central Texas and provide water in all or parts of 55 counties. Trinity Group deposits also occur as far west as the Panhandle and Trans-Pecos regions where they are included as part of the Edwards-Trinity (High Plains) and Edwards-Trinity (Plateau) aquifers. Within much of the LCRWPA, the Trinity aquifer is exposed at the land surface as the erosion dissected margin of the Edwards Plateau.

Groundwater use from the Trinity aquifer in the LCRWPA occurs in Blanco, Burnet, Gillespie, Hays, Mills, and Travis Counties. TWDB records indicate that the total groundwater pumpage from the Trinity in these counties for 2000 was 10,554 ac-ft. Municipal uses accounted for 70 percent of the total, mining accounted for 2 percent, irrigation accounted for 13 percent, and livestock accounted for 15 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.5.*

**Figure 3.5: Trinity Aquifer Within the Lower Colorado Regional Water Planning Area**



*Hydrogeology*

The Trinity aquifer is composed of sand, clay, and limestone deposited during the Cretaceous Period. The aquifer in the LCRWPA is subdivided into the Upper, Middle, and Lower Trinity aquifers. The Upper Trinity is composed of the Upper Glen Rose Formation. The Middle Trinity aquifer is composed of the Lower Glen Rose Formation and the Hensell Sand and Cow Creek Limestone of the Travis Peak Formation. The Hammett Shale of the Travis Peak Formation is a confining zone between the Middle and Lower Trinity aquifers. The Lower Trinity aquifer is composed of the Sligo Limestone and the Hosston Formation (sand and conglomerate). The Glen Rose Formation and the Cow Creek Limestone are karsted but not as heavily solutioned as the Edwards aquifer (BFZ). There are evaporite mineral beds (principally anhydrite) associated with the contact of the Upper and Lower Glen Rose Formation that contribute to water quality issues in the certain areas of the Trinity aquifer within the LCRWPA. The formations of the Trinity aquifer thin from down-dip areas toward the outcrop. In some areas of the LCRWPA this thinning is pronounced. At the Balcones Escarpment the Trinity may be significantly displaced by the throw of faults associated with the Balcones Fault Zone. Trinity aquifer well yields typically range from less than 20 to more than 300 gallons per minute. The yields of wells in the Upper and Middle Trinity aquifers may be closely associated with the degree of local karst or solutioning features. The yield of wells from the Lower Trinity aquifer may be generally greater than the average yields of Upper or Lower Trinity aquifer wells.

*Water Quality*

Water quality from the Trinity aquifer is acceptable for most municipal and industrial purposes; however, excess concentrations of certain constituents in many places exceed drinking water standards. Heavy pumpage and water level declines in this region have contributed to deteriorating water quality in the aquifer. Wells completed in the Middle Trinity (especially the Hensell Sand) may exhibit levels of sodium, sulfate, and chloride, which are believed to be the result of leakage from the overlying Glen Rose. This is less likely to be true for wells completed in the Lower Trinity. The Hammett Shale acts as an aquitard and effectively prevents leakage from the overlying formations. In some areas, poor quality water occurs in and near wells that have not been properly cased. These wells may have deteriorated casings, insufficient casing or cement, or the casing may have been perforated at multiple depths in an effort to maximize the well yield. These wells serve as a conduit for poor quality water originating in the evaporite beds near the contact of the of the Upper and Lower Glen Rose Formations. Water quality declines in the downdip direction of all of the Trinity water-bearing units.

*Availability*

The groundwater availability estimate values for the northern Trinity aquifer in Burnet, Mills, Travis, and Williamson Counties are based on DFCs submitted by GMA 8. The DFCs for the above mentioned counties are as follows:

Burnet County

- Average draw down of the Paluxy aquifer should not exceed approximately 1 foot after 50 years.
- Average draw down of the Glen Rose aquifer should not exceed approximately 1 foot after 50 years.
- Average draw down of the Hensell aquifer should not exceed approximately 11 feet after 50 years.
- Average draw down of the Hosston aquifer should not exceed approximately 29 feet after 50 years.

Mills County
- Average draw down of the Paluxy aquifer should not exceed approximately 0 feet after 50 years.
- Average draw down of the Glen Rose aquifer should not exceed approximately 0 feet after 50 years.
- Average draw down of the Hensell aquifer should not exceed approximately 3 feet after 50 years.
- Average draw down of the Hosston aquifer should not exceed approximately 12 feet after 50 years.

Travis County
- Average draw down of the Paluxy aquifer should not exceed approximately 124 feet after 50 years.
- Average draw down of the Glen Rose aquifer should not exceed approximately 61 feet after 50 years.
- Average draw down of the Hensell aquifer should not exceed approximately 98 feet after 50 years.
- Average draw down of the Hosston aquifer should not exceed approximately 116 feet after 50 years.

Williamson County
- Average draw down of the Paluxy aquifer should not exceed approximately 108 feet after 50 years.
- Average draw down of the Glen Rose aquifer should not exceed approximately 88 feet after 50 years.
- Average draw down of the Hensell aquifer should not exceed approximately 142 feet after 50 years.
- Average draw down of the Hosston aquifer should not exceed approximately 166 feet after 50 years.

The groundwater availability estimate value for Hays County is based on simulations performed using the Edwards-Trinity (Plateau) aquifer GAM. The approach to using the Edwards-Trinity GAM followed the general approach of maintaining 90 percent of the drought of record contribution of the aquifer to the surface water system. A different combination of water budget values was required to capture the surface water contribution due to the unique construction of the model. The availability value was based on a combination of the Stream Leakage and Drain values.

The available water, by river basin, was established by proportioning the total availability value based on the area located in each river basin in a county using GIS. This information is presented in *Table 3.14*.

**Table 3.14 Water Availability (by River Basin) for the Trinity Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | Colorado | 12 | 12 | 10 | 10 | 8 | 8 |
| | ***County Total*** | ***12*** | ***12*** | ***10*** | ***10*** | ***8*** | ***8*** |
| Blanco | Colorado | 1,149 | 1,149 | 1,149 | 1,149 | 942 | 942 |
| Blanco | Guadalupe | 451 | 451 | 451 | 451 | 373 | 373 |
| | ***County Total*** | ***1,600*** | ***1,600*** | ***1,600*** | ***1,600*** | ***1,315*** | ***1,315*** |
| Burnet | Brazos | 2,723 | 2,723 | 2,723 | 2,723 | 2,723 | 2,723 |
| Burnet | Colorado | 823 | 823 | 823 | 823 | 823 | 823 |
| | ***County Total*** | ***3,546*** | ***3,546*** | ***3,546*** | ***3,546*** | ***3,546*** | ***3,546*** |
| Gillespie | Colorado | 3,354 | 3,354 | 3,354 | 3,354 | 3,354 | 3,354 |
| Gillespie | Guadalupe | 46 | 46 | 46 | 46 | 46 | 46 |
| | ***County Total*** | ***3,400*** | ***3,400*** | ***3,400*** | ***3,400*** | ***3,400*** | ***3,400*** |
| Hays | Colorado | 2500 | 2500 | 2500 | 2500 | 2500 | 2500 |
| | ***County Total*** | ***2,500*** | ***2,500*** | ***2,500*** | ***2,500*** | ***2,500*** | ***2,500*** |
| Mills | Brazos | 379 | 379 | 379 | 379 | 379 | 379 |
| Mills | Colorado | 1,005 | 1,005 | 1,005 | 1,005 | 1,005 | 1,005 |
| | ***County Total*** | ***1,384*** | ***1,384*** | ***1,384*** | ***1,384*** | ***1,384*** | ***1,384*** |
| Travis | Brazos | 8 | 8 | 8 | 8 | 8 | 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Travis | Colorado | 3,882 | 3,882 | 3,882 | 3,882 | 3,882 | 3,882 |
| Travis | Guadalupe | 33 | 33 | 33 | 33 | 33 | 33 |
| | ***County Total*** | ***3,923*** | ***3,923*** | ***3,923*** | ***3,923*** | ***3,923*** | ***3,923*** |
| Williamson | Brazos | 157 | 157 | 157 | 157 | 157 | 157 |
| Williamson | Colorado | 61 | 61 | 61 | 61 | 61 | 61 |
| | ***County Total*** | ***218*** | ***218*** | ***218*** | ***218*** | ***218*** | ***218*** |
| **Region K** | **Region Total** | **16,583** | **16,583** | **16,583** | **16,583** | **16,583** | **16,583** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.1.4 *Availability*.

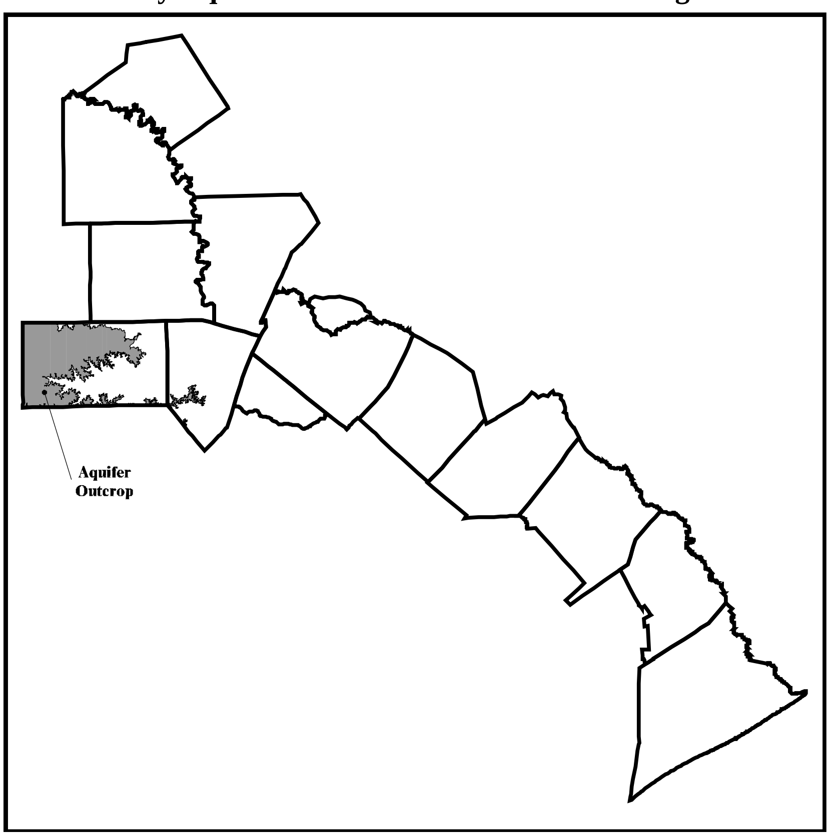
3.2.2.1.5 Edwards-Trinity (Plateau) Aquifer

*Location and Use*

The Edwards-Trinity (Plateau) aquifer underlies the Edwards Plateau east of the Pecos River and the Stockton Plateau west of the Pecos River, providing water to all or parts of 38 counties. The aquifer extends from the Hill Country of Central Texas to the Trans-Pecos region of West Texas.

Groundwater use from the Edwards-Trinity aquifer within the LCRWPA is limited to Gillespie County. TWDB records indicate that the total groundwater pumpage from the Edwards-Trinity (Plateau) in the study area for 2000 was 13 ac-ft, which was used exclusively for municipal purposes. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.6*.

**Figure 3.6: Edwards Trinity Aquifer Within the Lower Colorado Regional Water Planning Area**



*Hydrogeology*

The aquifer consists of saturated sediments of lower Cretaceous age Trinity Group formations and overlying limestones and dolomites of the Comanche Peak, Edwards, and Georgetown Formations. Springs issuing from the aquifer form the headwaters for the Pedernales, Llano, and San Saba Rivers.

The aquifer generally exists under water table conditions, however, where the Trinity is fully saturated and a zone of low permeability occurs near the base of the overlying Edwards, artesian conditions may exist. Reported well yields commonly range from less than 50 gal/min, where saturated thickness is thin, to more than 1,000 gal/min, in areas outside of Region K where large capacity wells are completed in jointed and cavernous limestone.

*Water Quality*

Natural chemical quality of Edwards-Trinity (Plateau) water ranges from fresh to slightly saline. The water is typically hard and may vary widely in concentrations of dissolved solids, composed mostly of calcium and bicarbonate. The salinity of the groundwater tends to increase toward the west. Water quality of springs issuing from the aquifer in the southern and eastern border areas is typically excellent.

*Availability*

There is little pumpage from the aquifer over most of its extent, and water levels have generally remained constant or have fluctuated only with seasonal precipitation. In some instances, water levels have declined as a result of increased pumpage. None of the areas supplied by groundwater from the Edwards-Trinity (Plateau) aquifer have experienced declines greater than 20 feet since 1980. The availability of the Edwards-Trinity aquifer in Gillespie County is based on the Hill Country Underground Water Conservation District Water Management Plan. The availability of the Edwards-Trinity aquifer in Blanco County has decreased to 0 ac-ft/yr, according to the Blanco-Pedernales Groundwater Conservation District. This information is presented in *Table 3.15.*

**Table 3.15 Water Availability from the Edwards-Trinity Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Blanco | Colorado | 0 | 0 | 0 | 0 | 0 | 0 |
| Blanco | Guadalupe | 0 | 0 | 0 | 0 | 0 | 0 |
| | ***County Total*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| Gillespie | Colorado | 1,410 | 1,410 | 1,410 | 1,410 | 1,410 | 1,410 |
| Gillespie | Guadalupe | 90 | 90 | 90 | 90 | 90 | 90 |
| | ***County Total*** | ***1,500*** | ***1,500*** | ***1,500*** | ***1,500*** | ***1,500*** | ***1,500*** |
| **Region K** | **Region Total** | **1,500** | **1,500** | **1,500** | **1,500** | **1,500** | **1,500** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.1.5 *Availability*.

### *3.2.2.2 Minor Aquifers*

The minor aquifers in the LCRWPA are the Hickory, Queen City, Sparta, Ellenburger-San Saba, Marble Falls, and Yegua-Jackson aquifers. These aquifers provide water supply to many of the cities and towns in the hill country of Central Texas, or in the case of the Sparta and Queen City aquifers, to farms, ranches, and small towns in Bastrop and Fayette Counties.

There are also WUGs in Region K that rely on alluvial aquifers for supply. These supplies are referred to as "Other Aquifer" since the actual aquifers have not been identified or named and the extent of the aquifer supply has not been determined.

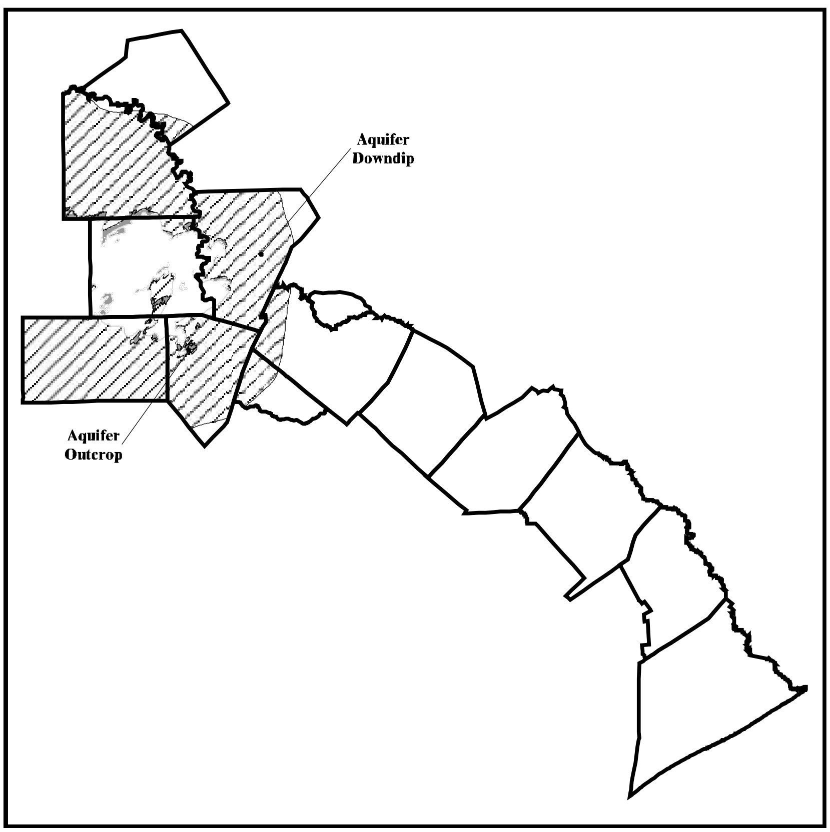
3.2.2.2.1 Hickory Aquifer

*Location and Use*

The Hickory aquifer underlies approximately 5,000 square miles in parts of 19 counties within the Llano Uplift region of Central Texas. Discontinuous outcrops of the Hickory sandstone overlie and flank the exposed Precambrian rocks that form the central core of the Uplift. The downdip artesian portion of the aquifer encircles the Uplift and extends to maximum depths approaching 4,500 feet.

Groundwater use from the Hickory aquifer within the LCRWPA occurs in Burnet, Gillespie, Llano, San Saba, and Blanco Counties. TWDB records indicate that the total groundwater pumpage from the Hickory aquifer in the study area for 2000 was 2,443 ac-ft. Municipal uses accounted for 13 percent of the total, mining accounted for 13 percent, irrigation accounted for 55 percent, and livestock accounted for 19 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.7.*

**Figure 3.7: Hickory Aquifer Within the Lower Colorado Regional Water Planning Area**



*Hydrogeology*

The Hickory aquifer, like the Marble Falls and Ellenburger-San Saba aquifers, was formed by the Llano Uplift, a distinct area of the state that includes portions of 19 counties. The Hickory Sandstone member of the Cambrian Riley Formation is composed of some of the oldest sedimentary rocks found in Texas. In most of the northern and western portions of the aquifer, the Hickory Sandstone Member can be differentiated into lower, middle, and upper units, which reach a maximum thickness of 480 feet in southwestern McCulloch County just northwest of the LCRWPA. In the southern and eastern extent of the aquifer, the Hickory Sandstone Member consists of only two units, which range in thickness from about 150 to 400 feet.

The Hickory aquifer has been compartmentalized by block faulting. The vertical displacement of faults ranges from a few feet to as much as 2,000 feet. Significant lateral displacement is also associated with these faults. Throughout its extent, the thickness of the aquifer is affected by the relief of the underlying Precambrian surface. Both of these elements have contributed to the significant variability that occurs in groundwater availability, movement, quality, and productivity.

Large wells used for irrigation and municipal supply may range from 200 to 500 gal/min. Some exceptional wells have been reported to have yields in excess of 1,000 gal/min. These would typically occur outside of the LCRWPA, northwest of the Llano Uplift.

*Water Quality*

In general, the quality of water from the Hickory aquifer could be described as moderate to low quality. The total dissolved solids concentrations vary from 300 to 500 mg/l. In some areas the groundwater may have dissolved solids concentrations as high as 3,000 mg/l. The water may contain alpha particle and total radium concentrations that may exceed the new safe drinking water levels soon to be issued by the EPA. Radon gas may also be entrained. Most of the radioactive groundwater is thought to be produced from the middle Hickory unit, while the upper Hickory unit produces water that exceeds safe drinking water concentrations for iron. High nitrate levels may be found in the shallower portions of the aquifer where there may be interaction with surface activities such as fertilizer applications and septic systems.

*Availability*

The amounts of water available from the Hickory aquifer in Blanco, Gillespie, and San Saba Counties are based on the Blanco-Pedernales Groundwater Conservation District, the Hill Country UWCD, and the Hickory Underground Water Conservation District (UWCD) No. 1 Water Management Plans, respectively. Groundwater availability in Burnet County is based on information in the Central Texas GCD Water Management Plan. Groundwater availability in Llano County is the same as in the 2000 Region K Water Supply Plan which were based on information obtained from the TWDB. These projections of availability are shown in *Table 3.16* below.

**Table 3.16 Water Availability from the Hickory Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Blanco | Colorado | 747 | 747 | 747 | 747 | 747 | 747 |
| Blanco | Guadalupe | 165 | 165 | 165 | 165 | 165 | 165 |
| | ***County Total*** | ***912*** | ***912*** | ***912*** | ***912*** | ***912*** | ***912*** |
| Burnet | Colorado | 2,148 | 2,148 | 2,148 | 2,148 | 2,148 | 2,148 |
| Burnet | Brazos | 0 | 0 | 0 | 0 | 0 | 0 |
| | ***County Total*** | ***2,148*** | ***2,148*** | ***2,148*** | ***2,148*** | ***2,148*** | ***2,148*** |
| Gillespie | Colorado | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 |
| Gillespie | Guadalupe | 66 | 66 | 66 | 66 | 66 | 66 |
| | ***County Total*** | ***2,000*** | ***2,000*** | ***2,000*** | ***2,000*** | ***2,000*** | ***2,000*** |
| Llano | Colorado | 12,517 | 12,517 | 12,517 | 12,517 | 12,517 | 12,517 |
| Mills | Brazos | 1 | 1 | 1 | 1 | 1 | 1 |
| Mills | Colorado | 35 | 35 | 35 | 35 | 35 | 35 |
| | ***County Total*** | ***36*** | ***36*** | ***36*** | ***36*** | ***36*** | ***36*** |
| San Saba | Colorado | 6,540 | 6,540 | 6,540 | 6,540 | 6,540 | 6,540 |
| **Region K** | **Region Total** | **24,153** | **24,153** | **24,153** | **24,153** | **24,153** | **24,153** |

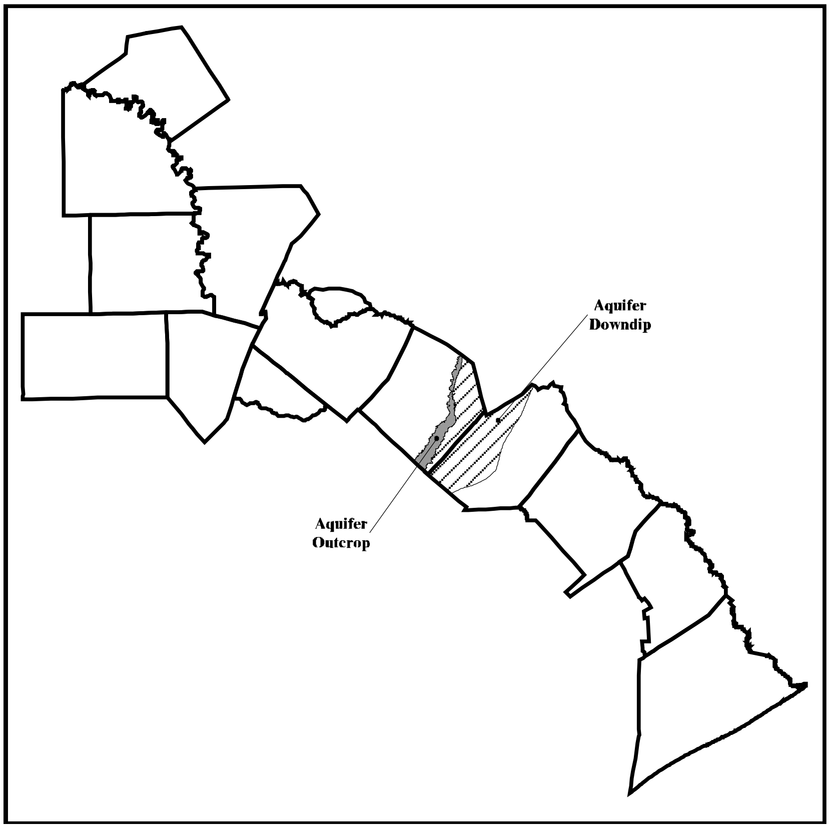
Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.1 *Availability*.

### 3.2.2.2.2 Queen City Aquifer

*Location and Use*

The Queen City aquifer extends in a band across most of the State from the Frio River in South Texas northeastward into Louisiana. The southwestern boundary is placed at the Frio River because of a facies change in the formation. This facies change results in reduced amounts of poorer quality water produced from this interval southwest of the Frio River. In 2000, Bastrop and Fayette Counties are listed as using Queen City water in the study area. The reported usage for 2000 was 126 ac-ft in the TWDB records. Municipal uses accounted for 29 percent of the total, irrigation accounted for 11 percent, and livestock accounted for 60 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.8*.

**Figure 3.8: Queen City Aquifer Within the Lower Colorado Regional Water Planning Area**




*Hydrogeology*

The Queen City aquifer is composed of sand, loosely cemented sandstone, and interbedded clay units of the Queen City Formation of the Tertiary Claiborne Group. These rocks slope downward or dip gently to the south and southeast toward the Gulf of Mexico. The total thickness of this aquifer is usually less than 500 feet in the LCRWPA. The Queen City aquifer generally parallels the Carrizo aquifer, and like the Carrizo, it has both a water table and artesian portion. Well yields are generally low with a few exceeding 400 gal/min.

*Water Quality*

Throughout most of the LCRWPA, the chemical quality of the Queen City aquifer water is excellent, but water quality may deteriorate fairly rapidly downdip. The water may be fairly acidic (low pH), have high iron concentrations, or contain hydrogen sulfide gas. All of these conditions are relatively easy to remedy with standard water treatment methods.

*Availability*

The water availability of the Queen City aquifer in Bastrop County is same as in the 2000 Region K Water Supply Plan which was based on aquifer-wide TWDB projections. The amount of water available from the Queen City aquifer in Fayette County is based on the Fayette County Groundwater Conservation

District Water Management Plan. The total supply available is distributed in proportion to the area occurring in each river basin. These projections are presented in *Table 3.17* below.

**Table 3.17 Water Availability From the Queen City Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | Brazos | 227 | 227 | 227 | 227 | 227 | 227 |
| Bastrop | Colorado | 2,126 | 2,126 | 2,126 | 2,126 | 2,126 | 2,126 |
| Bastrop | Guadalupe | 403 | 403 | 403 | 403 | 403 | 403 |
| | ***County Total*** | ***2,756*** | ***2,756*** | ***2,756*** | ***2,756*** | ***2,756*** | ***2,756*** |
| Fayette | Colorado | 1,034 | 1,034 | 1,034 | 1,034 | 1,034 | 1,034 |
| Fayette | Lavaca | 26 | 26 | 26 | 26 | 26 | 26 |
| Fayette | Guadalupe | 175 | 175 | 175 | 175 | 175 | 175 |
| | ***County Total*** | ***1,235*** | ***1,235*** | ***1,235*** | ***1,235*** | ***1,235*** | ***1,235*** |
| **Region K** | **Region Total** | **3,991** | **3,991** | **3,991** | **3,991** | **3,991** | **3,991** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.2 *Availability*.

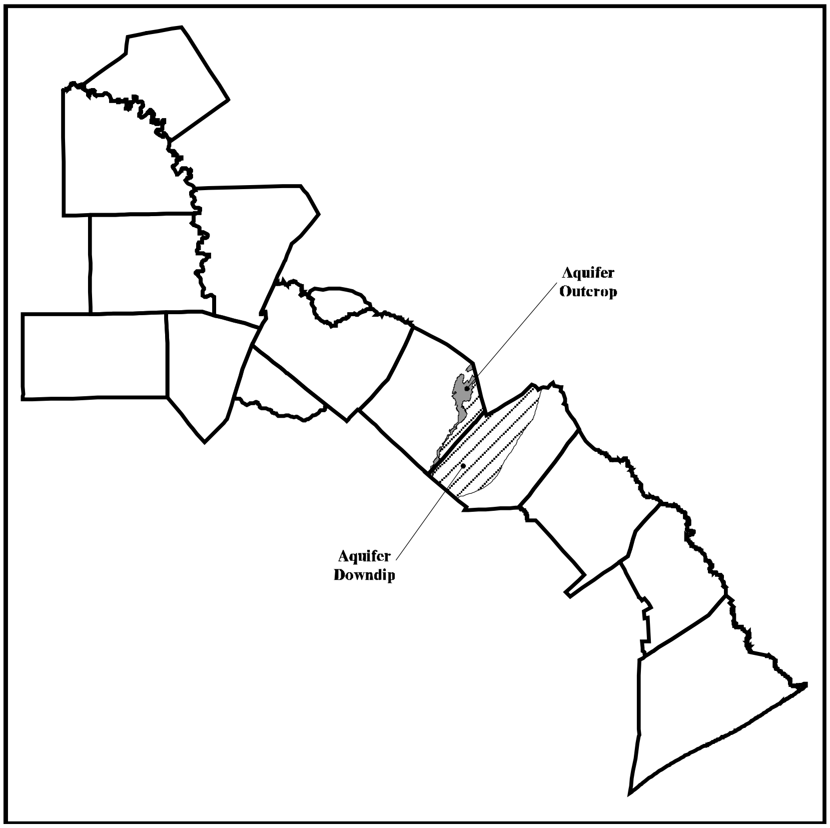
3.2.2.2.3 Sparta Aquifer

*Location and Use*

The Sparta aquifer extends in a narrow band across the state from the Frio River in South Texas northeastward to the Louisiana border in Sabine County. The southwestern boundary is placed at the Frio River because of a facies change in the formation, which makes it difficult to delineate the boundaries of the Sparta and contiguous formations southwestward. The facies change results in reduced amounts of water and poorer quality water produced from the interval.

Groundwater use from the Sparta aquifer within the LCRWPA occurs in Bastrop and Fayette Counties. TWDB records indicate that the total groundwater pumpage from the Sparta aquifer in the study area for 2000 was 181 ac-ft. Municipal uses accounted for 41 percent of the total, irrigation accounted for 37 percent, and livestock accounted for 22 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.9*.

**Figure 3.9: Sparta Aquifer Within the Lower Colorado Regional Water Planning Area**




*Hydrogeology*

The Sparta Formation, like the Queen City, is part of the Claiborne Group. The aquifer consists of sand and interbedded clay with more massive sand beds in the basal section. Rocks composing the Sparta Formation also dip gently to the south and southeast toward the Gulf Coast, with a total thickness that can reach up to 300 feet. Yields of individual wells are generally low to moderate, but high capacity wells, producing 400 to 500 gal/min, are possible. The water occurs under water table conditions near the outcrop but becomes confined and is under artesian conditions downdip. Usable quality water may be recovered from as much as 2,000 feet below the surface.

*Water Quality*

Usable quality water is commonly found within the outcrop and for a few miles downdip. The water quality in most of this aquifer is excellent, but the quality does decrease in the downdip direction. In some areas the water can contain iron concentrations exceeding the safe drinking water standards.

*Availability*

The amount of water available from the Sparta aquifer in Fayette County is based on the Fayette County Groundwater Conservation District Water Management Plan. The water availability from the Sparta aquifer in Bastrop County is same as in the 2000 Region K Water Supply Plan which was based on aquifer-wide TWDB projections. The total supply available was distributed in proportion to the area occurring in each basin. These projections are presented in *Table 3.18* below.

**Table 3.18 Water Availability from the Sparta Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Fayette | Colorado | 3,667 | 3,667 | 3,667 | 3,667 | 3,667 | 3,667 |
| Fayette | Lavaca | 235 | 235 | 235 | 235 | 235 | 235 |
| Fayette | Guadalupe | 598 | 598 | 598 | 598 | 598 | 598 |
| | ***County Total*** | ***4,500*** | ***4,500*** | ***4,500*** | ***4,500*** | ***4,500*** | ***4,500*** |
| Bastrop | Brazos | 49 | 49 | 49 | 49 | 49 | 49 |
| Bastrop | Colorado | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Bastrop | Guadalupe | 340 | 340 | 340 | 340 | 340 | 340 |
| | ***County Total*** | ***5,389*** | ***5,389*** | ***5,389*** | ***5,389*** | ***5,389*** | ***5,389*** |
| **Region K** | **Region Total** | **9,889** | **9,889** | **9,889** | **9,889** | **9,889** | **9,889** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.3, *Availability*.

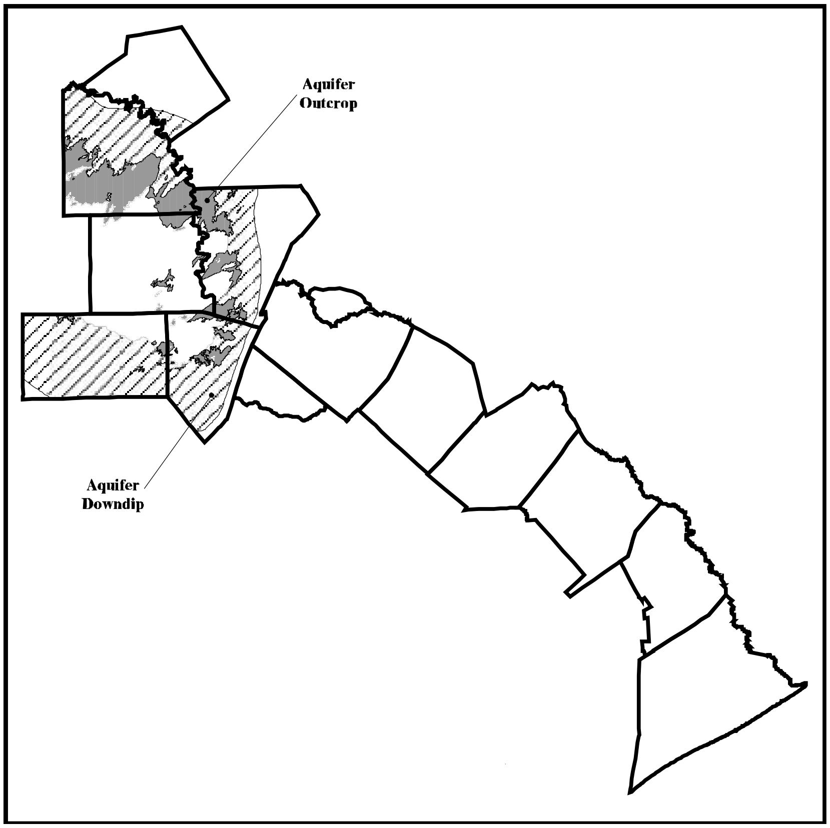
### 3.2.2.2.4 Ellenburger-San Saba Aquifer

*Location and Use*

The Ellenburger-San Saba aquifer underlies about 4,000 square miles in parts of 15 counties in the Llano Uplift area of Central Texas. Discontinuous outcrops of the aquifer generally encircle older rocks in the core of the uplift. The remaining downdip portion contains fresh to slightly saline water to depths of approximately 3,000 feet below land surface.

Groundwater use from the Ellenburger-San Saba aquifer within the LCRWPA occurs in Blanco, Burnet, Gillespie, Llano, and San Saba Counties. TWDB records indicate that the total groundwater pumpage from the Ellenburger-San Saba in the study area for 2000 was 4,972 ac-ft. Municipal uses accounted for 74 percent of the total, irrigation accounted for 10 percent, and livestock accounted for 15 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.10*.

**Figure 3.10: Ellenburger-San Saba Aquifer Within the Lower Colorado Regional Water Planning Area**




*Hydrogeology*

The Ellenburger-San Saba aquifer occurs in limestone and dolomite facies of the San Saba Member of the Wilbern Formation of the Late Cambrian Age; and in the Honeycut, Gorman, and Tanyard Formations of the Ellenburger Group. In the southeastern portion of the aquifer, these units have a combined maximum thickness of about 2,700 feet while in the northeastern portion of the aquifer and a maximum combined thickness is about 1,100 feet. In some areas where the overlying confining beds are thin or nonexistent the aquifer may be hydrologically connected to the Marble Falls aquifer.

Most of the water is under artesian conditions, even in the outcrop areas where impermeable carbonate rocks in the upper portion of the Ellenburger-San Saba function as confining layers. The aquifer is compartmentalized by block faulting with the fractures forming various sized cavities, which are the major water-bearing features.

The maximum capacity of wells used for municipal and irrigation purposes generally range from 200 to 600 gal/min. Most other wells produce less than 100 gal/min. The variable flow properties of the aquifer make it difficult to consistently obtain higher yield wells in some areas. Locations in the LCRWPA that have experienced this difficulty include the cities of Fredericksburg and Bertram.

*Water Quality*

Water produced from the aquifer may have dissolved concentrations that range from 200 mg/l to as high as 3,000 mg/l, but in most cases is usually less than 1,000 mg/l. The quality of water declines rapidly in the downdip direction.

*Availability*

The water available from the Ellenburger-San Saba aquifer in Blanco, Gillespie and San Saba Counties is based on the Blanco-Pedernales Groundwater Conservation District, the Hill Country UWCD and the Hickory Underground Water Conservation District (UWCD) No. 1 Water Management Plans respectively. Availability for the Ellenburger-San Saba aquifer in Burnet County was established by the TWDB and based on DFCs submitted by GMA 8. The DFC for Burnet Count is as follows:

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

The groundwater availability for Llano County is the same as in the 2000 Region K Water Supply Plan, which was based on the TWDB projections. GIS was used to apportion areas, which were then applied to separate the quantity available in the different river basins. The total supply available was distributed in proportion to the area occurring in each basin. These projections are shown in *Table 3.19* below.

**Table 3.19 Water Availability from the Ellenburger-San Saba Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Blanco | Colorado | 2,849 | 2,849 | 2,849 | 2,849 | 2,849 | 2,849 |
| Blanco | Guadalupe | 1,025 | 1,025 | 1,025 | 1,025 | 1,025 | 1,025 |
| | ***County Total*** | ***3,874*** | ***3,874*** | ***3,874*** | ***3,874*** | ***3,874*** | ***3,874*** |
| Burnet | Brazos | 123 | 123 | 123 | 123 | 123 | 123 |
| Burnet | Colorado | 5,403 | 5,403 | 5,403 | 5,403 | 5,403 | 5,403 |
| | ***County Total*** | ***5,526*** | ***5,526*** | ***5,526*** | ***5,526*** | ***5,526*** | ***5,526*** |
| Gillespie | Colorado | 5,535 | 5,535 | 5,535 | 5,535 | 5,535 | 5,535 |
| Gillespie | Guadalupe | 65 | 65 | 65 | 65 | 65 | 65 |
| | ***County Total*** | ***5,600*** | ***5,600*** | ***5,600*** | ***5,600*** | ***5,600*** | ***5,600*** |
| Llano | Colorado | 758 | 758 | 758 | 758 | 758 | 758 |
| Mills | Brazos | 5 | 5 | 5 | 5 | 5 | 5 |
| Mills | Colorado | 494 | 494 | 494 | 494 | 494 | 494 |
| | ***County Total*** | ***499*** | ***499*** | ***499*** | ***499*** | ***499*** | ***499*** |
| San Saba | Colorado | 10,194 | 10,194 | 10,194 | 10,194 | 10,194 | 10,194 |
| **Region K** | **Region Total** | **26,451** | **26,451** | **26,451** | **26,451** | **26,451** | **26,451** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.4 *Availability*.

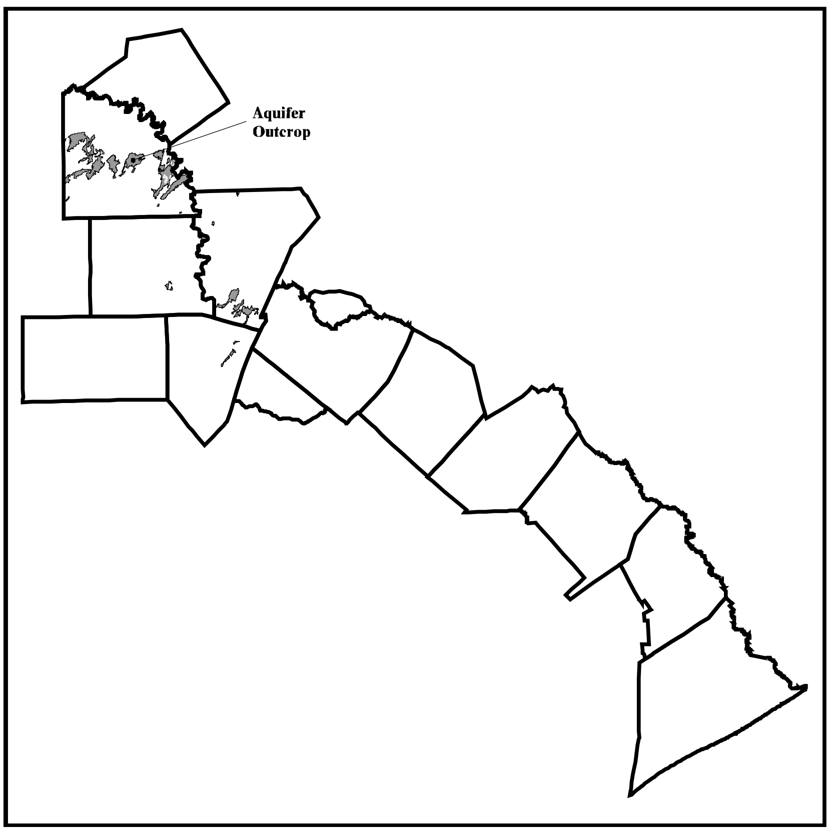
3.2.2.2.5 Marble Falls Aquifer

*Location and Use*

The Marble Falls aquifer occurs in several separated outcrops, primarily along the northern and eastern flanks of the Llano Uplift region of Central Texas. The downdip portion of the aquifer is of unknown extent.

Groundwater use from the Marble Falls aquifer within the LCRWPA occurs in Burnet and San Saba Counties. TWDB records indicate that the total groundwater pumpage from the Marble Falls in the study area for 2000 was 1,505 ac-ft. Municipal uses accounted for 76 percent of the total, manufacturing accounted for 2 percent, irrigation accounted for 6 percent, and livestock accounted for 16 percent. The location of the aquifer within the LCRWPA is illustrated in *Figure 3.11*.

**Figure 3.11: Marble Falls Aquifer Within the Lower Colorado Regional Water Planning Area**




*Hydrogeology*

This aquifer occurs in the fractures, solution cavities, and channels of the limestone rocks of the Marble Falls Formation of the Pennsylvanian Bend Group. The maximum thickness of the formation is 600 feet. Numerous large springs discharge from the aquifer and provide a significant portion of the baseflow of the San Saba River in McCulloch and San Saba Counties; and to the Colorado River in San Saba and

Lampasas Counties. The aquifer contributes flow to the San Saba springs, which is the source of drinking water for the City of San Saba. In some areas where the confining layers are thin or nonexistent, the Marble Falls aquifer may be hydrologically connected to the San Saba-Ellenburger aquifer. Some wells have been known to produce as much as 2,000 gal/min; however, most wells produce at rates significantly less than this amount.

*Water Quality*

The water produced from this aquifer is suitable for most purposes, but some wells in Blanco County have produced water with high nitrate concentrations. The downdip portion of the aquifer is not extensive, but in these areas the water becomes highly mineralized. Because the limestone formation comprising this aquifer is relatively shallow, it is susceptible to pollution by surface uses and activities.

*Availability*

The water available from the Marble Falls aquifer in Blanco and San Saba Counties is based on the Blanco-Pedernales Groundwater Conservation District and the Hickory Underground Water Conservation District (UWCD) No. 1 Water Management Plans respectively. Groundwater availability for the Marble Falls aquifer in Burnet County was established by the TWDB and based on DFCs submitted by GMA 8. The DFC for Burnet Count is as follows:

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

These projections are shown in *Table 3.20* below.

**Table 3.20 Water Availability from the Marble Falls Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Blanco | Colorado | 300 | 300 | 300 | 300 | 300 | 300 |
| Burnet | Brazos | 93 | 93 | 93 | 93 | 93 | 93 |
| Burnet | Colorado | 1,885 | 1,885 | 1,885 | 1,885 | 1,885 | 1,885 |
| | ***County Total*** | ***1,978*** | ***1,978*** | ***1,978*** | ***1,978*** | ***1,978*** | ***1,978*** |
| San Saba | Colorado | 12,380 | 12,380 | 12,380 | 12,380 | 12,380 | 12,380 |
| **Region K** | **Region Total** | **14,658** | **14,658** | **14,658** | **14,658** | **14,658** | **14,658** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.5 *Availability*.

### 3.2.2.2.6 Yegua-Jackson Aquifer

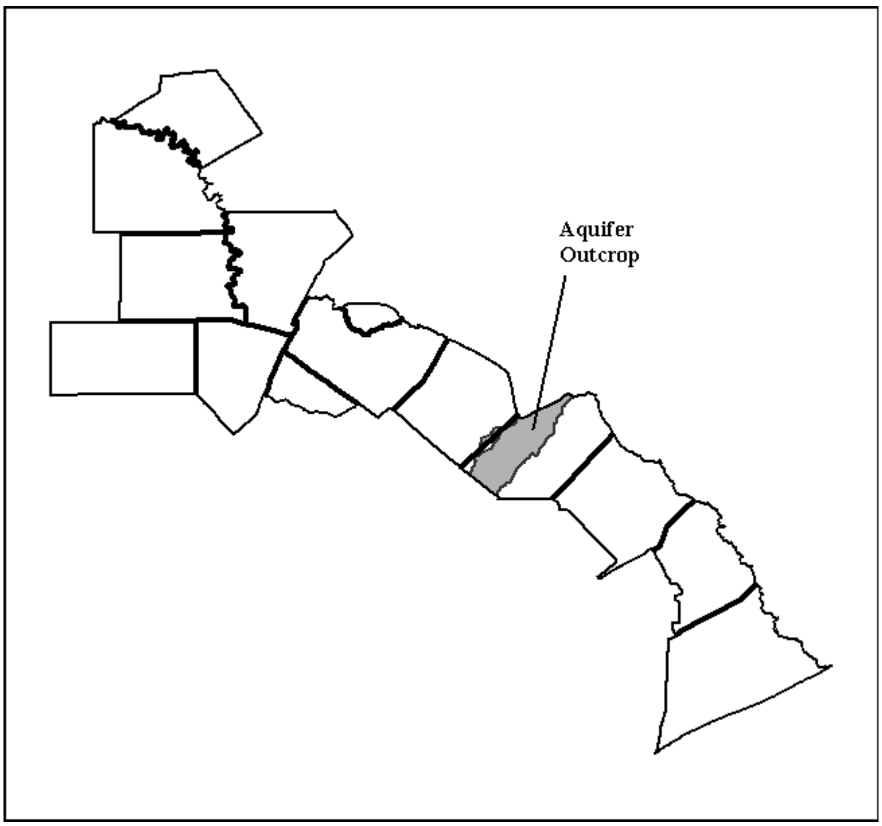
*Location and Use*

The Yequa-Jackson Aquifer extends in a narrow band from the Rio Grande Valley across the state to the Sabine River and Louisiana. It covers 10,904 square miles and exists within 34 counties.

The Yegua-Jackson Aquifer includes water bearing parts of the Yegua Formation and the Jackson Group. Within the LCRWPA, the Yegua Formation outcrops in Fayette County in a band approximately four to eight miles wide along the Bastrop-Fayette County line. The formation downdips at a rate of 150 feet per mile, and reaches its deepest depth of 2,800 feet below mean sea level along the Fayette-Lavaca County line. The yields of most wells in the Yegua-Jackson are generally small, ranging from less than 50 gallons per minute to over 300 gallons per minute. Groundwater use in Fayette County is primarily by rural landowners for domestic and livestock water supply.

The Jackson Group Formation outcrops in Fayette County within the LCRWPA in a band approximately three to eight miles wide along the northeasterly line from Flatonia to La Grange. The formation dips within Fayette County at a rate of approximately 150 feet per mile, and reaches its deepest depth of 2,200 feet below mean sea level near Fayetteville. Groundwater from the Jackson Group in Fayette County is used by the cities of Ledbetter, Flatonia, and Schulenburg as well as rural property owners.

**Figure 3.12: Yegua-Jackson Aquifer Within the Lower Colorado Regional Water Planning Area**




*Hydrogeology*

The Yegua-Jackson Aquifer's geologic units consist of complexly interbedded sand, silt, and clay layers originally deposited as fluvial and deltaic sediments. Most groundwater is produced from the sand units of the aquifer with the more significant productivity occurring in areas of more extensive fluvial channel sands and thick deltaic sands. Usable quality groundwater is generally limited to sands in the outcrop or slightly downdip. Net freshwater sands are generally less than 200 feet deep at any location within the aquifer.

*Water Quality*

Where the thicker, more extensive sand layers occur in the outcrop and slightly downdip, significant amounts of fresh to slightly saline water is available. Water quality varies greatly within the aquifer, and shallow occurrences of poor-quality water are not uncommon. The chemical quality of the groundwater is variable due to the variability of the composition of the sediments that make up the aquifer and the variability of how easily water moves through the aquifer. In all areas the aquifer becomes highly mineralized downdip.

*Availability*

The water available from the Yegua-Jackson aquifer in Fayette County is based on information provided by the Fayette County Groundwater Conservation District. These projections are shown in *Table 3.20* below.

**Table 3.21 Water Availability from the Yegua-Jackson Aquifer (ac-ft/yr)**

| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Fayette | Colorado | 17,000 | 17,000 | 17,000 | 17,000 | 17,000 | 17,000 |
| Fayette | Guadalupe | 2,700 | 2,700 | 2,700 | 2,700 | 2,700 | 2,700 |
| Fayette | Lavaca | 300 | 300 | 300 | 300 | 300 | 300 |
| | ***County Total*** | ***20,000*** | ***20,000*** | ***20,000*** | ***20,000*** | ***20,000*** | ***20,000*** |
| **Region K** | **Region Total** | **20,000** | **20,000** | **20,000** | **20,000** | **20,000** | **20,000** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.6 *Availability*.

3.2.2.2.7 Other Aquifer

Other Aquifer refers to alluvial aquifer water supplies that have not been identified, named, or studied. These alluvial aquifers are being used by a few WUGs in Region K as supply sources. The most likely source of these Other Aquifer supplies in Region K is the Colorado River Alluvium and related terrace deposits. Other Aquifer supplies were only considered for counties where WUGs specifically list alluvial aquifer type supplies as a source or where municipal or industrial WUGs could potentially utilize these alluvial supplies. Other Aquifer supplies were not considered for counties which had already established availability based on total groundwater usage and where there was not significant usage of Other Aquifer water occurring currently. The TCEQ Water Utility Database was used to determine the well capacities and productions for these Other Aquifer supplies when information was available.

The availability of Other Aquifer supplies was estimated based on annual recharge estimates for the county. The annual recharge estimate is based on a GIS (Geographically Information Systems) calculation of the area in each county of the Colorado River alluvium and related terrace deposits and an assumptive rate of recharge of 1.5 percent of average annual precipitation.

For Llano County, the Other Aquifer supplies are based on TCEQ production data. For Travis County, the Other Aquifer availability estimate was almost the same as the supply estimate based upon WUG data, therefore, the Other Aquifer availability is based on the WUG data. *Table 3.22* contains a summary of the Other Aquifer sources available to the LCRWPA.

**Table 3.22 Water Availability from Other Aquifer (ac-ft/yr)**

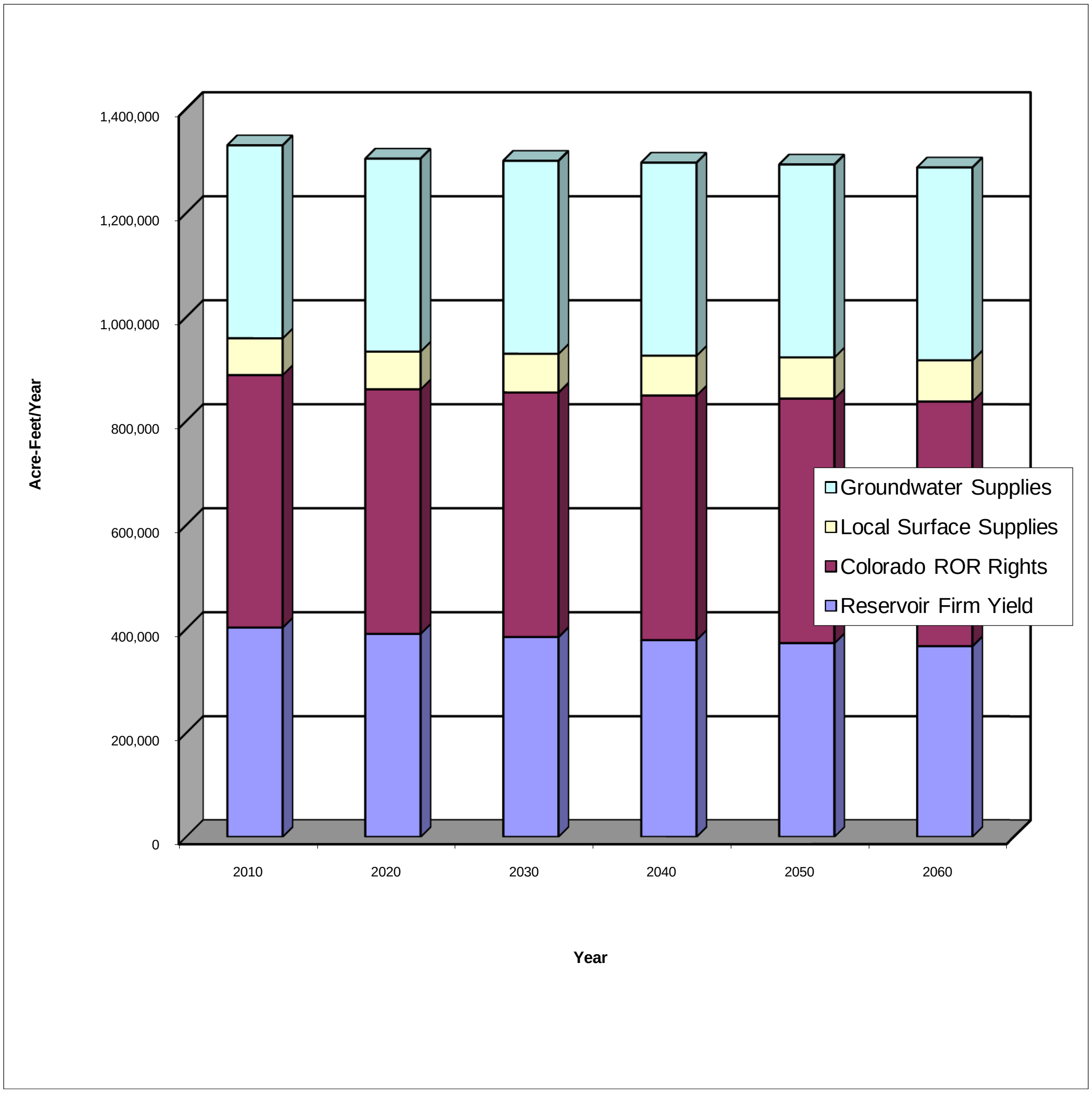
| County | Basin | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|---|
| Bastrop | Colorado | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 |
| | ***County Total*** | ***5,340*** | ***5,340*** | ***5,340*** | ***5,340*** | ***5,340*** | ***5,340*** |
| Burnet | Colorado | 305 | 305 | 305 | 305 | 305 | 305 |
| | ***County Total*** | ***305*** | ***305*** | ***305*** | ***305*** | ***305*** | ***305*** |
| Colorado | Colorado | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 |
| | ***County Total*** | ***4,269*** | ***4,269*** | ***4,269*** | ***4,269*** | ***4,269*** | ***4,269*** |
| Fayette | Colorado | 3,696 | 3,696 | 3,696 | 3,696 | 3,696 | 3,696 |
| | ***County Total*** | ***3,696*** | ***3,696*** | ***3,696*** | ***3,696*** | ***3,696*** | ***3,696*** |
| Llano | Colorado | 109 | 109 | 109 | 109 | 109 | 109 |
| | ***County Total*** | ***109*** | ***109*** | ***109*** | ***109*** | ***109*** | ***109*** |
| Travis | Colorado | 1,818 | 1,835 | 1,848 | 1,853 | 1,856 | 1,860 |
| Travis | Guadalupe | 25 | 30 | 34 | 37 | 40 | 43 |
| | ***County Total*** | ***1,843*** | ***1,865*** | ***1,882*** | ***1,890*** | ***1,896*** | ***1,903*** |
| **Region K** | **Region Total** | **15,562** | **15,584** | **15,601** | **15,609** | **15,615** | **15,622** |

Note: An explanation of the numbers presented in this table is provided in Section 3.2.2.2.6.

### 3.2.3 Regional Water Availability Summary

The TWDB guidelines for regional water planning process require that a summary of the water sources available to the region be presented. The table, *Region K Current Water Availability Sources*, is presented in the *Appendix 3C*. This information is presented graphically in *Figure 3.13* and is summarized in *Table 3.23*. As indicated, under current conditions, a total of approximately 1.3 million ac-ft of water is available annually to the LCRWPA under DOR conditions. Of this amount, approximately 72 percent is from surface water sources and 28 percent is from groundwater sources.

**Figure 3.13: Total Water Available to Region K During a Drought of Record**




*Appendix 3D* contains a comparison of the total water available to Region K in the 2006 Plan and in the current Plan.

**Table 3.23 Total Water Available to the Lower Colorado Regional Planning Area During a Drought of Record (ac-ft/yr)**

| Water Source | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| City of Austin - ROR Municipal [1] | 212,590 | 204,466 | 204,466 | 204,466 | 204,466 | 204,479 |
| City of Austin - ROR Steam Electric [1] | 8,420 | 8,420 | 8,420 | 8,420 | 8,420 | 8,420 |
| LCRA - Garwood ROR | 130,141 | 130,141 | 130,141 | 130,141 | 130,141 | 130,141 |
| LCRA - Gulf Coast ROR | 44,827 | 43,540 | 43,540 | 43,540 | 43,540 | 43,540 |
| LCRA - Lakeside #1 ROR | 12,531 | 12,498 | 12,498 | 12,498 | 12,498 | 12,498 |
| LCRA - Lakeside #2 ROR | 10,440 | 10,440 | 10,440 | 10,440 | 10,440 | 10,440 |
| LCRA - Pierce Ranch ROR | 14,116 | 14,173 | 14,173 | 14,173 | 14,173 | 14,173 |
| STP Nuclear Operating Co. ROR | 51,857 | 46,072 | 46,072 | 46,072 | 46,072 | 46,072 |
| San Bernard ROR | 665 | 597 | 597 | 597 | 597 | 597 |
| Highland Lakes [2] | 402,172 | 390,001 | 384,001 | 378,101 | 372,201 | 366,468 |
| Goldthwaite Reservoir | 0 | 0 | 0 | 0 | 0 | 0 |
| Llano Reservoir | 0 | 0 | 0 | 0 | 0 | 0 |
| Blanco Reservoir | 596 | 596 | 596 | 596 | 596 | 596 |
| Irrigation Local Supply | 40,663 | 40,663 | 40,663 | 40,663 | 40,663 | 40,663 |
| Livestock Local Supply [3] | 8,458 | 8,458 | 8,458 | 8,458 | 8,458 | 8,458 |
| Other Local Supply | 20,978 | 22,636 | 24,510 | 26,727 | 29,370 | 29,370 |
| Carrizo-Wilcox Aquifer | 28,400 | 28,400 | 28,400 | 28,400 | 28,400 | 28,400 |
| Edwards Aquifer BFZ | 9,496 | 9,496 | 9,496 | 9,496 | 9,496 | 9,496 |
| Edwards-Trinity Aquifer (Plateau) | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Ellenburger-San Saba Aquifer | 26,451 | 26,451 | 26,451 | 26,451 | 26,451 | 26,451 |
| Gulf Coast Aquifer | 198,425 | 198,425 | 198,425 | 198,425 | 198,425 | 198,425 |
| Hickory Aquifer | 24,153 | 24,153 | 24,153 | 24,153 | 24,153 | 24,153 |
| Marble Falls Aquifer | 14,658 | 14,658 | 14,658 | 14,658 | 14,658 | 14,658 |
| Queen City Aquifer | 3,991 | 3,991 | 3,991 | 3,991 | 3,991 | 3,991 |
| Sparta Aquifer | 9,889 | 9,889 | 9,889 | 9,889 | 9,889 | 9,889 |
| Trinity Aquifer | 17,600 | 17,600 | 17,598 | 17,598 | 17,311 | 17,311 |
| Yegua-Jackson Aquifer | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Other Aquifer | 15,562 | 15,584 | 15,601 | 15,609 | 15,615 | 15,622 |
| Sources Outside the Region [4] | 3,136 | 3,231 | 3,327 | 3,422 | 3,523 | 3,642 |
| **Region K Totals** | **1,331,715** | **1,306,079** | **1,302,064** | **1,298,484** | **1,295,047** | **1,289,453** |

Notes: Downstream water availability does not include return flows.
The water availability numbers in this table reflect water that is physically present in the region. This does not necessarily mean that this water is available to WUGs for immediate use as defined in *Table 3.30*.
Groundwater availabilities are discussed in Section 3.2.2.

[1] Refer to *Table 3.3* and *Table 3.26* for a breakdown of what is included in the COA ROR rights.
[2] Refer to *Table 3.1* for a detailed breakdown of the Highland Lakes.
[3] Local Supply Sources are presented in *Tables 3.4, 3.5, 3.6, 3.7, 3.8,* and *3.9.*
[4] Includes Lake Brownwood, Brazos River Authority System, Edwards-BFZ Aquifer, and Canyon Lake Reservoir

## 3.3 WHOLESALE WATER PROVIDERS

The RWPGs are required to prepare estimates of the water available to the Wholesale Water Providers within each region. The LCRWPG has identified two Wholesale Water Providers, the LCRA, and the City of Austin. The water supplies available to these two entities are discussed in the following sections.

### 3.3.1 LCRA Water Availability

The LCRA has acquired the rights to significant quantities of water within the LCRWPA. The majority of water that is available to LCRA during a repeat of the drought of record is associated with the Highland Lakes System. However, the LCRA also has two additional smaller reservoirs that it operates in association with two power generating facilities (Fayette Power Project and Sim Gideon/Lost Pines Power Park). In addition, the LCRA has acquired many of the senior rights for irrigation water in the lower basin. *Table 3.24* contains a summary of the water that is available to the LCRA.

**Table 3.24 Total Water Available to the Lower Colorado River Authority (ac-ft/yr)**

| Water Rights Holder | Water Availability During Drought of Record [1] | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| LCRA - Garwood | 130,141 | 130,141 | 130,141 | 130,141 | 130,141 | 130,141 |
| LCRA - Gulf Coast | 44,827 | 43,540 | 43,540 | 43,540 | 43,540 | 43,540 |
| LCRA - Lakeside #1 | 12,531 | 12,498 | 12,498 | 12,498 | 12,498 | 12,498 |
| LCRA - Lakeside #2 | 10,440 | 10,440 | 10,440 | 10,440 | 10,440 | 10,440 |
| LCRA - Pierce Ranch | 14,116 | 14,173 | 14,173 | 14,173 | 14,173 | 14,173 |
| LCRA - Highland Lakes | 402,172 | 390,001 | 384,001 | 378,101 | 372,201 | 366,468 |
| **Totals** | **614,227** | **600,793** | **594,793** | **588,893** | **582,993** | **577,260** |

Data Source: Colorado WAM provided by TCEQ, August 2007, Run 3. WRAP program by Dr. Ralph Wurbs, Texas A&M University, January 2009

Note: Downstream water availability does not include return flows.

[1] The firm yield determinations for the irrigation ROR rights are discussed in Section 3.2.1.1.3 and are presented in *Table 3.3*. The Highland Lakes firm yield determination is discussed in Section 3.2.1.1.1 and is presented in *Tables 3.1*.

The LCRA makes the majority of this water available to other entities for final consumption through water sales contracts. The majority of these water sales contracts are for stored water from the Highland Lakes System. In addition, the LCRA operates three irrigation divisions (Lakeside, Garwood and Gulf Coast) in the lower basin. These divisions provide irrigation water, subject to interruption, for rice production in Colorado, Wharton, and Matagorda Counties. *Table 3.25* contains a summary of current LCRA water supply commitments, including rice irrigation, by Water User Groups.

**Table 3.25 LCRA Water Commitment Summary (ac-ft/yr)**

| County/WUG | Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **Bastrop County** | | | | | | | |
| County-Other | Colorado | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 |
| Steam Electric | Colorado | 16,720 | 16,720 | 16,720 | 16,720 | 16,720 | 16,720 |
| **Burnet County** | | | | | | | |
| Burnet | Colorado | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 |
| Cottonwood Shores | Colorado | 138 | 138 | 138 | 138 | 138 | 138 |

**Table 3.25 LCRA Water Commitment Summary (ac-ft/yr) (Continued)**

| County/WUG | Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Granite Shoals | Colorado | 830 | 830 | 830 | 830 | 830 | 830 |
| Lake LBJ MUD | Colorado | 1,789 | 1,789 | 1,789 | 1,789 | 1,789 | 1,789 |
| Marble Falls | Colorado | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Meadowlakes | Colorado | 75 | 75 | 75 | 75 | 75 | 75 |
| County-Other | Colorado | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 |
| Manufacturing | Colorado | 500 | 500 | 500 | 500 | 500 | 500 |
| **Colorado County** | | | | | | | |
| Irrigation [1] | Colorado | 150,617 | 144,349 | 138,285 | 132,416 | 126,710 | 121,247 |
| **Fayette County** | | | | | | | |
| County-Other | Colorado | 102 | 102 | 102 | 102 | 102 | 102 |
| Steam Electric (LCRA) | Colorado | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 |
| Steam Electric (COA) | Colorado | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| **Gillespie County** | | | | | | | |
| County-Other | Colorado | 56 | 56 | 56 | 56 | 56 | 56 |
| **Hays County** | | | | | | | |
| Dripping Springs | Colorado | 506 | 506 | 506 | 506 | 506 | 506 |
| Dripping Springs WSC | Colorado | 560 | 560 | 560 | 560 | 560 | 560 |
| County-Other | Colorado | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 |
| **Lampasas County (Region G)** | | | | | | | |
| Lometa | Colorado | 882 | 882 | 882 | 882 | 882 | 882 |
| **Llano County** | | | | | | | |
| Kingsland WSC | Colorado | 500 | 500 | 500 | 500 | 500 | 500 |
| Llano | Colorado | 87 | 87 | 87 | 87 | 87 | 87 |
| Sunrise Beach Village [2] | Colorado | 278 | 278 | 278 | 278 | 278 | 278 |
| County-Other | Colorado | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 |
| Steam Electric [3] | Colorado | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 |
| **Matagorda County** | | | | | | | |
| Manufacturing | Brazos-Colorado | 7,438 | 7,438 | 7,438 | 7,438 | 7,438 | 7,438 |
| Manufacturing | Colorado | 6,784 | 6,784 | 6,784 | 6,784 | 6,784 | 6,784 |
| Irrigation [4] | Colorado | 167,952 | 161,883 | 156,037 | 150,437 | 145,048 | 139,853 |
| Steam Electric [5] | Colorado | 27,507 | 32,480 | 32,480 | 32,480 | 32,480 | 32,360 |
| **San Saba County** | | | | | | | |
| County-Other | Colorado | 20 | 20 | 20 | 20 | 20 | 20 |

[1] The Colorado County Irrigation commitment is estimated at 75 percent of the total Colorado County Irrigation demand and includes both supplies from LCRA ROR water rights and supplemental interruptible stored water from the Highland Lakes on an annual contract basis.
[2] The value for Sunrise Beach Village was estimated based upon TCEQ maximum production capacity for system.
[3] The Llano Steam Electric value is based on the authorized annual amount in the water right used by the Ferguson Power Plant instead of the 15,000 ac-ft/yr, which LCRA has in the 1999 WMP.
[4] The Matagorda Irrigation commitment is estimated at 87 percent of the Matagorda County Irrigation demand and includes both supplies from LCRA ROR water rights and supplemental interruptible stored water from the Highland Lakes on an annual contract basis.
[5] The Matagorda Steam Electric value is based on the Region K Cutoff Model Model for the average annual amount of LCRA backup supplies needed to supplement the STPNOC/LCRA water right

**Table 3.25 LCRA Water Commitment Summary (ac-ft/yr) (Continued)**

| County/WUG | Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| **Travis County** | | | | | | | |
| Austin - Municipal [6] | Colorado | 112,410 | 120,534 | 120,534 | 120,534 | 120,534 | 120,521 |
| Austin - Steam Electric [7] | Colorado | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 |
| Barton Creek West WSC | Colorado | 348 | 348 | 348 | 348 | 348 | 348 |
| Bee Cave Village | Colorado | 241 | 241 | 241 | 241 | 241 | 241 |
| Briar Cliff Village | Colorado | 300 | 300 | 300 | 300 | 300 | 300 |
| Cedar Park [8] | Colorado | 670 | 772 | 866 | 925 | 988 | 1,052 |
| The Hills | Colorado | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 |
| Jonestown WSC | Colorado | 460 | 460 | 460 | 460 | 460 | 460 |
| Lago Vista | Colorado | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 |
| Lakeway MUD | Colorado | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 |
| Loop 360 WSC | Colorado | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 |
| Pflugerville | Colorado | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 | 12,000 |
| River Place on Lake Austin | Colorado | 900 | 900 | 900 | 900 | 900 | 900 |
| Travis County WCID #17 | Colorado | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 |
| Travis County WCID #18 | Colorado | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| Travis County WCID #20 | Colorado | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 |
| West Travis County Regional WS [9] | Colorado | 9,101 | 9,101 | 9,101 | 9,101 | 9,101 | 9,101 |
| Williamson-Travis County MUD #1 | Colorado | 482 | 482 | 482 | 482 | 482 | 482 |
| County-Other [10] | Colorado | 19,548 | 19,548 | 19,548 | 19,548 | 19,548 | 19,548 |
| Manufacturing | Colorado | 526 | 526 | 526 | 526 | 526 | 526 |
| **Williamson County (Region G)** | | | | | | | |
| Cedar Park [8] | Brazos | 18,065 | 17,963 | 17,869 | 17,810 | 17,747 | 17,683 |
| Leander | Brazos | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 | 24,000 |
| County-Other | Brazos | 25,000 | 25,000 | 25,000 | 25,000 | 15,000 | 25,000 |
| **Wharton County** | | | | | | | |
| Irrigation [11] | Colorado | 100,642 | 97,043 | 93,570 | 90,224 | 86,997 | 74,751 |
| **TOTAL** | | **819,981** | **817,142** | **801,759** | **786,944** | **772,622** | **739,585** |

[6] The Austin-Municipal value is based on the Region K Cutoff Model for the amount of LCRA backup supplies needed to supplement Austin's municipal water rights.
[7] The Austin-Steam Electric value is based on the Region K Cutoff for the amount of LCRA backup supplies needed to supplement Austin's steam-electric water rights.
[8] Cedar Park is located in both Region K and Region G, and it serves Williamson-Travis Counties MUD #1 (WUG).
[9] West Travis County Regional WS is composed of multiple water user groups including the Village of Bee Cave, Barton Creek West WSC, and Hill Country WSC.
[10] Travis County-Other contains Travis County MUD District #4 who serves Travis County WCID #19 (WUG).
[11] The Wharton Irrigation commitment is estimated at 55 percent of the total Wharton County Irrigation demand and includes both supplies from LCRA ROR water rights and supplemental interruptible stored water from the Highland Lakes on an annual contract basis.

In general, the municipal and manufacturing commitments listed in the table above are considered firm commitments for water, while the water provided by LCRA to irrigation users is on an interruptible supply basis. Based on the LCRA Water Management Plan, the LCRA will release water from storage on an interruptible basis when the levels in the Highland Lakes are above a prescribed level at the beginning of the year. During drought conditions, this water may not be available for users or is available in limited quantities. Therefore, in accordance with the TWDB guidance, interruptible water supplied by LCRA is not being considered as a "currently available water supply." The actual availability of this water will be addressed in Chapter 4 discussing management strategies to meet identified water shortages.

### 3.3.2 City of Austin Water Availability

The City of Austin has run-of-river water rights to divert and use water from the Colorado River. Hydrologic conditions are such that Austin's full authorized diversion amount of water is not available to Austin under these water rights. As a result, the City of Austin has entered into a contract with LCRA to firm up these water rights with water stored in the Highland Lakes. *Table 3.26* contains a summary of the water available to the City of Austin.

**Table 3.26 City of Austin Water Availability (ac-ft/yr)**

| Water Source (Water Right ID Numbers) | Water Rights Holder | Water Supply Source | Water Availability During Drought of Record (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| 61405471005SMRR | COA [1] | ROR-Municipal | 148,431 | 143,846 | 143,846 | 143,846 | 143,846 | 143,859 |
| 61405471005SBU | COA [1] | ROR-Municipal | 49,845 | 48,034 | 48,034 | 48,034 | 48,034 | 48,034 |
| 61405471005LMRR | COA [2] | ROR-Municipal | 9,949 | 8,413 | 8,413 | 8,413 | 8,413 | 8,413 |
| 61405489003M | COA [3] | ROR-Municipal | 4,365 | 4,173 | 4,173 | 4,173 | 4,173 | 4,173 |
| Municipal ROR Subtotal | | | 212,590 | 204,466 | 204,466 | 204,466 | 204,466 | 204,479 |
| | | | | | | | | |
| 61405471005RMBU | COA backup (LCRA) [1] | Highland Lakes | 51,724 | 58,120 | 58,120 | 58,120 | 58,120 | 58,107 |
| 61405471005LMBU | COA backup (LCRA) [2] | Highland Lakes | 11,459 | 12,996 | 12,996 | 12,996 | 12,996 | 12,996 |
| 61405489003MBU | COA backup (LCRA) [3] | Highland Lakes | 15,935 | 16,781 | 16,127 | 16,127 | 16,127 | 16,781 |
| Remaining Contract | LCRA Contract | Highland Lakes | 33,291 | 32,637 | 33,291 | 33,291 | 33,291 | 32,637 |
| LCRA Subtotal | | | 112,410 | 120,534 | 120,534 | 120,534 | 120,534 | 120,521 |
| | | | | | | | | |
| **Municipal & Manufacturing Total** | | | **325,000** | **325,000** | **325,000** | **325,000** | **325,000** | **325,000** |

[1] These two City of Austin ROR Rights and the LCRA backup total 250,000 ac-ft/yr.
[2] The City of Austin ROR Right and the LCRA backup total 21,403 ac-ft/yr.
[3] The City of Austin ROR Right and the LCRA backup total 20,300 ac-ft/yr.

**Table 3.26 City of Austin Water Availability (ac-ft/yr) (Continued)**

| Water Source (Water Right ID Numbers) | Water Rights Holder | Water Supply Source | Water Availability During Drought of Record (Ac-Ft/Yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| 61405471001P (Lady Bird Lake) | COA | ROR-SE [4] | 6,171 | 6,171 | 6,171 | 6,171 | 6,171 | 6,171 |
| 61405471002P (FPP) | COA | ROR-SE | 1,267 | 1,267 | 1,267 | 1,267 | 1,267 | 1,267 |
| 61405489003P (Decker) | COA | ROR-SE | 0 | 0 | 0 | 0 | 0 | 0 |
| 61405489003PBU (Decker) | COA [5] | ROR-SE | 982 | 982 | 982 | 982 | 982 | 982 |
| Steam Electric ROR Subtotal | | | 8,420 | 8,420 | 8,420 | 8,420 | 8,420 | 8,420 |
| | | | | | | | | |
| Decker Contract | LCRA Contract [5] | Highland Lakes | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 |
| FPP & Sandhill Contract | LCRA Contract | Highland Lakes | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| LCRA Steam Electric Subtotal | | | 18,674 | 18,674 | 18,674 | 18,674 | 18,674 | 18,674 |
| | | | | | | | | |
| **Steam Electric Total** | | | **27,094** | **27,094** | **27,094** | **27,094** | **27,094** | **27,094** |
| | | | | | | | | |
| **TOTAL (Municipal & Manufacturing + Stream Electric)** | | | **352,094** | **352,094** | **352,094** | **352,094** | **352,094** | **352,094** |

[4] ROR–SE stands for Run-of-River Steam Electric right.
[5] The Decker ROR right and the LCRA contract total 16,156 ac-ft/yr

The City of Austin provides treated water to customers within its service area. In addition, the City has contracts to provide treated water on a wholesale basis to utility districts and cities in surrounding areas. *Table 3.27* contains a summary of the City of Austin water commitments.

**Table 3.27 City of Austin Water Commitment Summary (ac-ft/yr)**

| Water User Groups (WUGs) | County | Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|
| Austin | Travis | Colorado | 150,180 | 179,861 | 212,133 | 241,074 | 271,296 | 293,095 |
| County-Other [1] (COA Retail portion) | Travis | Colorado | 4,477 | 4,649 | 4,243 | 4,104 | 4,268 | 4,656 |
| Manufacturing [1] (COA portion) | Travis | Colorado | 22,309 | 27,601 | 38,149 | 49,790 | 57,010 | 63,959 |
| Creedmoor-Maha WSC [1] | Travis | Colorado | 596 | | | | | |
| Creedmoor-Maha WSC [1] | Travis | Guadalupe | 16 | | | | | |
| Lost Creek MUD | Travis | Colorado | 935 | 921 | 906 | 891 | 882 | 882 |
| Manor [1] | Travis | Colorado | 1,680 | | | | | |
| Manville WSC [1] | Travis | Colorado | 2,240 | 2,240 | | | | |
| North Austin MUD#1 | Travis | Colorado | 109 | 107 | 106 | 103 | 102 | 102 |
| Rollingwood | Travis | Colorado | 377 | | | | | |
| San Leanna | Travis | Colorado | 100 | | | | | |
| Shady Hollow MUD | Travis | Colorado | 747 | 731 | 716 | 700 | 694 | 694 |
| Wells Branch MUD | Travis | Colorado | 1,508 | 1,490 | 1,472 | 1,444 | 1,435 | 1,435 |
| West Lake Hills | Travis | Colorado | 1,605 | | | | | |
| Windermere Utility [1] | Travis | Colorado | 2,157 | | | | | |
| Austin | Williamson | Brazos | 5,457 | 7,398 | 9,691 | 12,161 | 14,834 | 17,693 |
| County-Other (All COA Retail) | Williamson | Brazos | 2,401 | 2,729 | 3,118 | 3,536 | 3,989 | 4,469 |
| North Austin MUD#1 | Williamson | Brazos | 983 | 968 | 952 | 928 | 920 | 920 |
| **Total** | | | **197,877** | **228,695** | **271,486** | **314,731** | **355,430** | **387,905** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Steam-Electric [2] | Fayette [3] | Colorado | 14,222 | 14,302 | 17,602 | 25,739 | 25,739 | 31,649 |
| Steam-Electric [2] | Travis | Colorado | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| **Total** | | | **31,722** | **32,802** | **40,102** | **49,239** | **53,239** | **60,149** |

[1] These WUGs are also served by other entities.
[2] COA's portion of the STPNOC demand is included in the STPNOC total steam-electric demand in Matagorda County.
[3] COA portion - based on estimated current supply levels and approved projections.

## 3.4 WATER SUPPLIES AVAILABLE TO WATER USER GROUPS

Estimates of the total available supply of water within the LCRWPA during a repeat of the drought of record conditions are presented in Section 3.2. However, the availability of this water to each of the water user groups is dependent upon the WUG's location and the infrastructure capacity or permits/contracts that are in place to move the water where it is needed. The following sections discuss the currently available water supplies for each of the water user groups within the LCRWPA. The water supply amounts presented in this section are a total of permitted/contracted amount and/or infrastructure capacity for each WUG in LCRWPA. The amount presented in Section 3.2 (*Table 3.24*) is the total water available for LCRWPA established through modeling effort or regulatory limit.

The amount of total water supply available to the WUGs in Region K is less than the total available water to the region presented in *Table 3.24*, since the water supply for the WUGs is limited by current supplies owned or controlled by each WUG, location relative to the source, and infrastructure limitations. There is water available in Region K that is not currently being used by WUGs because they do not have the needs right now, or they do not have the means to utilize the source at this time. The following sections present the amount of water supply that is currently available to the WUGs (current permits/contracts and infrastructure capacities).

### 3.4.1 Surface Water Supplies Available to Water User Groups

As previously stated, there are three primary categories of surface water to be considered. The three categories include water stored in reservoirs, run-of-river water rights, and local surface water supplies. The surface water supplies are available to the water user groups in a variety of methods. Many users of water throughout the basin have contracts with one of the two designated Wholesale Water Providers within the Region. Other users of surface water generally obtain water from small reservoirs or from other local sources such as stock ponds. Surface water information was also obtained from the TCEQ Water Utility Database (plant production capacities). If better information was not available the values determined in the 2001 LCRWPG Region K Water Plan were utilized.

Information concerning the available surface water supply for each county within the LCRWPA is presented in *Table 3.28.* Detailed information concerning water supply availability for individual WUGs is presented in *Appendix 3C* in the table *Region K Water Supply Table (by WUG and water source).*

**Table 3.28 Summary of Surface Water Supply to WUGs by County (ac-ft/yr)**

| County | 2010 Supply | 2020 Supply | 2030 Supply | 2040 Supply | 2050 Supply | 2060 Supply |
|---|---|---|---|---|---|---|
| Bastrop | 20,017 | 20,015 | 20,014 | 20,014 | 20,016 | 20,016 |
| Blanco | 1,638 | 1,719 | 1,796 | 1,861 | 1,929 | 2,008 |
| Burnet | 16,006 | 16,231 | 16,461 | 16,678 | 16,958 | 17,057 |
| Colorado | 133,871 | 134,791 | 135,911 | 137,318 | 138,998 | 138,998 |
| Fayette | 45,866 | 45,866 | 45,866 | 45,866 | 45,866 | 45,866 |
| Gillespie | 1,622 | 1,622 | 1,622 | 1,622 | 1,622 | 1,622 |
| Hays | 5,964 | 6,786 | 7,064 | 7,333 | 7,666 | 7,928 |
| Llano | 21,055 | 21,020 | 20,987 | 20,956 | 20,925 | 20,889 |
| Matagorda | 147,759 | 145,660 | 145,660 | 145,660 | 145,660 | 145,540 |
| Mills | 2,702 | 2,702 | 2,700 | 2,700 | 2,700 | 2,699 |
| San Saba | 9,044 | 9,044 | 9,044 | 9,044 | 9,044 | 9,044 |
| Travis | 413,198 | 411,311 | 410,195 | 407,778 | 405,148 | 401,660 |
| Wharton | 65,507 | 65,489 | 65,536 | 65,587 | 65,643 | 65,643 |
| Williamson | 8,841 | 11,095 | 13,761 | 16,625 | 19,743 | 23,082 |
| **Regional Totals** | **893,090** | **893,351** | **896,617** | **899,042** | **901,918** | **902,052** |

Note: The supplies presented in this table are supplies currently available to the WUGs (current contracts and infrastructure capacities). Surface water availability excludes City of Austin return flows.

### 3.4.2 Groundwater Supplies Available to Water User Groups

Groundwater supplies were allocated to the various WUGs within the LCRWPA using data from various sources. Information provided by the water user group was entered when available. Permit information was entered for various groundwater conservation districts, and supplies were estimated based upon the

TCEQ Water Utility Database information (well production capacities). If better information was not available the values determined in the 2001 LCRWPG Region K Water Plan were utilized.

Methodology for the 2001 LCRWPG Region K Water Plan:

The primary source of information is data from the 1997 State Water Plan provided by the TWDB, which shows projected user demands and projected user allocations for the LCRWPA. Most of the groundwater users are found in the TWDB allocation tables; however, additional users are included based on information provided in the TWDB demand tables and the demand projections provided in Chapter 2 of the 2001 LCRWPG Region K Water Plan. The TWDB allocation tables provided data in the form of an allocation percent or allocation limit for each user. To estimate the projected supply of water available to each user from the applicable water sources, the percent allocation value was applied to the amount of available water. The following are exceptions to that methodology:

- When the allocation table provided an estimate representing the limit in ac-ft/year of water available to a user, that number was used for the allocation;

- When a user was not included in the allocation tables but was listed in the demand projections, the values from the projected demand tables were used to represent the supply available to that user;

- When a user was not included in the allocation tables or in the demand projections, but listed in the TWDB demand tables, the values from the demand tables were used to represent the supply available to that user;

- When the TWDB allocation for a user was given as 100 percent of the water available from the associated water source, the resulting value (1.00 x available water from *Section 3.2.2* of the 2001 LCRWPG Region K Water Plan) was reduced by the sum of the supply values listed for other users also drawing from a particular groundwater supply. Example: User "C" is allocated 100 percent of the supply from a particular aquifer. User "A" is allocated an amount "N" from this aquifer and user "B" is allocated an amount "M" also from this aquifer. The total amount available from this aquifer is "Q." Therefore, the availability for the water user is C = Q – N – M.

- When available, results for municipalities were compared with information provided in the 1990 TWDB Facility Plan Summaries. Additionally, users were contacted individually to confirm their current maximum sustainable groundwater supply capacity and the supply estimates were adjusted where appropriate.

Information concerning the available groundwater supply for each county within the LCRWPA is presented in *Table 3.29*. Detailed information concerning water supply availability for individual WUGs is presented in *Appendix 3C* in the table *Region K Water Supply Table (by WUG and water source)*.

**Table 3.29 Summary of Groundwater Supply to WUGs by County (ac-ft/yr)**

| County | 2010 Supply | 2020 Supply | 2030 Supply | 2040 Supply | 2050 Supply | 2060 Supply |
|---|---|---|---|---|---|---|
| Bastrop | 26,485 | 26,168 | 25,814 | 24,865 | 24,974 | 24,830 |
| Blanco | 4,342 | 4,355 | 4,369 | 4,379 | 4,113 | 4,113 |
| Burnet | 7,590 | 7,569 | 7,491 | 7,468 | 7,394 | 7,394 |
| Colorado | 42,458 | 42,458 | 42,458 | 42,458 | 42,458 | 42,458 |
| Fayette | 8,706 | 8,538 | 8,432 | 8,354 | 8,362 | 8,388 |
| Gillespie | 12,500 | 12,500 | 12,500 | 12,500 | 12,500 | 12,500 |
| Hays | 2,860 | 2,860 | 2,860 | 2,860 | 2,852 | 2,852 |
| Llano | 12,090 | 12,090 | 12,090 | 12,090 | 12,090 | 12,090 |
| Matagorda | 38,842 | 38,839 | 38,838 | 38,838 | 38,839 | 38,839 |
| Mills | 2,003 | 2,003 | 1,818 | 1,818 | 1,584 | 1,584 |
| San Saba | 27,753 | 27,753 | 27,753 | 27,753 | 27,753 | 27,753 |
| Travis | 6,456 | 6,705 | 6,890 | 6,978 | 6,927 | 7,057 |
| Wharton | 78,867 | 78,867 | 78,867 | 78,867 | 78,867 | 78,867 |
| Williamson | 147 | 147 | 147 | 147 | 147 | 147 |
| **Regional Totals** | **271,099** | **270,852** | **270,327** | **269,375** | **268,860** | **268,872** |

Note: The supplies presented in this table are supplies currently available to the WUGs (current permits and infrastructure capacities).

### 3.4.3 WUG Water Supply Summary

Information concerning the available water supply to WUGs in each county within the LCRWPA is presented in *Table 3.30.* There is water available in Region K that is not currently being used by WUGs because they do not have the needs right now, or they do not have the means to utilize the source at this time. *Table 3.30* shows the amount of water supply that is currently available to the WUGs (current permits/contracts and infrastructure capacities). As the contracts and permits expire, it is assumed they will be renewed at their currently contracted amount. *Figure 3.13* presents a comparison of the total water supply available to WUGs during the years 2000 and 2060.

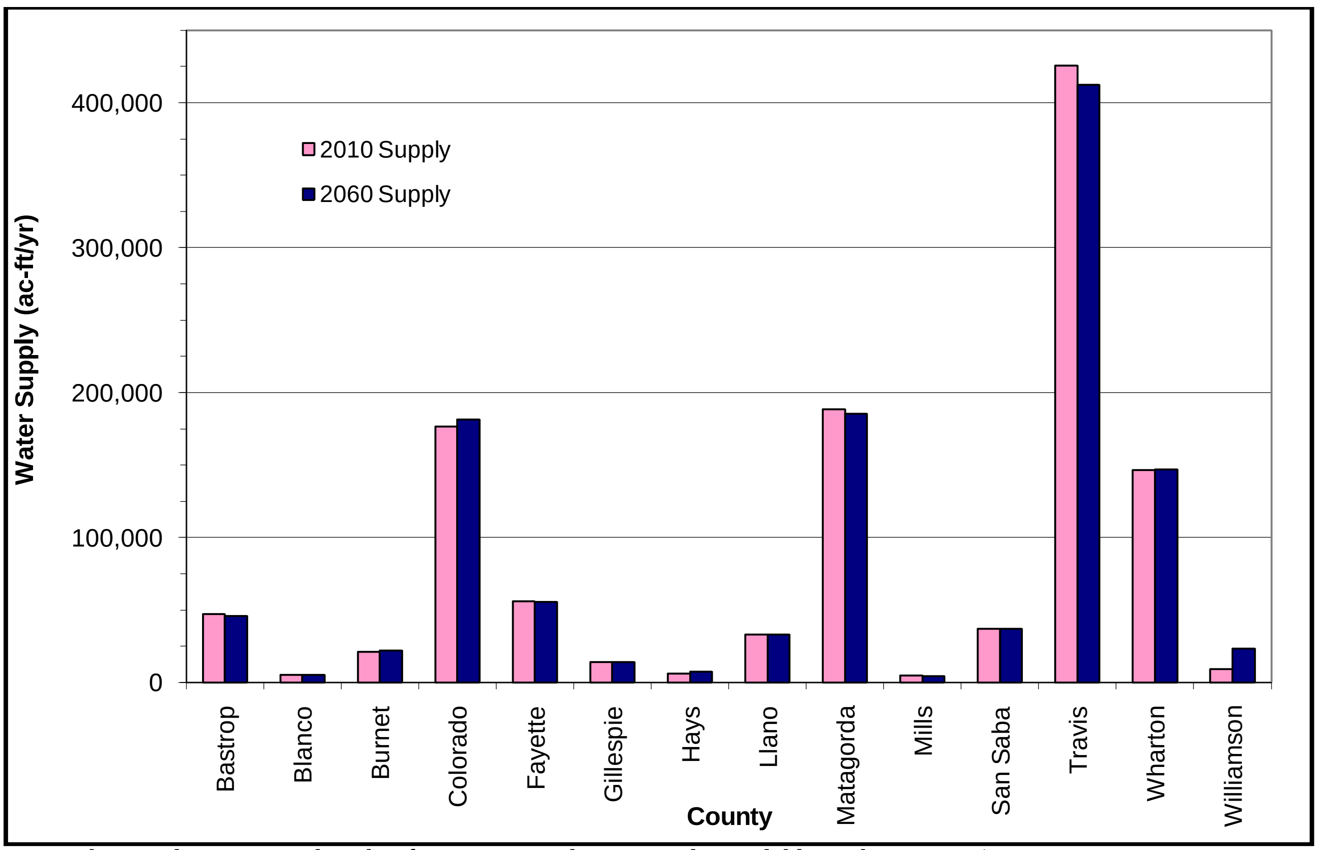
Detailed information concerning water supply available for every individual WUG in Region K is presented in *Appendix 3C* in the table *Region K Water Supply Table (by WUG and water source)*.

**Table 3.30 Total Water Supply to WUGs by County (ac-ft/yr)**

| County | 2010 Supply | 2020 Supply | 2030 Supply | 2040 Supply | 2050 Supply | 2060 Supply |
|---|---|---|---|---|---|---|
| Bastrop | 46,502 | 46,183 | 45,828 | 44,879 | 44,990 | 44,846 |
| Blanco | 5,980 | 6,074 | 6,165 | 6,240 | 6,042 | 6,121 |
| Burnet | 23,596 | 23,800 | 23,952 | 24,146 | 24,352 | 24,451 |
| Colorado | 176,329 | 177,249 | 178,369 | 179,776 | 181,456 | 181,456 |
| Fayette | 54,572 | 54,404 | 54,298 | 54,220 | 54,228 | 54,254 |
| Gillespie | 14,122 | 14,122 | 14,122 | 14,122 | 14,122 | 14,122 |
| Hays | 8,824 | 9,646 | 9,924 | 10,193 | 10,518 | 10,780 |
| Llano | 33,145 | 33,110 | 33,077 | 33,046 | 33,015 | 32,979 |
| Matagorda | 186,601 | 184,499 | 184,498 | 184,498 | 184,499 | 184,379 |
| Mills | 4,705 | 4,705 | 4,518 | 4,518 | 4,284 | 4,283 |
| San Saba | 36,797 | 36,797 | 36,797 | 36,797 | 36,797 | 36,797 |
| Travis | 419,654 | 418,016 | 417,085 | 414,756 | 412,075 | 408,717 |
| Wharton | 144,374 | 144,356 | 144,403 | 144,454 | 144,510 | 144,510 |
| Williamson | 8,988 | 11,242 | 13,908 | 16,772 | 19,890 | 23,229 |
| **Regional Totals** | **1,164,189** | **1,164,203** | **1,166,944** | **1,168,417** | **1,170,778** | **1,170,924** |

Note: The supplies presented in this table are supplies currently available to the WUGs (current permits/contracts and infrastructure capacities).

**Figure 3.14: Total Water Supply to WUGs by County**




Note: The supplies presented in this figure are supplies currently available to the WUGs (current permits/contracts and infrastructure capacities).

# *APPENDIX 3A*

# *WATER RIGHTS HELD IN THE LOWER COLORADO REGIONAL WATER PLANNING AREA*

# *APPENDIX 3B*

# *DESCRIPTION OF REGION K WAM RUN 3 CUTOFF MODEL*

# *APPENDIX 3C*

## *CURRENTLY AVAILABLE WATER SUPPLY TABLES*
## *(by Water Source and WUG)*

# *APPENDIX 3D*

## *WATER AVAILABILITY COMPARISON*
## *(2011 Plan versus 2006 Plan)*

# WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 3448 | JOHN W WHITE | Bastrop | Colorado | Recreation | | 11/15/1976 |
| 3491 | BLUEBONNET LANDOWNERS ASSN INC | Bastrop | Colorado | Recreation | 83 | 3/14/1977 |
| 3849 | DAN L DUNCAN | Bastrop | Guadalupe | Recreation | | 8/30/1976 |
| 5084 | SUN WEST INVESTMENTS INC | Bastrop | Colorado | Irrigation | 4 | 8/14/1986 |
| 5398 | JOHN COLEMAN HORTON III ET AL | Bastrop | Colorado | Irrigation | 120 | 3/31/1954 |
| 5399 | BELLE PENDLETON | Bastrop | Colorado | Irrigation | 26 | 6/30/1955 |
| 5400 | JERRY B DONALDSON | Bastrop | Colorado | Irrigation | 8 | 4/30/1955 |
| 5402 | LLOYD KETHA | Bastrop | Colorado | Irrigation | 348 | 12/31/1905 |
| 5403 | MERLE A PROKOP JR | Bastrop | Colorado | Irrigation | 5 | 7/31/1966 |
| 5404 | TEXAS PARKS & WILDLIFE DEPT | Bastrop | Colorado | Recreation | | 5/19/1969 |
| 5405 | EDWARD L HUGHES | Bastrop | Colorado | Irrigation | 8 | 12/31/1960 |
| 5406 | J B LOVEJOY | Bastrop | Colorado | Irrigation | 2 | 12/31/1962 |
| 5407 | A J ROD | Bastrop | Colorado | Irrigation | 80 | 12/9/1974 |
| 5408 | TEXAS PARKS & WILDLIFE DEPT | Bastrop | Colorado | Recreation | | 8/25/1969 |
| 5411 | MILTON C PETZOLD | Bastrop | Colorado | Irrigation | 15 | 2/23/1970 |
| 5412 | ASSN | Bastrop | Colorado | Recreation | | 4/8/1975 |
| 5413 | CARL DROEMER | Bastrop | Colorado | Irrigation | 61 | 9/16/1974 |
| 5414 | LAKE THUNDERBIRDS OWNERS ASSN INC | Bastrop | Colorado | Recreation | | 10/15/1973 |
| 5415 | INDIAN LAKE OWNERS ASSOCIATION | Bastrop | Colorado | Recreation | | 10/1/1973 |
| 5473 | LOWER COLORADO RIVER AUTHORITY | Bastrop | Colorado | Industrial | 10750 | 3/4/1963 |
| 1468 | MARY O'BOYLE II ENGLISH | Blanco | Colorado | Irrigation | 500 | 4/1/1963 |
| 1470 | TEXAS PARKS & WILDLIFE DEPT | Blanco | Colorado | Irrigation | | 1/1/1967 |
| 1470 | WERNER SCHUMANN | Blanco | Colorado | Irrigation | 50 | 1/1/1967 |
| 1472 | AL LOUIS LINDIG ET UX | Blanco | Colorado | Irrigation | 7 | 1/1/1933 |
| 1473 | JOHN W O'BOYLE JR | Blanco | Colorado | Irrigation | 276 | 1/1/1964 |
| 1477 | KELLER EQUIPMENT COMPANY | Blanco | Colorado | Irrigation | 4 | 12/31/1964 |
| 1478 | JAMES J MOONEY | Blanco | Colorado | Irrigation | 9 | 8/16/1965 |
| 1479 | CITY OF JOHNSON CITY | Blanco | Colorado | Municipal/Domestic | 220 | 11/29/1966 |
| 1480 | W T YETT | Blanco | Colorado | Recreation | | 4/1/1967 |
| 1481 | TEXAS PARKS & WILDLIFE DEPT | Blanco | Colorado | Municipal/Domestic | 30 | 4/24/1972 |
| 1482 | NANCY WARREN FRASHER | Blanco | Colorado | Irrigation | 34 | 9/7/1962 |
| 3673 | GARY & BRUCE GRANBERG | Blanco | Guadalupe | Irrigation | 7 | 2/5/1979 |
| 3728 | STEVE MARSHALL ET AL | Blanco | Guadalupe | Recreation | | 1/7/1980 |
| 3871 | W J HAAS | Blanco | Guadalupe | Irrigation | 12 | 9/30/1957 |
| 3872 | HALL STREET HAMMOND | Blanco | Guadalupe | Irrigation | 20 | 11/25/1974 |
| 3872 | STETLER FAMILY LIVING TRUST | Blanco | Guadalupe | Irrigation | 7 | 11/25/1974 |
| 3872 | THOMAS A SIKES ET AL | Blanco | Guadalupe | Irrigation | 5 | 11/25/1974 |
| 3873 | HENRY & ELSIE LEE MCCLAIN | Blanco | Guadalupe | Irrigation | 49 | 6/30/1957 |
| 3874 | JIMMY C PARKER ET AL | Blanco | Guadalupe | Irrigation | 24 | 11/30/1963 |
| 3875 | MCCOMBS LEGACY LTD | Blanco | Guadalupe | Irrigation | 45 | 5/31/1963 |
| 3876 | NORVAL A HAILE ET UX | Blanco | Guadalupe | Recreation | | 5/28/1974 |
| 3876 | WAYNE A ZERCHER | Blanco | Guadalupe | Recreation | | 5/28/1974 |
| 3876 | WILLIAM W ATWELL | Blanco | Guadalupe | Recreation | | 5/28/1974 |
| 3877 | CITY OF BLANCO | Blanco | Guadalupe | Municipal/Domestic | 600 | 8/29/1955 |
| 3878 | TEXAS PARKS & WILDLIFE DEPT | Blanco | Guadalupe | Recreation | | 5/26/1969 |
| 3879 | STEPHEN E MARSHALL ET UX | Blanco | Guadalupe | Recreation | | 6/14/1976 |
| 3930 | WAYMOND LIGHTFOOT TRUSTEE | Blanco | Guadalupe | Recreation | | 9/20/1982 |
| 3988 | A DEAN MABRY ET AL | Blanco | Guadalupe | Recreation | | 1/10/1983 |
| 4041 | LUXURY TRAILS INCORPORATED | Blanco | Colorado | Recreation | | 5/23/1983 |
| 5556 | CHARLES JAMES TESAR | Blanco | Guadalupe | Irrigation | 20 | 7/31/1996 |
| 2607 | GOODRICH RANCH | Burnet | Colorado | Irrigation | 43 | 3/31/1955 |
| 2608 | GOODRICH RANCH | Burnet | Colorado | Domestic and Livestock Only | | 9/7/1950 |
| 2609 | JAMES BARBER JOHANSON | Burnet | Colorado | Irrigation | 33 | 12/31/1948 |
| 2614 | FAMILY TRUST NO 1 | Burnet | Colorado | Irrigation | 46 | 12/31/1953 |
| 2615 | ESTATE OF KATHLEEN BARNETT | Burnet | Colorado | Irrigation | 150 | 12/31/1959 |
| 2629 | FRITZ & BERNICE BRUNS | Burnet | Colorado | Irrigation | 8 | 12/31/1956 |
| 2630 | AGNES ANDERSON HEFNER ET AL | Burnet | Colorado | Irrigation | 438 | 7/4/1956 |
| 2631 | TEXAS GRANITE CORPORATION | Burnet | Colorado | Industrial | 33 | 5/23/1950 |

# WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 2632 | CITY OF MEADOWLAKES | Burnet | Colorado | Irrigation | 78 | 4/4/1895 |
| 2633 | JOAN BREWER | Burnet | Colorado | Irrigation | 18 | 12/31/1934 |
| 2634 | MOUSTAPHA ABOU-SAMRA ET UX | Burnet | Colorado | Irrigation | 144 | 12/31/1953 |
| 2635 | MARGERY RUTH FELPS TRUST | Burnet | Colorado | Irrigation | 11 | 12/31/1953 |
| 2636 | BILLIE J PRATT | Burnet | Colorado | Irrigation | 2 | 3/31/1966 |
| 2637 | BILLIE J PRATT | Burnet | Colorado | Irrigation | 6 | 3/31/1966 |
| 2638 | BILLIE J PRATT | Burnet | Colorado | Irrigation | 6 | 3/31/1966 |
| 2639 | P H & JANICE L SMITH | Burnet | Colorado | Irrigation | 10 | 3/31/1966 |
| 2640 | R G FUSSELL ET UX | Burnet | Colorado | Irrigation | 10 | 3/31/1966 |
| 2641 | G S ALLEN | Burnet | Colorado | Irrigation | 253 | 2/28/1958 |
| 2642 | D M DOYLE | Burnet | Colorado | Irrigation | 89 | 12/31/1961 |
| 2643 | COSTILLO C LEWIS | Burnet | Colorado | Irrigation | 80 | 4/30/1967 |
| 2989 | CAROLYN SUE CAROTHERS | Burnet | Brazos | Irrigation | 9 | 12/31/1923 |
| 2989 | GARY L REID ET AL | Burnet | Brazos | Irrigation | 19 | 12/31/1923 |
| 2990 | HERBERT A & BARBARA MAAS | Burnet | Brazos | Irrigation | 63 | 4/30/1966 |
| 2991 | SAWTOOTH ENTERPRISES LTD | Burnet | Brazos | Irrigation | 145 | 12/31/1965 |
| 2992 | FLORENCE ELIZABETH BROWN | Burnet | Brazos | Irrigation | 34 | 3/14/1954 |
| 2992 | MARY ANGELINE GAGE | Burnet | Brazos | Irrigation | 34 | 3/14/1954 |
| 2993 | HANSFORD B SMITH ET AL | Burnet | Brazos | Irrigation | 44 | 12/31/1925 |
| 2994 | THOMAS M & BETTY L R SPENCER | Burnet | Brazos | Irrigation | 6 | 12/31/1925 |
| 2995 | MORSE RANCH A PARTNERSHIP | Burnet | Brazos | Irrigation | 120 | 3/7/1966 |
| 2996 | JOHN TAYLOR ET UX | Burnet | Brazos | Irrigation | 56 | 4/1/1966 |
| 3411 | THE MEADOWLAKES COMPANY | Burnet | Colorado | Irrigation | 403 | 11/22/1976 |
| 3735 | HENRY GRADY RYLANDER | Burnet | Brazos | Irrigation | 26 | 6/30/1963 |
| 5116 | BUCKNER BAPTIST BENEVOLENCES INC | Burnet | Colorado | Recreation | | 12/30/1986 |
| 5193 | GREENSMITHS INC | Burnet | Colorado | Other | | 9/6/1988 |
| 5216 | GOLDSTAR INVESTMENTS LTD ET AL | Burnet | Colorado | Domestic and Livestock Only | | 2/10/1989 |
| 5327 | CITY OF BURNET | Burnet | Colorado | Recreation | | 10/26/1990 |
| 5452 | BASKIN FAMILY CAMPS INC | Burnet | Colorado | Recreation | | 2/23/1993 |
| 5478 | LOWER COLORADO RIVER AUTHORITY | Burnet | Colorado | Municipal/Domestic | 1500000 | 3/29/1926 |
| 5479 | LOWER COLORADO RIVER AUTHORITY | Burnet | Colorado | Hydroelectric | | 3/29/1926 |
| 5480 | LOWER COLORADO RIVER AUTHORITY | Burnet | Colorado | Industrial | 15700 | 3/29/1926 |
| 5481 | LOWER COLORADO RIVER AUTHORITY | Burnet | Colorado | Hydroelectric | | 3/29/1926 |
| 5593 | JERRY W GLAZE ET UX | Burnet | Brazos | Irrigation | 130 | 7/1/1997 |
| 2079 | LAKE SHERIDAN ESTATES INC | Colorado | Lavaca | Recreation | | 10/7/1963 |
| 2080 | ENGSTROM BROTHERS PARTNERSHIP | Colorado | Lavaca | Irrigation | 248 | 12/31/1938 |
| 2081 | TRUMAN ENGSTROM JR ET AL | Colorado | Lavaca | Irrigation | 683 | 4/30/1955 |
| 2085 | WILLIAM MARK WIED | Colorado | Lavaca | Irrigation | 13 | 12/31/1962 |
| 2086 | A J RICHTER ET AL | Colorado | Lavaca | Irrigation | 282 | 4/30/1955 |
| 2087 | LEO M KORENEK | Colorado | Lavaca | Irrigation | 84 | 4/30/1946 |
| 2088 | LEO M KORENEK | Colorado | Lavaca | Irrigation | 45 | 4/30/1924 |
| 2089 | LOUIS P HOFFMAN | Colorado | Lavaca | Irrigation | 48 | 5/31/1966 |
| 3415 | MERIDEE BATLA CORLEY | Colorado | Brazos-Colorado | Irrigation | 11 | 5/31/1964 |
| 3415 | ORA LEE BATLA PLENGEMEYER | Colorado | Brazos-Colorado | Irrigation | 14 | 5/31/1964 |
| 3416 | JOHN W ADKINS | Colorado | Brazos-Colorado | Irrigation | 150 | 7/14/1980 |
| 3417 | ALICE M ADKINS ET AL | Colorado | Brazos-Colorado | Irrigation | 150 | 7/14/1980 |
| 3904 | NORBERT WEID AND PAT WISHERT | Colorado | Lavaca | Irrigation | 60 | 11/16/1981 |
| 3906 | HERBERT J & JOSEPHINE POPP | Colorado | Lavaca | Irrigation | 140 | 11/16/1981 |
| 3908 | ELIZABETH B MILLER | Colorado | Lavaca | Irrigation | 279 | 11/16/1981 |
| 5156 | US DEPARTMENT OF THE INTERIOR | Colorado | Brazos-Colorado | Other | | 9/15/1987 |
| 5429 | C G JOHNSON | Colorado | Colorado | Irrigation | 73 | 7/31/1949 |
| 5432 | CHARLES T TREFNY | Colorado | Colorado | Irrigation | 21 | 8/31/1951 |
| 5434 | CITY OF CORPUS CHRISTI | Colorado | Colorado | Municipal/Domestic | 35000 | 11/2/1900 |
| 5434 | LOWER COLORADO RIVER AUTHORITY | Colorado | Colorado | Irrigation | 133000 | 11/1/1900 |
| 5475 | LOWER COLORADO RIVER AUTHORITY | Colorado | Colorado | Irrigation | 131250 | 1/4/1901 |
| 5523 | CLARK & VICKI POWERS | Colorado | Brazos-Colorado | Irrigation | 300 | 3/1/1995 |
| 5728 | CITY OF WEIMAR | Colorado | Colorado | Irrigation | | 1/25/2001 |
| 2075 | H D WRIGHT ET UX | Fayette | Lavaca | Irrigation | 2 | 12/31/1954 |

# WATER RIGHTS
# LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)



| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 2075 | O C TOWNSEND ET UX | Fayette | Lavaca | Irrigation | 2 | 12/31/1954 |
| 3469 | JEAN A PHARR | Fayette | Colorado | Recreation | | 6/14/1976 |
| 3522 | JOHN WETH | Fayette | Colorado | Irrigation | 35 | 6/20/1977 |
| 5410 | FIVE H & ONE LTD | Fayette | Colorado | Recreation | | 2/17/1975 |
| 5416 | CLEAR LAKE PINES MAINTENANCE CORP | Fayette | Colorado | Recreation | | 9/16/1974 |
| 5417 | G W OEDING | Fayette | Colorado | Recreation | | 9/17/1973 |
| 5418 | EDMUND KAPPLER ET AL | Fayette | Colorado | Irrigation | 128 | 2/10/1975 |
| 5420 | WILLIAM GOLDAPP | Fayette | Colorado | Irrigation | 32 | 6/10/1968 |
| 5421 | WILLIE G LEHMANN | Fayette | Colorado | Irrigation | 30 | 5/22/1972 |
| 5422 | ROBERT LEHMANN | Fayette | Colorado | Irrigation | 3 | 6/30/1967 |
| 5423 | CLEAR LAKE PINES INC | Fayette | Colorado | Recreation | | 7/5/1976 |
| 5424 | ERNEST G BARTEK ET UX | Fayette | Colorado | Irrigation | 47 | 7/31/1967 |
| 5425 | CHARLES T TREFNY | Fayette | Colorado | Irrigation | 76 | 7/31/1956 |
| 5426 | HAGEMANN | Fayette | Colorado | Irrigation | 10 | 7/31/1956 |
| 5427 | C A HENSEL | Fayette | Colorado | Irrigation | 14 | 7/31/1956 |
| 5428 | RALPH T JOHNSON ET UX | Fayette | Colorado | Irrigation | 15 | 7/31/1956 |
| 5433 | KELLY K REYNOLDS  TRUSTEE | Fayette | Colorado | Irrigation | 35 | 11/4/1974 |
| 5474 | LOWER COLORADO RIVER AUTHORITY | Fayette | Colorado | Industrial | | 2/3/1975 |
| 1405 | CUATRO ESTRELLAS LTD | Gillespie | Colorado | Irrigation | 10 | 1/1/1959 |
| 1405 | MARY C VEHLE | Gillespie | Colorado | Irrigation | 27 | 1/1/1959 |
| 1405 | R J SECHRIST ET UX | Gillespie | Colorado | Irrigation | 21 | 1/1/1959 |
| 1405 | REDDING RANCH LTD | Gillespie | Colorado | Irrigation | 16 | 1/1/1959 |
| 1406 | REDDING RANCH LTD | Gillespie | Colorado | Irrigation | 8 | 9/30/1957 |
| 1407 | CLETIS GRONA ET AL | Gillespie | Colorado | Irrigation | 11 | 12/31/1940 |
| 1407 | FALCON SEABOARD DIVERSIFIED INC | Gillespie | Colorado | Irrigation | 33 | 12/31/1940 |
| 1407 | PENNY LEIGH GRONA CRENWELGE ET UX | Gillespie | Colorado | Irrigation | 16 | 12/31/1940 |
| 1408 | HERBERT REEH | Gillespie | Colorado | Irrigation | 8 | 12/31/1955 |
| 1409 | KEYSER BIERSCHWALE | Gillespie | Colorado | Irrigation | 13 | 12/31/1958 |
| 1410 | JAY D RUTLEDGE III ET AL | Gillespie | Colorado | Irrigation | 25 | 12/31/1970 |
| 1411 | PAUL D & BETTY MEEK | Gillespie | Colorado | Irrigation | 50 | 12/31/1951 |
| 1412 | C H BONN & SONS | Gillespie | Colorado | Irrigation | 118 | 3/31/1955 |
| 1413 | EDWIN & WERNER HENKE | Gillespie | Colorado | Irrigation | 21 | 9/30/1954 |
| 1414 | ERNEST W KOTT | Gillespie | Colorado | Irrigation | 12 | 12/31/1955 |
| 1415 | STEVE & HILMER JUENKE | Gillespie | Colorado | Irrigation | 13 | 7/1/1974 |
| 1416 | MELVIN BONN ET UX | Gillespie | Colorado | Irrigation | 22 | 4/30/1955 |
| 1417 | ALLEN ROY HENKE ET AL | Gillespie | Colorado | Irrigation | 7 | 5/1/1938 |
| 1417 | E J COP | Gillespie | Colorado | Irrigation | 120 | 5/1/1938 |
| 1417 | ROY RICHARD HENKE | Gillespie | Colorado | Irrigation | 113 | 5/1/1938 |
| 1418 | NATHAN KOTT ET AL | Gillespie | Colorado | Irrigation | 44 | 12/31/1955 |
| 1419 | WALTON HEIMANN | Gillespie | Colorado | Irrigation | 3 | 4/1/1960 |
| 1420 | LILLIAN WISSEMANN ET VIR | Gillespie | Colorado | Irrigation | 10 | 1/10/1967 |
| 1420 | YUCCA LILY LTD | Gillespie | Colorado | Irrigation | 10 | 1/10/1967 |
| 1421 | BRIAN T MCLAUGHLIN | Gillespie | Colorado | Irrigation | 31 | 12/31/1935 |
| 1421 | DONALD M PARRISH ET UX | Gillespie | Colorado | Irrigation | 67 | 12/31/1935 |
| 1422 | WEIRICH BROTHERS INC | Gillespie | Colorado | Mining | 50 | 1/1/1959 |
| 1423 | GREGORY KEITH HAGEL | Gillespie | Colorado | Irrigation | 80 | 4/15/1967 |
| 1424 | THOMAS G LOEFFLER ET UX | Gillespie | Colorado | Irrigation | 33 | 6/30/1964 |
| 1425 | RAY E & ANNETTE GILBERT | Gillespie | Colorado | Irrigation | 2 | 12/31/1963 |
| 1426 | F W BURGESS | Gillespie | Colorado | Irrigation | 17 | 4/30/1963 |
| 1427 | CITY OF FREDERICKSBURG | Gillespie | Colorado | Recreation | | 4/1/1968 |
| 1428 | VAN C BROWN | Gillespie | Colorado | Irrigation | 21 | 12/31/1952 |
| 1429 | CONRAD ERNST | Gillespie | Colorado | Irrigation | 6 | 12/31/1951 |
| 1430 | MILTON C BOOS | Gillespie | Colorado | Irrigation | 25 | 12/31/1950 |
| 1431 | LILLIAN M WISSEMANN | Gillespie | Colorado | Irrigation | 11 | 4/15/1967 |
| 1432 | DAYTON SOLBRIG ET AL | Gillespie | Colorado | Irrigation | 25 | 12/31/1947 |
| 1432 | MARVIN G PIPKIN ET UX | Gillespie | Colorado | Irrigation | 12 | 12/31/1947 |
| 1433 | THEODORE J STEHLING | Gillespie | Colorado | Irrigation | 30 | 1/11/1949 |
| 1434 | DR J HARDIN PERRY | Gillespie | Colorado | Irrigation | 6 | 12/31/1963 |

## WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 1435 | CLEMENS IMMEL ESTATE | Gillespie | Colorado | Irrigation | 12 | 12/31/1957 |
| 1436 | GAY NELL MILLARD ET AL | Gillespie | Colorado | Irrigation | 12 | 5/31/1965 |
| 1437 | DR DOR W BROWN JR | Gillespie | Colorado | Irrigation | 30 | 4/30/1964 |
| 1438 | ALBERT G DWARSHUS JR | Gillespie | Colorado | Irrigation | 3 | 1/1/1952 |
| 1438 | HENRY J FRANTZEN | Gillespie | Colorado | Irrigation | 4 | 1/1/1952 |
| 1438 | LESTER C FRANTZEN | Gillespie | Colorado | Irrigation | 33 | 1/1/1952 |
| 1439 | HILMER WEINHEIMER | Gillespie | Colorado | Irrigation | 221 | 5/31/1948 |
| 1440 | BOOT RANCH DEVELOPMENT LP | Gillespie | Colorado | Irrigation | 121 | 12/31/1943 |
| 1441 | BOOT RANCH DEVELOPMENT LP | Gillespie | Colorado | Irrigation | 34 | 1/1/1943 |
| 1442 | LISTON MANER | Gillespie | Colorado | Irrigation | 12 | 1/1/1940 |
| 1443 | EUGENE PATTESON | Gillespie | Colorado | Irrigation | 13 | 1/1/1966 |
| 1443 | JANICE C PATTESON | Gillespie | Colorado | Irrigation | 0 | 1/1/1966 |
| 1445 | WAYNE E MOHR | Gillespie | Colorado | Mining | 30 | 1/1/1951 |
| 1446 | PARTNERSHIP | Gillespie | Colorado | Irrigation | 45 | 12/31/1964 |
| 1447 | MICHAEL G PAINTER | Gillespie | Colorado | Irrigation | 21 | 8/1/1964 |
| 1448 | VICTOR KLINKSIEK | Gillespie | Colorado | Irrigation | 22 | 1/1/1923 |
| 1449 | DANIEL HOHENBERGER | Gillespie | Colorado | Irrigation | 26 | 1/1/1966 |
| 1450 | CLAYTON KLINKSIEK ET AL | Gillespie | Colorado | Irrigation | 35 | 1/1/1943 |
| 1452 | JEANINE M BELL | Gillespie | Colorado | Irrigation | 19 | 1/1/1952 |
| 1452 | SHEILA E PETSCH | Gillespie | Colorado | Irrigation | 19 | 1/1/1952 |
| 1453 | WILLIE A WEHMEYER JR | Gillespie | Colorado | Irrigation | 41 | 1/1/1964 |
| 1454 | WILLIE A WEHMEYER JR | Gillespie | Colorado | Irrigation | 68 | 1/1/1962 |
| 1456 | ELGIN O BEHRENDS | Gillespie | Colorado | Irrigation | 4 | 1/1/1967 |
| 1456 | MELVIN RAY BEHRENDS | Gillespie | Colorado | Irrigation | 6 | 1/1/1967 |
| 1457 | BERNARD STAUDT ESTATE | Gillespie | Colorado | Irrigation | 14 | 1/1/1965 |
| 1458 | HILMAR O NEBGEN | Gillespie | Colorado | Irrigation | 2 | 8/1/1966 |
| 1459 | RUBEN RUEBSAHM | Gillespie | Colorado | Irrigation | 26 | 1/1/1953 |
| 1460 | CHARLES W KLEIN | Gillespie | Colorado | Irrigation | 10 | 1/1/1948 |
| 1461 | BRYON C HULETT ET UX | Gillespie | Colorado | Irrigation | 13 | 1/1/1966 |
| 1461 | J MIKE HOWARD ET UX | Gillespie | Colorado | Irrigation | 14 | 1/1/1966 |
| 1461 | JOE KIRK FULTON | Gillespie | Colorado | Irrigation | 500 | 1/1/1966 |
| 1461 | THE LBJ COMPANY | Gillespie | Colorado | Irrigation | 3 | 1/1/1966 |
| 1462 | TEXAS PARKS & WILDLIFE DEPT | Gillespie | Colorado | Recreation | | 5/8/1972 |
| 1463 | ERNEST HODGES ESTATE | Gillespie | Colorado | Industrial | 39 | 1/1/1950 |
| 1464 | THE LBJ COMPANY | Gillespie | Colorado | Irrigation | 86 | 1/8/1952 |
| 1465 | US DEPARTMENT OF THE INTERIOR | Gillespie | Colorado | Irrigation | 114 | 1/8/1952 |
| 1466 | JOE KIRK FULTON | Gillespie | Colorado | Irrigation | 16 | 1/1/1952 |
| 1466 | THE LBJ COMPANY | Gillespie | Colorado | Irrigation | 1244 | 1/1/1952 |
| 1466 | US DEPARTMENT OF THE INTERIOR | Gillespie | Colorado | Irrigation | | 1/1/1952 |
| 1467 | AUSTIN INVESTMENTS COMPANY | Gillespie | Colorado | Irrigation | 220 | 1/1/1953 |
| 1467 | US DEPARTMENT OF THE INTERIOR | Gillespie | Colorado | Irrigation | | 1/1/1953 |
| 1469 | TEXAS PARKS & WILDLIFE DEPT | Gillespie | Colorado | Irrigation | 160 | 3/1/1964 |
| 1471 | ESTATE OF J O TANNER | Gillespie | Colorado | Irrigation | 22 | 1/1/1944 |
| 1471 | GEORGE RICHARD TANNER | Gillespie | Colorado | Irrigation | 1 | 1/1/1944 |
| 1471 | KENNETH LINDIG | Gillespie | Colorado | Irrigation | 33 | 1/1/1944 |
| 1474 | KERMIT ECKHARDT | Gillespie | Colorado | Irrigation | 26 | 1/1/1900 |
| 1475 | CHARLES OTTMERS | Gillespie | Colorado | Irrigation | 3 | 1/1/1942 |
| 1476 | JOHNNIE W OTTMERS | Gillespie | Colorado | Irrigation | 3 | 1/1/1966 |
| 1632 | BRADLEY OWEN BAETHGE ET AL | Gillespie | Colorado | Irrigation | 6 | 3/1/1954 |
| 1632 | BYRON KEITH HOOPER ET AL | Gillespie | Colorado | Irrigation | 10 | 3/1/1954 |
| 2619 | BILL TEAGUE | Gillespie | Colorado | Irrigation | 114 | 9/30/1962 |
| 2620 | LEVY ERSCH | Gillespie | Colorado | Irrigation | 1 | 4/30/1966 |
| 2621 | DANIEL J PETERSEN | Gillespie | Colorado | Irrigation | 15 | 12/31/1935 |
| 2622 | LEROY RABKE | Gillespie | Colorado | Industrial | 1 | 9/30/1944 |
| 3405 | DANIEL J PETERSEN | Gillespie | Colorado | Irrigation | 55 | 11/8/1976 |
| 3409 | J D HEXT ESTATE | Gillespie | Colorado | Irrigation | 19 | 11/22/1976 |
| 5427 | CITY OF FREDERICKSBURG | Gillespie | Colorado | Recreation | | 7/15/1992 |
| 4143 | STEVEN R SPRINKEL ET UX | Hays | Colorado | Irrigation | 25 | 6/5/1984 |

# WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 5086 | STEPHEN P CARRIGAN | Hays | Colorado | Irrigation | 88 | 8/15/1986 |
| 5273 | COYOTE CREW RANCH LTD | Hays | Colorado | Irrigation | 60 | 12/18/1989 |
| 5360 | RIVER OAKS RANCH DEVELOPMENT CORP | Hays | Colorado | Recreation | | 5/15/1991 |
| 5387 | JAMES H ARNOLD JR | Hays | Colorado | Irrigation | 61 | 1/13/1965 |
| 5387 | JAMES H ARNOLD JR ET AL | Hays | Colorado | Irrigation | 61 | 1/13/1965 |
| 5387 | WILLIAM H CUNNINGHAM ET UX | Hays | Colorado | Irrigation | 61 | 1/13/1965 |
| 5388 | TRAVIS ALLISON MATHIS | Hays | Colorado | Irrigation | 16 | 7/31/1965 |
| 5389 | ANNA MARIE WIDEN SPEIR ET AL | Hays | Colorado | Irrigation | 5 | 12/31/1939 |
| 5389 | HANCOCK/HANKS INVESTMENTS LTD | Hays | Colorado | Irrigation | 0 | 12/31/1939 |
| 5390 | SLAUGHTER FAMILY RANCH ET AL | Hays | Colorado | Irrigation | 6 | 12/31/1954 |
| 5391 | KATHRYN LAURA NAGEL ELLIOTT | Hays | Colorado | Irrigation | 12 | 5/31/1955 |
| 5696 | ASSOCIATION INC | Hays | Colorado | Recreation | | 8/15/2000 |
| 5768 | FSP DEVELOPMENT OF TEXAS LLC | Hays | Colorado | Recreation | | 3/25/2002 |
| 1571 | KINGSLAND WSC | Llano | Colorado | Municipal/Domestic | 40 | 5/1/1910 |
| 1642 | RANDOLPH C LEIFESTE | Llano | Colorado | Industrial | 5 | 1/1/1956 |
| 1643 | CHARLES T PERKINS JR ET UX | Llano | Colorado | Industrial | 1 | 1/1/1959 |
| 1644 | NORMAN GRENWELGE | Llano | Colorado | Industrial | 30 | 1/1/1947 |
| 1645 | CLYDE C BUSH ET AL | Llano | Colorado | Recreation | | 1/1/1960 |
| 1646 | MRS LUKE MOSS | Llano | Colorado | Recreation | | 1/1/1954 |
| 1647 | MRS RACHEL E JONES TALKINGTON | Llano | Colorado | Irrigation | 15 | 1/1/1900 |
| 1648 | FLOYD KOTHMANN | Llano | Colorado | Irrigation | 2 | 1/1/1930 |
| 1649 | ODIS K JONES | Llano | Colorado | Irrigation | 6 | 1/1/1964 |
| 1650 | CITY OF LLANO | Llano | Colorado | Municipal/Domestic | 400 | 12/10/1956 |
| 1651 | LILA FAYE JOHNSON | Llano | Colorado | Irrigation | 24 | 9/1/1964 |
| 1652 | KENNETH D RHODES ET UX | Llano | Colorado | Irrigation | 11 | 3/1/1966 |
| 1653 | MRS LUKE MOSS | Llano | Colorado | Recreation | | 12/31/1945 |
| 1654 | MAUD MOSS | Llano | Colorado | Recreation | | 1/1/1939 |
| 1655 | CITY OF LLANO | Llano | Colorado | Municipal/Domestic | 1380 | 6/13/1914 |
| 1656 | GUY L CLYMER | Llano | Colorado | Recreation | | 11/29/1946 |
| 1658 | D MALCOLM LONG | Llano | Colorado | Irrigation | 60 | 1/1/1904 |
| 1659 | ROY B SILER | Llano | Colorado | Irrigation | 24 | 9/18/1918 |
| 2610 | T-BAR-O RANCH PARTNERSHIP LTD | Llano | Colorado | Irrigation | 99 | 8/31/1957 |
| 2611 | DRACE WILLIAMS ET AL | Llano | Colorado | Irrigation | 52 | 12/31/1910 |
| 2612 | T M CASH | Llano | Colorado | Irrigation | 12 | 5/31/1955 |
| 2613 | SOUTHERN PACIFIC LINES | Llano | Colorado | Other | 1 | 1/19/1915 |
| 2616 | ANN ETTA HALL | Llano | Colorado | Recreation | | 12/31/1935 |
| 2617 | J A RATLIFF ET AL | Llano | Colorado | Recreation | | 12/31/1950 |
| 2618 | JAMES M INKS ET AL | Llano | Colorado | Recreation | | 12/31/1939 |
| 2623 | CAROLINE OEHLER JOHNSON | Llano | Colorado | Irrigation | 3 | 12/31/1964 |
| 2623 | MARY OEHLER GOFF | Llano | Colorado | Irrigation | 1 | 12/31/1964 |
| 2623 | SAMUEL OEHLER | Llano | Colorado | Irrigation | 3 | 12/31/1964 |
| 2624 | HAROLD DONOVAN HOHMANN ET AL | Llano | Colorado | Irrigation | 7 | 3/31/1966 |
| 2625 | HAROLD DONOVAN HOHMANN ET AL | Llano | Colorado | Irrigation | 6 | 3/31/1966 |
| 2626 | OTTO DOYLE HOHMANN ET UX | Llano | Colorado | Irrigation | 10 | 3/31/1966 |
| 3883 | LAKE LBJ IMPROVEMENT CORP | Llano | Colorado | Irrigation | 750 | 2/17/1982 |
| 4121 | LAKE LBJ INVESTMENT CORPORATION | Llano | Colorado | Recreation | | 4/25/1983 |
| 4152 | LAKE LBJ INVESTMENT CORPORATION | Llano | Colorado | Recreation | | 7/10/1984 |
| 5033 | DEBORAH SLATOR GILLAN ET AL | Llano | Colorado | Domestic and Livestock Only | | 12/12/1985 |
| 3426 | JOHN S RUNNELLS III | Matagorda | Brazos-Colorado | Irrigation | 17 | 3/1/1971 |
| 3426 | TIMOTHY BLAYLOCK ET UX | Matagorda | Brazos-Colorado | Irrigation | 26 | 3/1/1971 |
| 3427 | MICHAEL D STONE | Matagorda | Brazos-Colorado | Irrigation | 24 | 11/7/1977 |
| 3428 | ESTATE OF P J REEVES JR | Matagorda | Brazos-Colorado | Irrigation | 20 | 11/6/1978 |
| 3429 | D R ALFORD | Matagorda | Brazos-Colorado | Irrigation | 40 | 6/27/1977 |
| 3430 | HUDGINS DIVISION OF J D HUDGINS | Matagorda | Brazos-Colorado | Irrigation | 800 | 11/1/1954 |
| 3431 | MICHAEL J PRUETT | Matagorda | Brazos-Colorado | Irrigation | 44 | 8/25/1964 |
| 3431 | SAMANTHA ANNETTE HUDGINS | Matagorda | Brazos-Colorado | Irrigation | 41 | 8/25/1964 |
| 3432 | JOHNNY WAYNE & VICKI LYNN JONES | Matagorda | Brazos-Colorado | Irrigation | 2 | 12/12/1977 |
| 3434 | DONALD R & JANICE M KOPNICKY | Matagorda | Brazos-Colorado | Irrigation | 30 | 10/29/1979 |

# WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 3435 | JOHN A HUEBNER JR ET AL | Matagorda | Brazos-Colorado | Irrigation | 550 | 4/2/1969 |
| 3436 | RUSSELL A & JUANITA L MATTHES | Matagorda | Brazos-Colorado | Irrigation | 880 | 12/16/1974 |
| 3437 | FRANCIS I SAVAGE | Matagorda | Brazos-Colorado | Irrigation | 411 | 9/11/1967 |
| 3437 | O B STANLEY | Matagorda | Brazos-Colorado | Irrigation | 2339 | 9/11/1967 |
| 3438 | E CROSS CATTLE COMPANY INC | Matagorda | Brazos-Colorado | Irrigation | 668 | 6/25/1914 |
| 3439 | E CROSS CATTLE COMPANY INC | Matagorda | Brazos-Colorado | Irrigation | 592 | 6/25/1914 |
| 3795 | LILLIAN G ZERNICEK | Matagorda | Brazos-Colorado | Irrigation | 80 | 12/22/1980 |
| 3846 | LINDA C MOORE | Matagorda | Brazos-Colorado | Irrigation | 90 | 11/9/1981 |
| 3895 | THE MINZE LAND INVESTMENTS LP | Matagorda | Brazos-Colorado | Irrigation | 1000 | 5/17/1982 |
| 3957 | FUTURO FARMS INC | Matagorda | Brazos-Colorado | Irrigation | 450 | 1/10/1983 |
| 3957 | G P HARDY III | Matagorda | Brazos-Colorado | Irrigation | | 1/10/1983 |
| 3967 | BETTY GENE MCAFERTY ET AL | Matagorda | Brazos-Colorado | Irrigation | 35 | 12/20/1982 |
| 3972 | JOHN SCHMERMUND | Matagorda | Colorado-Lavaca | Irrigation | 1500 | 1/31/1983 |
| 3992 | RUNNELLS PASTURE COMPANY LTD | Matagorda | Brazos-Colorado | Irrigation | 219 | 2/28/1983 |
| 4122 | JULIA HOLUB ET AL | Matagorda | Brazos-Colorado | Irrigation | 25 | 11/28/1983 |
| 4207 | DON A CULWELL & LESLIE L APPELT | Matagorda | Colorado-Lavaca | Industrial | 2250 | 1/3/1985 |
| 4780 | MAX CORNELIUS JOHNSON ET AL | Matagorda | Colorado-Lavaca | Irrigation | 400 | 11/24/1969 |
| 4781 | LAWRENCE J PETERSON & WIFE | Matagorda | Colorado-Lavaca | Irrigation | 400 | 1/24/1916 |
| 4782 | FARMERS CANAL COMPANY | Matagorda | Colorado-Lavaca | Irrigation | 120 | 1/24/1916 |
| 4783 | LOUIS F HARPER | Matagorda | Colorado-Lavaca | Irrigation | 301 | 12/31/1961 |
| 4786 | WILLIAM J NAISER | Matagorda | Colorado-Lavaca | Irrigation | 93 | 12/31/1945 |
| 4787 | FARMERS CANAL COMPANY | Matagorda | Colorado-Lavaca | Irrigation | 20615 | 5/31/1909 |
| 4788 | MRS GLEN HUTSON ET AL | Matagorda | Colorado-Lavaca | Irrigation | 7 | 12/31/1956 |
| 4790 | PARTNERSHIP | Matagorda | Colorado-Lavaca | Irrigation | 1500 | 1/12/1976 |
| 5099 | MATAGORDA BAY AQUACULTURE INC | Matagorda | Colorado-Lavaca | Industrial | 316 | 9/25/1986 |
| 5436 | LLP | Matagorda | Colorado | Irrigation | 1443 | 6/26/1914 |
| 5437 | NRG TEXAS LP | Matagorda | Colorado | Industrial | | 6/10/1974 |
| 5437 | AGENT | Matagorda | Colorado | Industrial | | 6/10/1974 |
| 5437 | AGENT ET AL | Matagorda | Colorado | Industrial | 102000 | 6/10/1974 |
| 5438 | MATAGORDA CO DRAINAGE DIST NO 1 | Matagorda | Brazos-Colorado | Other | 260 | 11/17/1992 |
| 5476 | LOWER COLORADO RIVER AUTHORITY | Matagorda | Colorado | Irrigation | 2404680 | 12/1/1900 |
| 5609 | TEXAS BRINE CO LLC | Matagorda | Colorado | Industrial | | 5/28/1998 |
| 5682 | HERFF CORNELIUS | Matagorda | Brazos-Colorado | Irrigation | 2400 | 3/27/2000 |
| 1744 | L L GILGER | Mills | Colorado | Irrigation | 95 | 1/1/1963 |
| 1745 | JOHN JUDSON GRAVES ET AL | Mills | Colorado | Irrigation | 80 | 7/14/1969 |
| 1746 | JOHN JUDSON GRAVES ET AL | Mills | Colorado | Irrigation | 160 | 1/1/1906 |
| 1748 | SLEDGE CATTLE COMPANY INC | Mills | Colorado | Irrigation | 47 | 1/1/1904 |
| 1748 | ZEPHYR LAND COMPANY | Mills | Colorado | Irrigation | 78 | 1/1/1904 |
| 1749 | GENE SLEDGE / SLEDGE CATTLE CO INC | Mills | Colorado | Irrigation | 20 | 11/2/1964 |
| 1750 | J DON WYLIE | Mills | Colorado | Irrigation | 32 | 11/12/1969 |
| 1751 | MARY ALICE STALCUP | Mills | Colorado | Irrigation | 200 | 4/27/1970 |
| 1751 | PEGGY JEAN ROSS | Mills | Colorado | Irrigation | | 4/27/1970 |
| 1752 | P V KING | Mills | Colorado | Irrigation | 127 | 3/1/1973 |
| 1753 | CHARLES & CATHERINE MANGHAM | Mills | Colorado | Irrigation | 52 | 6/9/1969 |
| 1755 | JOHN C SMITH ET AL | Mills | Colorado | Irrigation | 60 | 2/2/1970 |
| 1756 | VIRGIL KEITH ANDERSON ET UX | Mills | Colorado | Irrigation | 16 | 1/1/1964 |
| 1757 | MILLS COUNTY HUNTING & FISHING CLUB | Mills | Colorado | Recreation | | 7/6/1916 |
| 1758 | JAMES R FARMER ET UX | Mills | Colorado | Irrigation | 3 | 8/1/1965 |
| 1759 | W M STANSBERRY | Mills | Colorado | Irrigation | 69 | 3/1/1965 |
| 1760 | DUREN TRUST | Mills | Colorado | Irrigation | 60 | 2/7/1972 |
| 1761 | JERRY L SPRINKLE ET UX | Mills | Colorado | Irrigation | 4 | 1/1/1957 |
| 1762 | DORIS CATHERINE STERLING TRUSTEE | Mills | Colorado | Irrigation | 41 | 1/1/1955 |
| 1920 | WALLACE MADDOX ET AL | Mills | Colorado | Industrial | 14 | 6/3/1914 |
| 2472 | O P LEONARD JR ET UX | Mills | Colorado | Irrigation | 1460 | 12/31/1961 |
| 2524 | PARTNERSHIP | Mills | Colorado | Irrigation | 120 | 12/31/1923 |
| 2526 | W H HICKS | Mills | Colorado | Irrigation | 14 | 5/15/1963 |
| 2527 | CHARLES A HICKS | Mills | Colorado | Irrigation | 14 | 5/15/1963 |
| 2528 | TRUMAN LONG | Mills | Colorado | Irrigation | 203 | 3/4/1916 |

## WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 2532 | A J BECK ESTATE | Mills | Colorado | Irrigation | 90 | 5/7/1973 |
| 2535 | DAVID SWENSON ET AL | Mills | Colorado | Irrigation | 313 | 6/22/1914 |
| 2537 | L I TANNER | Mills | Colorado | Irrigation | 125 | 12/31/1913 |
| 2538 | BILLY W BORHO ET UX | Mills | Colorado | Irrigation | 66 | 5/31/1913 |
| 2538 | GRENETTA BELL BERRY | Mills | Colorado | Irrigation | 17 | 5/31/1913 |
| 2539 | GRENETTA BELL BERRY | Mills | Colorado | Irrigation | 102 | 6/30/1906 |
| 2541 | SHERAL M RAINBOLT ET AL | Mills | Colorado | Irrigation | 57 | 12/31/1905 |
| 2542 | MILDRED HALE CHANEY ET AL | Mills | Colorado | Irrigation | 13 | 8/15/1967 |
| 2543 | BILLY B HALE | Mills | Colorado | Irrigation | 100 | 12/31/1956 |
| 2544 | J WAYNE WILCOX | Mills | Colorado | Irrigation | 16 | 12/31/1957 |
| 2545 | JAMES C BLUE ET UX | Mills | Colorado | Irrigation | 16 | 12/31/1957 |
| 2547 | RYON DUNLAP ET UX | Mills | Colorado | Irrigation | 171 | 9/30/1965 |
| 2549 | O P LEONARD JR ET UX | Mills | Colorado | Irrigation | 249 | 12/31/1905 |
| 2550 | O P LEONARD JR ET AL | Mills | Colorado | Irrigation | 3680 | 12/31/1903 |
| 2551 | WILLIAM HAYDEN COCKRELL ET AL | Mills | Colorado | Irrigation | 81 | 12/31/1926 |
| 2552 | MARTIN HUGHES DVM ET UX | Mills | Colorado | Irrigation | 37 | 12/31/1950 |
| 2552 | ROBERT LEE LONG JR ET UX | Mills | Colorado | Irrigation | 73 | 12/31/1950 |
| 2553 | CITY OF GOLDTHWAITE | Mills | Colorado | Municipal/Domestic | 1750 | 5/6/1960 |
| 2554 | LEE P SHELLBERG TRUSTEE | Mills | Colorado | Irrigation | 24 | 9/27/1949 |
| 2555 | FRED E HARTLEY ET UX | Mills | Colorado | Irrigation | 34 | 2/26/1968 |
| 2556 | A & A LANDSCAPE & IRRIGATION LP | Mills | Colorado | Irrigation | 75 | 12/31/1952 |
| 2565 | THE ESTATE OF OTHEL OTTO SMITH | Mills | Colorado | Irrigation | 100 | 6/30/1964 |
| 2566 | DORTHEY DUCKETT | Mills | Colorado | Irrigation | 159 | 12/31/1952 |
| 2568 | KELLIS LANDRUM | Mills | Colorado | Irrigation | 168 | 12/31/1963 |
| 2569 | MILLS COUNTY STATE BANK | Mills | Colorado | Irrigation | 2 | 12/31/1905 |
| 2569 | R C JOHNSON | Mills | Colorado | Irrigation | 106 | 12/31/1905 |
| 2570 | TRUST | Mills | Colorado | Irrigation | 189 | 12/31/1904 |
| 2570 | MILLS COUNTY STATE BANK | Mills | Colorado | Municipal/Domestic | 277 | 12/31/1904 |
| 2570 | TRUSTEE | Mills | Colorado | Irrigation | 5 | 12/31/1904 |
| 2576 | DONALD D BURNHAM | Mills | Colorado | Irrigation | 84 | 12/31/1941 |
| 2916 | LEE ROY SCHWARTZ | Mills | Brazos | Irrigation | 53 | 5/31/1959 |
| 2917 | WILFORD & RUTH WITZSCHE | Mills | Brazos | Irrigation | 25 | 3/31/1963 |
| 2918 | PAMELA ANN MARWITZ POPE ET AL | Mills | Brazos | Irrigation | 20 | 4/30/1949 |
| 2919 | FRITZ HOPPER | Mills | Brazos | Irrigation | 27 | 4/30/1958 |
| 2920 | DOUG HOPPER | Mills | Brazos | Irrigation | 12 | 5/31/1965 |
| 2955 | MARTIN P SHELTON ET AL | Mills | Brazos | Irrigation | 150 | 7/1/1968 |
| 2957 | HOWARD K MOORE | Mills | Brazos | Irrigation | 65 | 8/31/1940 |
| 5111 | NEW HORIZONS RANCH & CENTER INC | Mills | Colorado | Municipal/Domestic | 15 | 11/24/1986 |
| 1847 | LLANO PARTNERS LTD | San Saba | Colorado | Irrigation | 200 | 1/1/1951 |
| 1856 | JUDY DUNNEGAN | San Saba | Colorado | Irrigation | 16 | 6/26/1914 |
| 1856 | KATHLEEN HAWKINS | San Saba | Colorado | Irrigation | 18 | 6/24/1914 |
| 1857 | MABEL FLEMING | San Saba | Colorado | Irrigation | 6 | 6/24/1914 |
| 1858 | E L BYRD | San Saba | Colorado | Irrigation | 19 | 6/24/1914 |
| 1859 | CHRISTINE DIANE POOL BESSENT ET AL | San Saba | Colorado | Irrigation | 171 | 6/27/1914 |
| 1860 | LARRY BAKER ET UX | San Saba | Colorado | Irrigation | 96 | 6/27/1914 |
| 1861 | WILLARD KEITH BESSENT ET UX | San Saba | Colorado | Irrigation | 20 | 6/27/1914 |
| 1862 | CHRISTINE DIANE POOL BESSENT ET AL | San Saba | Colorado | Irrigation | 28 | 6/27/1914 |
| 1863 | FRANK CHURCHILL ET UX | San Saba | Colorado | Irrigation | 15 | 6/27/1914 |
| 1863 | JIMMY N SHOOK ET AL | San Saba | Colorado | Irrigation | 35 | 6/27/1914 |
| 1864 | DON FOWLER ET UX | San Saba | Colorado | Irrigation | 26 | 4/25/1914 |
| 1864 | SHARON KAY LEWIS | San Saba | Colorado | Irrigation | 7 | 4/25/1914 |
| 1865 | CLARENCE G JOHNSON III | San Saba | Colorado | Irrigation | 15 | 4/25/1914 |
| 1866 | SEIDERS SAN SABA RANCH LTD | San Saba | Colorado | Irrigation | 93 | 1/1/1947 |
| 1867 | JOHNSON REVOCABLE TRUST | San Saba | Colorado | Irrigation | 54 | 1/1/1935 |
| 1868 | JOHNSON REVOCABLE TRUST | San Saba | Colorado | Irrigation | 190 | 1/1/1918 |
| 1869 | CRAIG STENCIL ET UX | San Saba | Colorado | Irrigation | 41 | 1/1/1925 |
| 1869 | HOMER R OWENS ET UX | San Saba | Colorado | Irrigation | 26 | 1/1/1925 |
| 1870 | HOMER R OWENS ET UX | San Saba | Colorado | Irrigation | 88 | 5/2/1914 |

## WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 1871 | LARRY GENE CONNER | San Saba | Colorado | Irrigation | 120 | 1/1/1955 |
| 1872 | TRIPLE M CATTLE COMPANY | San Saba | Colorado | Irrigation | 225 | 6/24/1914 |
| 1873 | EUGENE CONNER | San Saba | Colorado | Irrigation | 104 | 1/1/1952 |
| 1874 | BEN F AMONETT ET AL | San Saba | Colorado | Irrigation | 1 | 1/1/1922 |
| 1874 | DENNIS HARDMAN ET UX | San Saba | Colorado | Irrigation | 34 | 1/1/1922 |
| 1875 | CHARLES B MARTIN JR ET UX | San Saba | Colorado | Irrigation | 114 | 6/22/1914 |
| 1876 | THE ESTATE OF RILEY C HARKEY ET AL | San Saba | Colorado | Irrigation | 142 | 1/1/1922 |
| 1877 | BONNIE HARKEY | San Saba | Colorado | Irrigation | 146 | 11/14/1914 |
| 1878 | THE ESTATE OF RILEY C HARKEY | San Saba | Colorado | Irrigation | 120 | 1/1/1910 |
| 1879 | RANDY KIRK HARKEY ET AL | San Saba | Colorado | Irrigation | 25 | 1/1/1913 |
| 1880 | CHRISTINE BAGLEY EDMONDSON | San Saba | Colorado | Irrigation | 29 | 1/1/1956 |
| 1881 | CHRISTINE BAGLEY EDMONDSON | San Saba | Colorado | Irrigation | 21 | 1/1/1910 |
| 1881 | CONNIE BAGLEY ADAMS | San Saba | Colorado | Irrigation | 37 | 1/1/1910 |
| 1881 | DEAN BAGLEY JR | San Saba | Colorado | Irrigation | 103 | 1/1/1910 |
| 1882 | MARJORIE GUNTER ET AL | San Saba | Colorado | Irrigation | 150 | 1/1/1919 |
| 1883 | ESTATE OF BYRON E & GEORGIA L LEWIS | San Saba | Colorado | Irrigation | 31 | 1/1/1933 |
| 1884 | JAMES B BONHAM CORPORATION | San Saba | Colorado | Irrigation | 72 | 1/1/1963 |
| 1885 | T N WOOD | San Saba | Colorado | Irrigation | 64 | 9/4/1962 |
| 1886 | MAXINE MIFFLETON | San Saba | Colorado | Irrigation | 4 | 1/1/1911 |
| 1886 | RICKY LAMBERT ET UX | San Saba | Colorado | Irrigation | 31 | 1/1/1911 |
| 1886 | RONNIE MCBRIDE ET UX | San Saba | Colorado | Irrigation | 4 | 1/1/1911 |
| 1887 | ROGER RICKY LAMBERT ET UX | San Saba | Colorado | Irrigation | 329 | 1/1/1911 |
| 1888 | SLOAN LIVESTOCK LTD | San Saba | Colorado | Irrigation | 88 | 1/1/1956 |
| 1889 | MRS HOPE CRUTSINGER | San Saba | Colorado | Irrigation | 41 | 1/1/1925 |
| 1890 | THE GREAT SAN SABA RIVER PECAN CO | San Saba | Colorado | Irrigation | 434 | 1/1/1911 |
| 1891 | JOE ROGAN MILLER | San Saba | Colorado | Municipal/Domestic | 118 | 1/1/1921 |
| 1891 | THE ESTATE OF SARA JEAN CAMERON | San Saba | Colorado | Irrigation | 25 | 1/1/1921 |
| 1892 | ESTATE OF JOHN P MCCONNELL JR | San Saba | Colorado | Irrigation | 53 | 1/1/1953 |
| 1892 | JOHNETTE MCCONNELL EARLY ET AL | San Saba | Colorado | Irrigation | 180 | 1/1/1953 |
| 1893 | DEAN BAGLEY JR | San Saba | Colorado | Irrigation | 52 | 1/1/1959 |
| 1894 | GAILIAN DEAN BAGLEY JR | San Saba | Colorado | Irrigation | 272 | 1/1/1913 |
| 1895 | THE GREAT SAN SABA RIVER PECAN CO | San Saba | Colorado | Irrigation | 48 | 1/1/1955 |
| 1896 | GAILIAN DEAN BAGLEY JR | San Saba | Colorado | Irrigation | 64 | 1/1/1950 |
| 1897 | WILTON & BETTY MARTIN | San Saba | Colorado | Irrigation | 80 | 5/16/1914 |
| 1898 | DAVID GILGER | San Saba | Colorado | Irrigation | 40 | 3/30/1914 |
| 1899 | ANITA OWEN | San Saba | Colorado | Irrigation | 340 | 1/1/1929 |
| 1900 | STEVE D STIFFLEMIRE | San Saba | Colorado | Irrigation | 54 | 1/1/1954 |
| 1901 | ROY BAGLEY | San Saba | Colorado | Irrigation | 49 | 1/1/1940 |
| 1902 | JOHN T & GLENNETTA SANDERSON | San Saba | Colorado | Irrigation | 2 | 1/1/1963 |
| 1903 | CITY OF SAN SABA | San Saba | Colorado | Municipal/Domestic | 550 | 6/29/1914 |
| 1904 | WINSTON MIKE MILLICAN | San Saba | Colorado | Irrigation | 5 | 1/1/1966 |
| 1905 | L F & MARY B TOWNSEND | San Saba | Colorado | Irrigation | 38 | 1/1/1912 |
| 1906 | CITY OF SAN SABA | San Saba | Colorado | Irrigation | 54 | 1/1/1920 |
| 1907 | PATSY RAYE MCCONNELL | San Saba | Colorado | Irrigation | 198 | 1/1/1933 |
| 1908 | W L OWEN JR | San Saba | Colorado | Irrigation | 40 | 10/8/1914 |
| 1909 | JOE C SMITH | San Saba | Colorado | Irrigation | 84 | 1/1/1963 |
| 1910 | EDGAR HUBBERT JR ET AL | San Saba | Colorado | Irrigation | 14 | 6/26/1914 |
| 1911 | JIMMY N SHOOK ET AL | San Saba | Colorado | Irrigation | 95 | 1/1/1883 |
| 1912 | J M GAGE JR | San Saba | Colorado | Irrigation | 112 | 1/1/1915 |
| 1913 | EMMETT LEE GRUMBLES | San Saba | Colorado | Irrigation | 270 | 1/1/1932 |
| 1913 | JOHN PAT GRUMBLES | San Saba | Colorado | Irrigation |  | 1/1/1932 |
| 1914 | MARTHA OWEN BURNHAM ET AL | San Saba | Colorado | Irrigation | 207 | 1/1/1931 |
| 1915 | MAX MAHAN | San Saba | Colorado | Irrigation | 220 | 1/1/1918 |
| 1916 | ALAN LANE JOHNSON ET UX | San Saba | Colorado | Irrigation | 103 | 1/1/1908 |
| 1917 | MARTHA OWEN BURNHAM ET AL | San Saba | Colorado | Irrigation | 188 | 1/1/1918 |
| 1918 | MIKE REAVIS ET UX | San Saba | Colorado | Irrigation | 40 | 4/25/1914 |
| 1919 | JIMMIE D SHAHAN | San Saba | Colorado | Irrigation | 15 | 6/3/1914 |
| 1921 | SAN SABA IRREVOCABLE TR AGREEMENT | San Saba | Colorado | Irrigation | 20 | 1/1/1904 |

# WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 1922 | WILLIE MAY SHAHAN | San Saba | Colorado | Irrigation | 40 | 6/3/1914 |
| 1924 | RAYMOND A OLIVER | San Saba | Colorado | Irrigation | 49 | 1/1/1905 |
| 1925 | WILLIE MAY SHAHAN | San Saba | Colorado | Irrigation | 37 | 5/30/1914 |
| 1926 | R L OLIVER ET AL | San Saba | Colorado | Irrigation | 6 | 1/1/1905 |
| 1927 | MARJORIE ANN O'BANNON ALTIZER | San Saba | Colorado | Irrigation | 54 | 1/1/1905 |
| 1928 | ELSIE MILLICAN ET AL | San Saba | Colorado | Irrigation | 118 | 1/1/1905 |
| 2452 | O P LEONARD JR ET AL | San Saba | Colorado | Irrigation | 1302 | 12/31/1864 |
| 2516 | J PHILLIP KEETER | San Saba | Colorado | Irrigation | 12 | 12/31/1966 |
| 2518 | OSCAR L GRANT | San Saba | Colorado | Irrigation | 6 | 12/31/1966 |
| 2519 | JEAN IRBY | San Saba | Colorado | Irrigation | 8 | 12/31/1966 |
| 2525 | C BARTON DRAPER ET UX | San Saba | Colorado | Irrigation | 620 | 12/31/1903 |
| 2529 | T WARD LOCKLEAR | San Saba | Colorado | Irrigation | 239 | 12/31/1924 |
| 2530 | RIVER CREEK LTD | San Saba | Colorado | Irrigation | 41 | 12/31/1904 |
| 2531 | DON TAPP ET UX | San Saba | Colorado | Irrigation | 73 | 12/31/1960 |
| 2531 | PAT REAGAN ET UX | San Saba | Colorado | Irrigation | 55 | 12/31/1960 |
| 2531 | RICHARD M BARNEY | San Saba | Colorado | Irrigation | 28 | 12/31/1960 |
| 2531 | STEWART LIVING TRUST DATED 3/13/02 | San Saba | Colorado | Irrigation | 43 | 12/31/1960 |
| 2533 | KITTY JO SIMPSON CUMMINGS | San Saba | Colorado | Irrigation | 44 | 12/31/1912 |
| 2533 | NANCY C BUSH | San Saba | Colorado | Irrigation | 44 | 12/31/1912 |
| 2533 | ROGER D BUSH ET UX | San Saba | Colorado | Irrigation | 44 | 12/31/1912 |
| 2534 | 1997 | San Saba | Colorado | Irrigation | 156 | 12/31/1955 |
| 2536 | CHARLES E JONES ET UX | San Saba | Colorado | Irrigation | 96 | 12/31/1912 |
| 2536 | THE JOAN PEET MCMULLAN TRUST NO 1 | San Saba | Colorado | Irrigation | 140 | 12/31/1912 |
| 2540 | J C EDMONDSON | San Saba | Colorado | Irrigation | 67 | 12/31/1937 |
| 2546 | KENNETH O O'REAR ET UX | San Saba | Colorado | Irrigation | 1600 | 12/31/1956 |
| 2557 | JOHN W & JEAN BARFIELD | San Saba | Colorado | Irrigation | 16 | 8/31/1928 |
| 2558 | CECIL CAMPBELL | San Saba | Colorado | Irrigation | 71 | 8/31/1928 |
| 2559 | J C & LOUISE OSWALD | San Saba | Colorado | Irrigation | 27 | 8/31/1928 |
| 2560 | ROBERT E & DEBORAH O MILLICAN | San Saba | Colorado | Irrigation | 27 | 8/31/1928 |
| 2561 | CECIL CAMPBELL | San Saba | Colorado | Irrigation | 39 | 8/31/1928 |
| 2562 | JOHN H BANNISTER ET UX | San Saba | Colorado | Irrigation | 47 | 7/31/1913 |
| 2562 | MELBA LOU WHITT ESTATE ET AL | San Saba | Colorado | Irrigation | 49 | 7/31/1913 |
| 2563 | O P LEONARD JR ET AL | San Saba | Colorado | Irrigation | 173 | 12/31/1937 |
| 2564 | HASKEL G HUDSON ET UX | San Saba | Colorado | Irrigation | 606 | 12/31/1929 |
| 2564 | KENDALL C MONTGOMERY ET UX | San Saba | Colorado | Irrigation | 20 | 12/31/1929 |
| 2564 | LUTHER W SIMPSON ET UX | San Saba | Colorado | Irrigation | 474 | 12/31/1929 |
| 2567 | RICHARD TURNER MILLER | San Saba | Colorado | Irrigation | 70 | 6/29/1914 |
| 2571 | JAMES R CROMER | San Saba | Colorado | Irrigation | 113 | 7/31/1965 |
| 2572 | ALTA FERN EDMONDSON FREEMAN ET AL | San Saba | Colorado | Irrigation | 232 | 6/30/1910 |
| 2573 | STEPHEN BURKE ET UX | San Saba | Colorado | Irrigation | 11 | 12/31/1952 |
| 2574 | JOHN J OLIVER | San Saba | Colorado | Irrigation | 45 | 12/31/1911 |
| 2575 | TOMMIE WORTH WOOD ET AL | San Saba | Colorado | Irrigation | 93 | 12/31/1911 |
| 2577 | CHEREE HAMBLEN | San Saba | Colorado | Irrigation | 44 | 12/31/1911 |
| 2578 | SUE BETH O'BANON GRIMES ET AL | San Saba | Colorado | Irrigation | 30 | 12/31/1940 |
| 2582 | DICK GLOVER COMPANY INC | San Saba | Colorado | Irrigation | 71 | 12/31/1905 |
| 2583 | MICHAEL H ROCKAFELLOW ET UX | San Saba | Colorado | Irrigation | 259 | 12/31/1912 |
| 2584 | MYLES D MCDOWELL ET AL | San Saba | Colorado | Irrigation | 96 | 6/23/1914 |
| 2591 | KENNETH R & JUDITH ANNE MCCOY | San Saba | Colorado | Irrigation | 73 | 1/31/1911 |
| 2593 | KENNETH R & JUDITH ANNE MCCOY | San Saba | Colorado | Irrigation | 57 | 9/30/1963 |
| 2595 | WILLIAM G BURGESS ET UX | San Saba | Colorado | Irrigation | 205 | 12/31/1914 |
| 2601 | BOBBY JOHN FOSTER | San Saba | Colorado | Irrigation | 105 | 12/31/1957 |
| 2602 | W D PORCH | San Saba | Colorado | Irrigation | 30 | 6/30/1964 |
| 2603 | JACKIE BRISTER | San Saba | Colorado | Irrigation | 187 | 5/31/1907 |
| 2604 | W N CLARK | San Saba | Colorado | Irrigation | 60 | 5/31/1907 |
| 2606 | ELSIE MILLICAN ET AL | San Saba | Colorado | Irrigation | 18 | 12/31/1961 |
| 5288 | TOMMY LEE JONES ET UX | San Saba | Colorado | Irrigation | 20 | 3/20/1990 |
| 2644 | US FISH & WILDLIFE SERVICE | Travis | Colorado | Irrigation | 28 | 12/31/1954 |
| 2645 | LAGO VISTA INC | Travis | Colorado | Irrigation | 9 | 1/28/1974 |

# WATER RIGHTS
## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 2646 | JAMES L ANDERSON | Travis | Colorado | Irrigation | 0 | 4/30/1964 |
| 2647 | TEX CONF ASSOC SEVENTH DAY ADVENTS | Travis | Colorado | Irrigation | 6 | 4/30/1964 |
| 2648 | SAAAM LTD | Travis | Colorado | Irrigation | 0 | 4/30/1964 |
| 2649 | JAMES L ANDERSON | Travis | Colorado | Irrigation | 10 | 7/31/1963 |
| 2650 | MARVIN T & PEGGY JEAN TALBOTT | Travis | Colorado | Irrigation | 1 | 7/31/1963 |
| 2651 | US FISH & WILDLIFE SERVICE | Travis | Colorado | Irrigation | 14 | 12/31/1954 |
| 3344 | ONION CREEK CLUB INC | Travis | Colorado | Irrigation | 12 | 8/2/1976 |
| 3379 | HYDE PARK BAPTIST CHURCH | Travis | Colorado | Recreation | 64 | 9/13/1976 |
| 3414 | CARROLL & JAMES SANSOM | Travis | Colorado | Irrigation | 200 | 9/27/1976 |
| 3815 | APACHE SHORES INC | Travis | Colorado | Recreation | | 3/30/1981 |
| 3841 | ASSN INC | Travis | Colorado | Irrigation | 76 | 9/21/1981 |
| 4007 | CITY OF CEDAR PARK | Travis | Colorado | Municipal/Domestic | 5600 | 7/18/1983 |
| 4008 | CITY OF AUSTIN / DRAINAGE UTILITY | Travis | Colorado | Recreation | | 4/18/1983 |
| 4025 | THE LAKEWAY COMPANY | Travis | Colorado | Irrigation | | 4/18/1983 |
| 4169 | HURST CREEK MUD OF TRAVIS COUNTY | Travis | Colorado | Irrigation | 1700 | 11/1/1982 |
| 5042 | TEX CONF ASSOC SEVENTH DAY ADVENTS | Travis | Colorado | Recreation | | 1/29/1986 |
| 5058 | HHCC PROPERTIES INC | Travis | Colorado | Recreation | | 5/16/1986 |
| 5070 | THI AUSTIN LP | Travis | Colorado | Recreation | | 6/27/1986 |
| 5095 | NORWOOD/UNITED PARK JOINT VENTURE | Travis | Colorado | Recreation | | 9/8/1986 |
| 5102 | AQUAPLEX INC | Travis | Colorado | Recreation | | 10/8/1986 |
| 5179 | WINDERMERE A JOINT VENTURE AND | Travis | Colorado | Other | | 5/4/1988 |
| 5268 | APPLIED MATERIALS INC | Travis | Colorado | Recreation | | 12/6/1989 |
| 5269 | MARKBOROUGH DEVELOPMENT CO LTD | Travis | Colorado | Recreation | | 12/6/1989 |
| 5368 | 239 RIO VISTA LTD | Travis | Colorado | Irrigation | 14 | 6/30/1954 |
| 5368 | DORIS WILKERSON | Travis | Colorado | Irrigation | 0 | 6/30/1954 |
| 5368 | JAY C CHOWNING ET AL | Travis | Colorado | Irrigation | 0 | 6/30/1954 |
| 5368 | LA/WCD FAMILY WATERWORKS LTD | Travis | Colorado | Irrigation | 2 | 6/30/1954 |
| 5368 | LAKE AUSTIN LAND & CATTLE LTD | Travis | Colorado | Irrigation | 1 | 6/30/1954 |
| 5368 | MICHAEL G MCCARTHY | Travis | Colorado | Irrigation | 1 | 6/30/1954 |
| 5368 | MINI-ME MANAGEMENT LTD | Travis | Colorado | Irrigation | 12 | 6/30/1954 |
| 5368 | ROBERT L STEINER TRUSTEE | Travis | Colorado | Irrigation | 0 | 6/30/1954 |
| 5368 | RONALD LEE FINN | Travis | Colorado | Irrigation | 0 | 6/30/1954 |
| 5368 | LTD | Travis | Colorado | Irrigation | 123 | 6/30/1954 |
| 5368 | THL RANCH LTD | Travis | Colorado | Irrigation | 8 | 6/30/1954 |
| 5369 | BOHLS CATTLE RANCH & INVEST VENTURE | Travis | Colorado | Irrigation | 22 | 12/31/1939 |
| 5371 | MARION FOWLER | Travis | Colorado | Irrigation | 8 | 12/12/1956 |
| 5372 | GEORGE S NALLE JR | Travis | Colorado | Irrigation | 25 | 12/31/1948 |
| 5373 | RANDOLPH G MUELLER ET AL | Travis | Colorado | Irrigation | 11 | 12/31/1966 |
| 5374 | GREAT HILL LTD | Travis | Colorado | Irrigation | 13 | 1/20/1976 |
| 5375 | ROBERT J JOHNSON TRUST NO 1 ET AL | Travis | Colorado | Irrigation | 40 | 8/16/1965 |
| 5376 | HILL COUNTRY GOLF INC | Travis | Colorado | Recreation | | 3/13/1972 |
| 5377 | CITY OF AUSTIN | Travis | Colorado | Recreation | | 3/24/1975 |
| 5378 | BALCONES COUNTRY CLUB | Travis | Colorado | Irrigation | 60 | 8/27/1991 |
| 5379 | ARLENE BOLM FITZPATRICK ET AL | Travis | Colorado | Irrigation | | 6/10/1914 |
| 5379 | EXECUTOR | Travis | Colorado | Irrigation | 1323 | 6/10/1914 |
| 5380 | CAPITOL AGGREGATES LTD | Travis | Colorado | Mining | 2540 | 9/11/1972 |
| 5382 | WILLIAM D MCMORRIS ET AL | Travis | Colorado | Irrigation | 50 | 6/29/1914 |
| 5384 | SHAPARD FARMS | Travis | Colorado | Irrigation | 74 | 6/29/1914 |
| 5385 | WILLIAM D MCMORRIS ET AL | Travis | Colorado | Irrigation | 67 | 3/4/1916 |
| 5386 | TEXAS INDUSTRIES INC | Travis | Colorado | Mining | 110 | 5/25/1970 |
| 5393 | SCHWERTNER FARMS INC | Travis | Colorado | Industrial | 95 | 6/30/1963 |
| 5393 | TRAVIS COUNTY LANDFILL COMPANY LLC | Travis | Colorado | Industrial | 20 | 6/30/1963 |
| 5394 | DAVID & KATHERINE MELLENBRUCH | Travis | Colorado | Irrigation | 150 | 4/25/1899 |
| 5396 | BASTROP ENERGY PARTNERS LP | Travis | Colorado | Irrigation | 180 | 11/12/1913 |
| 5397 | CLARENCE WASHINGTON | Travis | Colorado | Industrial | 17 | 11/20/1967 |
| 5401 | J W SIMECEK | Travis | Colorado | Irrigation | 30 | 4/30/1963 |
| 5471 | CITY OF AUSTIN | Travis | Colorado | Municipal/Domestic | 270403 | 6/30/1913 |
| 5482 | LOWER COLORADO RIVER AUTHORITY | Travis | Colorado | Industrial | 1470 | 3/29/1926 |

## WATER RIGHTS



## LOWER COLORADO REGIONAL WATER PLANNING AREA (REGION K)

| Water Right Number | Owner | County | Basin | Use | Max. Permitted Diversion (ac-ft/yr) | Priority Date |
|---|---|---|---|---|---|---|
| 5483 | NIX O BODDEN ET UX | Travis | Colorado | Irrigation | 1 | 12/31/1961 |
| 5489 | CITY OF AUSTIN | Travis | Colorado | Municipal/Domestic | 36456 | 8/20/1945 |
| 5491 | ROBERT D HEJL | Travis | Colorado | Irrigation | 22 | 12/31/1952 |
| 5542 | WELLS BRANCH MUD | Travis | Colorado | Recreation | | 11/20/1995 |
| 5564 | NATIONAL INSTRUMENTS CORPORATION | Travis | Colorado | Recreation | | 12/9/1996 |
| 5677 | LOWER COLORADO RIVER AUTHORITY | Travis | Colorado | Municipal/Domestic | 6400 | 2/2/2000 |
| 5781 | BAE SYSTEMS | Travis | Colorado | Recreation | | 7/3/2002 |
| 5790 | CITY OF PFLUGERVILLE | Travis | Colorado | Municipal/Domestic | 12000 | 12/20/2002 |
| 5888 | NINE HIDDEN LAKE LTD | Travis | Colorado | Recreation | | 6/6/2005 |
| 3418 | GLEN D LAAS ET UX | Wharton | Brazos-Colorado | Irrigation | 480 | 5/7/1979 |
| 3418 | HARRY H ANDERSON ET UX | Wharton | Brazos-Colorado | Irrigation | 110 | 12/31/1910 |
| 3419 | HARRY H ANDERSON ET UX | Wharton | Brazos-Colorado | Irrigation | 800 | 5/7/1979 |
| 3420 | PEMM PARTNERS LTD | Wharton | Brazos-Colorado | Irrigation | 300 | 9/10/1979 |
| 3421 | CONOCOPHILLIPS CO | Wharton | Brazos-Colorado | Municipal/Domestic | 1000 | 9/13/1928 |
| 3421 | LEONARD WITTIG GRASS FARMS INC | Wharton | Brazos-Colorado | Mining | 1000 | 9/13/1928 |
| 3421 | WHARTON COUNTY GENERATION LLC | Wharton | Brazos-Colorado | Municipal/Domestic | 1600 | 9/13/1928 |
| 3814 | JAMES L FORGASON ET UX | Wharton | Brazos-Colorado | Irrigation | 912 | 3/24/1981 |
| 3816 | CHARLIE F JOCHETZ ET AL | Wharton | Brazos-Colorado | Irrigation | 400 | 5/30/1981 |
| 3847 | S W K LAND COMPANY ET AL | Wharton | Brazos-Colorado | Irrigation | 1011 | 11/30/1981 |
| 3887 | RAYMOND A & JO MARIE RABIUS | Wharton | Brazos-Colorado | Irrigation | 275 | 4/19/1982 |
| 3926 | WAYNE LEE CORMAN ET AL | Wharton | Brazos-Colorado | Irrigation | 300 | 9/7/1982 |
| 3996 | RONALD D & JOHNNIE M CLOUGH | Wharton | Brazos-Colorado | Irrigation | 130 | 2/22/1983 |
| 4177 | WAYNE ALLEN & THERESA A GUESS ET AL | Wharton | Brazos-Colorado | Irrigation | 164 | 9/25/1984 |
| 4229 | MARCIAL SORRELL III TRUSTEE ET AL | Wharton | Brazos-Colorado | Irrigation | 297 | 3/19/1985 |
| 4243 | MERLE T CARLSON ET AL | Wharton | Colorado-Lavaca | Other | 111 | 5/7/1985 |
| 4284 | GARY W ROBERTS & DONALD G ROBERTS | Wharton | Brazos-Colorado | Irrigation | 450 | 7/30/1985 |
| 4288 | LEROY MACHA ET AL | Wharton | Brazos-Colorado | Irrigation | 1151 | 9/3/1985 |
| 4773 | EDMUND HOLUB | Wharton | Colorado-Lavaca | Irrigation | 160 | 12/31/1951 |
| 4774 | JOHN T GANN JR | Wharton | Colorado-Lavaca | Irrigation | 63 | 6/30/1948 |
| 4775 | KATHRYN E ALLEN | Wharton | Colorado-Lavaca | Irrigation | 640 | 12/31/1941 |
| 4776 | JOHN T GANN JR | Wharton | Colorado-Lavaca | Irrigation | 228 | 12/31/1941 |
| 4777 | PATSY RUTH COX CARLQUIST | Wharton | Colorado-Lavaca | Irrigation | 640 | 4/30/1944 |
| 4778 | JAMES R HLAVINKA ET AL | Wharton | Colorado-Lavaca | Irrigation | 1093 | 3/31/1953 |
| 4779 | ELIAS R CALLAHAN ET UX | Wharton | Colorado-Lavaca | Irrigation | 116 | 4/30/1923 |
| 4779 | SOUTH TEXAS RICE INC | Wharton | Colorado-Lavaca | Irrigation | 347 | 4/30/1923 |
| 4784 | PARTNERSHIP | Wharton | Colorado-Lavaca | Irrigation | 324 | 4/30/1944 |
| 4785 | MAREK FARMS | Wharton | Colorado-Lavaca | Irrigation | 26 | 4/30/1944 |
| 5067 | ELIZABETH ANN ULLMAN | Wharton | Brazos-Colorado | Irrigation | 2290 | 6/4/1986 |
| 5067 | OMAR ARLT TRUST | Wharton | Brazos-Colorado | Irrigation | | 6/4/1986 |
| 5067 | ROBERT STRUNK TRUST | Wharton | Brazos-Colorado | Irrigation | | 6/4/1986 |
| 5324 | RABIUS CHILDREN TRUST | Wharton | Brazos-Colorado | Irrigation | 87 | 10/25/1990 |
| 5338 | BERNARD O STONE JR | Wharton | Brazos-Colorado | Irrigation | 420 | 12/19/1990 |
| 5435 | TRI-GEN LAND CORPORATION | Wharton | Colorado | Irrigation | 192 | 12/31/1955 |
| 5459 | S & S FARMS A JOINT VENTURE WITH | Wharton | Brazos-Colorado | Irrigation | 1000 | 4/21/1993 |
| 5477 | LOWER COLORADO RIVER AUTHORITY | Wharton | Colorado | Irrigation | 55000 | 9/1/1907 |
| 5477 | LOWER COLORADO RIVER AUTHORITY | Wharton | Colorado | Municipal/Domestic | | 9/1/1907 |
| 5477 | LOWER COLORADO RIVER AUTHORITY | Wharton | Colorado | Industrial | | 9/1/1907 |
| 5568 | MORRISON TRUST | Wharton | Brazos-Colorado | Irrigation | 1120 | 1/15/1997 |
| 5573 | ANNIE LEE ANSLEY | Wharton | Brazos-Colorado | Irrigation | 1289 | 1/21/1997 |
| 5623 | STEVEN C CALLAWAY ET AL | Wharton | Brazos-Colorado | Irrigation | 185 | 4/6/1999 |
| 5674 | F JOE PREISLER JR ET AL | Wharton | Brazos-Colorado | Irrigation | 152 | 2/4/2000 |
| 5684 | WILLIAM A ANSLEY ET AL | Wharton | Brazos-Colorado | Irrigation | 184 | 5/5/2000 |
| 5685 | MARIE E SIKORA | Wharton | Brazos-Colorado | Irrigation | 33 | 5/5/2000 |
| 5702 | LESLIE W HUDGINS | Wharton | Brazos-Colorado | Irrigation | 217 | 11/1/2000 |
| 5721 | NIZAR MULLANI ET AL | Wharton | Brazos-Colorado | Irrigation | 72 | 11/16/2000 |

# DESCRIPTION OF REGION K WAM RUN 3 CUTOFF MODEL

The TCEQ's Colorado WAM Run 3 (circa September 17, 2007) was used as the base model for constructing the current version of what is referred to as the Region K WAM Run 3 Cutoff Model. This model is believed to be exactly the same as the TCEQ's current Run 3 version of the Colorado Basin WAM, except that it has been modified to reflect historical and existing operations of water rights with respect to reservoirs in the upper basin above Ivie and Brownwood Dams and to be generally consistent with procedures for determining the firm yield of the Highland Lakes as incorporated in the currently effective LCRA 1999 Water Management Plan (WMP). Specifically, the following modifications have been made to the TCEQ model for purposes of Region K planning:

1) The Colorado River Basin has been divided into two subbasins; one above Ivie and Brownwood Dams and one below these dams, with all water rights in the upper basin made senior in priority to all water rights in the lower subbasin while still maintaining priority order among the water rights in each subbasin.
2) The interruptible supply of water from the Highland Lakes that is authorized under the LCRA 1999 WMP for supplementing the water supply of downstream run-of-the-river water rights has been eliminated to reflect future firm yield operation of the Highland Lakes in accordance with policies incorporated in the WMP.
3) In accordance with provisions of the 2006 Settlement Agreement between the LCRA and the South Texas Project (STP), the available supply of run-of-river water for STP under Certificate of Adjudication No. 14-5437 is authorized at 102,000 ac-ft/yr (excluding Highland Lakes backup water), and the available supply of backup water for STP from the Highland Lakes is limited to 20,000 ac-ft/yr (as a 5-year rolling average) with two generating units in operation (as will be the case through the year 2015 according to STP) and to 40,000 ac-ft/yr (as a 5-year rolling average) with any additional generating units in operation (beginning in the year 2016 according to STP). In the WAM, water requirements for STP in excess of these limits are assumed to be obtained from external sources other than the Colorado River.
4) While the combined effects of these modifications to the model have resulted in changes in the overall available supply of water for various users in the basin, the authorized diversion amount (demand) for the LCRA "uncommitted card" (WAM Water Right ID No. 61405482001C) is still set at 132,000 ac-ft/yr in order to maintain the Highland Lakes system in a firm yield condition in accordance with WMP procedures.

Following is a summary of specific features and information regarding the Region K WAM Run 3 Cutoff Model as it currently exists:

1) All water rights in the entire Colorado River Basin and the Colorado-Brazos Coastal Basin (San Bernard River) are individually represented and simulated in accordance with their full authorized diversion and reservoir storage amounts.

2) All streamflow restrictions and environmental flow requirements stipulated in individual water rights, including the LCRA 1999 WMP, that limit diversions and/or reservoir storage are accounted for in the model.

3) Simulations with the WAM are made using a monthly time step over the entire period from 1940 through 1998.

4) Monthly naturalized streamflows are input to the model at primary control points (gaging stations) for the entire 1940-1998 simulation period and used to describe the available naturalized flows at all water right locations based on drainage area ratios.

5) The original naturalized flows for September 1952 for all primary control points on the mainstem of the Colorado River from Mansfield Dam to the Gulf of Mexico have been reduced by 300,000 acre-feet to reflect an adjustment in the original procedures used to estimate inflows to Lake Travis from its upstream ungaged watershed.

6) The area-capacity relationships for all reservoirs represented in the model correspond to authorized conservation storage quantities stipulated in existing water rights; however, for purposes of evaluating future water supply strategies, these area-capacity relationships will be adjusted to reflect future sedimentation conditions in the reservoirs corresponding to the future demand (decade) conditions being analyzed.

7) Bay and estuary (B&E) freshwater inflow requirements for Critical and Target conditions as stipulated in the LCRA 1999 WMP are fully engaged in the model based on the 1997 FINS criteria, including the Buchanan-Travis combined storage triggers for determining when Highland Lakes water is made available for satisfying the various B&E inflow needs. For purposes of evaluating future water supply strategies, alternative B&E inflow requirements may be used such as the 2006 FINS criteria or the LCRA/SAWS Water Project bay health criteria.

8) Instream environmental flow requirements at various locations along the Lower Colorado River are represented in the model in accordance with the LCRA 1999 WMP, including the Buchanan-Travis combined storage triggers for determining when Highland Lakes water is made available for satisfying the various instream environmental flow needs.

9) Annual and multi-year environmental flow caps from the LCRA 1999 WMP are included in the model for limiting the use of Highland Lakes water for satisfying instream and B&E environmental flow requirements. For purposes of evaluating future water supply strategies, it is anticipated that these caps will be eliminated from the model because the need for environmental flows will change as other demands for water from the Highland Lakes change in the future.

10) In accordance with the restructuring of the model for Region K planning, no interruptible water from the Highland Lakes is provided for supplying the demands of any water rights in the lower basin. For purposes of evaluating future water supply strategies, it is anticipated that interruptible water from the Highland Lakes will be provided for supplying demands in the lower basin in order to be more consistent with actual system operations and that appropriate irrigation demand curtailment procedures will be used in accordance with current WMP practices.

11) Water demands for LCRA's four lower basin irrigation operations are set at the annual diversion amounts authorized in the existing water rights for these operations, which totals

636,750 ac-ft/yr; however, for purposes of evaluating future water supply strategies, these irrigation water demands will be reduced to levels consistent with anticipated future usage and may be varied annually and monthly as a function of weather conditions.

12) Unless specified otherwise in a particular water right, no Municipal or Industrial return flows, including those from the City of Austin, are accounted for in the model. Municipal or Industrial return flows may be addressed as part of future water supply strategies.

13) No Irrigation return flows are discharged into the Colorado River or any of its tributaries in the model. Irrigation return flows may be addressed as part of future water supply strategies.

14) In accordance with provisions in water rights owned by Austin and LCRA, Austin's most senior water authorizing the diversion of 250,000 ac-ft/yr from the Colorado River is designated as being senior in priority to all of LCRA's water rights, with the exception of the Garwood right, even though some of LCRA's water rights have priority dates older than the Austin senior water right.

15) The provisions of the recent Settlement Agreement between the LCRA and the City of Austin are not represented in the model, but may be incorporated as part of the evaluation of future water supply strategies.

16) The provisions of the recent Settlement Agreement between LCRA and the South Texas Project are represented in the model.

17) Operating rules for Lakes Buchanan and Travis maintain consistent levels of drawdown in each of the reservoirs under specified demands, with Lake Buchanan serving as the last source of water for meeting demands during extreme drought conditions. Reservoir operating rules may change as part of the evaluation of future water supply strategies.

18) No existing term permits for water rights are included in the model.

# LOWER COLORADO REGIONAL WATER PLANNING GROUP

John E. Burke, P.E.
Chairman

P.O. Drawer P
Bastrop, TX 78602

Phone: 512/303-3943
Fax: 512/303-4881

February 22, 2008

Mr. Kevin Ward
Executive Administrator
Texas Water Development Board
Stephen F. Austin Bldg.
P.O. Box 13231
Austin, Texas 78711-3231

**Subject: Request by the Lower Colorado Regional Water Planning Group (Region K) to use a model other than the TCEQ WAM Run 3 for determining availability of surface water resources**

Dear Mr. Ward:

During the last round of regional water planning, it was determined very late in the planning effort that the required TCEQ WAM Run 3 did not adequately reflect the historical operation of water rights and existing contractual commitments in the Colorado River Basin. To remedy the situation, Region F developed a modeling process called the Region F No-Call Run 3 WAM that was used by Region K to determine its surface water availability numbers. Results from the Region F model were presented in the 2006 Region K Plan and used to evaluate some of Region K's water management strategy needs. However, there were several issues and concerns that Region K had with the Region F model and its assumptions but there was not sufficient time or budget to resolve such.

Because of these issues and concerns, Region K applied for and received first round funding to fully evaluate which model it should use in its future planning efforts in determining surface water availability. Region K's Water Modeling Committee fully evaluated all of the modeling platforms which are capable of providing such analyses. After an extensive review, the Modeling Committee and subsequently the full Region K planning group adopted LCRA's No-Call Run 3 WAM (Region K WAM Run 3 Cutoff Model) as the model that most reflects the existing contractual commitments and historic operation of the water rights in the basin. The LCRWPG officially approved, at its most recent meeting on January 9, 2008, the use of the model as the base platform for determining surface water availabilities. Region K has been in contact with the consultant for Region F regarding Region K's use of the Region K WAM Run 3 Cutoff model. We do not anticipate that there will be significant conflicts between the two regions with respect to this model's use.

The Region K WAM Run 3 Cutoff Model uses the base TCEQ WAM 3 model with several modifications as described in the attached document by TRC/Brandes, entitled *Description of Region K WAM Run 3 Cutoff Model.* The model will be adjusted for sedimentation when determining the availabilities for the years 2010 through 2060.

Our Water Modeling Committee has reviewed all of the assumptions that are currently embedded in the Region K WAM Run 3 Cutoff Model and agrees with them. This is the model that Region K proposes to use to determine surface water availability under its first round funded tasks items for this planning cycle. We are happy to provide you with a copy of the model for your review.

If the Board has any issues or concerns with Region K's use of this particular model, we would appreciate hearing back as quickly as possible. Developing the scope of work for the next biennium will need to begin shortly, and the Board's decision on the use of this model for planning purposes could significantly affect the scope.

Very Truly Yours,

John E. Burke, Chairman
Lower Colorado Regional Water Planning Group

JEB/cb

Enclosure: *Description of Region K WAM Run 3 Cutoff Model*
CD containing the Region K WAM Run 3 Cutoff model

c: Mr. David Meesey, TWDB

TEXAS WATER DEVELOPMENT BOARD



March 11, 2008

Mr. John E. Burke, P.E.
Chairman, Lower Colorado Regional Water Planning Group
P.O. Drawer P
Bastrop, Texas 78602

John
~~Dear Mr. Burke:~~

Thank you for your letter dated February 22, 2008 in which you requested permission to use a modified surface water availability model, termed the "Region K WAM Run 3 cutoff model", in the current phase of regional water planning. Approval by the Texas Water Development Board's (TWDB) Executive Administrator for use of a locally-modified water availability model is required by the regional planning grant contract between the TWDB and the political subdivision for your planning group. Because of problems experienced in the last round of regional water planning with the base model, region-specific modifications were made which resulted in the "cutoff model."

After a review of the proposed model by our Surface Water Resources Division, the TWDB agrees that the "Region K WAM Run 3 cutoff model" is an appropriate tool for your region to use in determining surface water availability during the current planning cycle. Use of this model is approved for development of the 2011 Region K plan.

We appreciate your ongoing commitment to regional water planning. If you have any questions, please contact Mr. David Meesey, Team Leader for State and Regional Water Planning, at (512) 936-0852.

Sincerely,

J. Kevin Ward
Executive Administrator

# SUMMARY OF REGION K WAM MODELING ASSUMPTIONS REGARDING SUPPLY AND STRATEGY ANALYSES

| NO. | ASSUMPTION | INCLUDE FOR SUPPLY ANALYSIS | INCLUDE FOR STRATEGY ANALYSIS |
|---|---|---|---|
| 1 | Use of Natural Priority for All Upstream Water Rights | No | No |
| 2 | Use of 1999 Water Management Plan Environmental Flow Caps | Yes | No |
| 3 | Use of Pending 2003 Water Management Plan Environmental Flow Caps | No | No |
| 4 | Use of Reservoir Area-Capacity Relationships Reflecting Future Sedimentation Conditions by Decade | Yes | Yes |
| 5 | Use of 1997 FINS Criteria for B&E Inflow Requirements | Yes | No |
| 6 | Use of 2006 FINS Criteria for B&E Inflow Requirements | No | Yes [1] |
| 7 | Use of 1999 Water Management Plan Instream Flow Criteria | Yes | Yes |
| 8 | Simulate Interruptible Water from the Highland Lakes | No | Yes |
| 9 | Include Curtailment of Total Demand of LCRA Interruptible Water Users as Necessary to Satisfy LCRA Municipal/Industrial Demands | No | Yes |
| 10 | Set Irrigation Demands Associated with LCRA Lower-Basin Run-of-River Rights Equal to Full Authorized Diversion Amounts | Yes | No |
| 11 | Set Irrigation Demands Associated with LCRA Lower-Basin Run-of-River Rights Equal to Projected Future Demands | No | Yes |
| 12 | Apply Weather-Variable Irrigation Demands for LCRA Lower-Basin Run-of-River Rights | No | Yes |
| 13 | Include LCRA Irrigation Return Flows to the Colorado River | No | Yes |
| 14 | Include Reuse Provisions of LCRA-Austin 2007 Settlement Agreement, Including Environmental Flow Mitigation | No | No [2] |
| 15 | Include Return Flows from Municipal/Industrial Wastewater Treatment Plants | No | No [2] |
| 16 | Include Provisions of LCRA-STP 2006 Settlement Agreement | Yes | Yes |
| 17 | Include Operating Rules for Lakes Buchanan and Travis to Maintain Consistent Levels of Drawdown in the Lakes | Yes | Yes |
| 18 | Assist in Meeting Junction and Brady Future Water Demands in Region F | No | As a Strategy [3] |
| 19 | Include Term Permits as Water Demands | No | No |

[1] The 2006 Freshwater Inflow Needs Study criteria have been approved by the State agencies, but have not been included in any permit or Water Management Plan. They will be applied to the Highland Lakes for the Strategy Analysis, but they will be considered on a case-by-case basis for their application to individual strategies.

[2] Only as part of the LSWP Model

[3] Only at the request of the Region F Water Planning Group.

## Region K Current Water Availability Sources

| Source Name | Source Type | Source RWPG | Source County | Source Basin | Source Identifier | Water Availability (ac-ft/yr) Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| City of Austin - ROR (Municipal) | 0 | K | | Colorado | 3461405471A | 208,225 | 200,293 | 200,293 | 200,293 | 200,293 | 200,306 | REGION K WAM CUTOFF MODEL |
| City of Austin - ROR (Municipal) | 0 | K | | Colorado | 3461405489A | 4,365 | 4,173 | 4,173 | 4,173 | 4,173 | 4,173 | REGION K WAM CUTOFF MODEL |
| City of Austin - ROR (Steam Elec.) | 0 | K | | Colorado | 3461405471A-SE | 7,438 | 7,438 | 7,438 | 7,438 | 7,438 | 7,438 | REGION K WAM CUTOFF MODEL |
| City of Austin - ROR (Steam Elec.) | 0 | K | | Colorado | 3461405489A-SE | 982 | 982 | 982 | 982 | 982 | 982 | REGION K WAM CUTOFF MODEL |
| LCRA - Garwood ROR | 0 | K | | Colorado | 3461405434A | 130,141 | 130,141 | 130,141 | 130,141 | 130,141 | 130,141 | REGION K WAM CUTOFF MODEL |
| LCRA - Gulf Coast ROR | 0 | K | | Colorado | 3461405476A | 44,827 | 43,540 | 43,540 | 43,540 | 43,540 | 43,540 | REGION K WAM CUTOFF MODEL |
| LCRA - Lakeside ROR | 0 | K | | Colorado | 3461405475 | 22,971 | 22,938 | 22,938 | 22,938 | 22,938 | 22,938 | REGION K WAM CUTOFF MODEL |
| LCRA - Pierce Ranch ROR | 0 | K | | Colorado | 3461405477 | 14,116 | 14,173 | 14,173 | 14,173 | 14,173 | 14,173 | REGION K WAM CUTOFF MODEL |
| STP Nuclear Operating Co. - ROR | 0 | K | | Colorado | 3461405437 | 51,857 | 46,072 | 46,072 | 46,072 | 46,072 | 46,072 | REGION K WAM CUTOFF MODEL |
| San Bernard ROR | 0 | K | | Brazos-Colorado | 3461303421 | 665 | 597 | 597 | 597 | 597 | 597 | REGION K WAM CUTOFF MODEL |
| Goldthwaite Reservoir | 0 | K | | Colorado | 14350 | 0 | 0 | 0 | 0 | 0 | 0 | REGION K WAM CUTOFF MODEL |
| Highland Lakes | 0 | K | | Colorado | 140B0 | 402,172 | 390,001 | 384,001 | 378,101 | 372,201 | 366,468 | REGION K WAM CUTOFF MODEL |
| Llano Reservoir | 0 | K | | Colorado | 14520 | 0 | 0 | 0 | 0 | 0 | 0 | REGION K WAM CUTOFF MODEL |
| Blanco Reservoir | 0 | K | | Guadalupe | 18120 | 596 | 596 | 596 | 596 | 596 | 596 | TCEQ WAM |
| Irrigation Local Supply | 0 | K | Bastrop | Brazos | 011996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Bastrop | Colorado | 011996 | 786 | 786 | 786 | 786 | 786 | 786 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Bastrop | Guadalupe | 011996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Blanco | Colorado | 016996 | 67 | 67 | 67 | 67 | 67 | 67 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Blanco | Guadalupe | 016996 | 9 | 9 | 9 | 9 | 9 | 9 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Burnet | Brazos | 027996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Burnet | Colorado | 027996 | 276 | 276 | 276 | 276 | 276 | 276 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Colorado | Brazos-Colorado | 045996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Colorado | Colorado | 045996 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Colorado | Lavaca | 045996 | 4,002 | 4,002 | 4,002 | 4,002 | 4,002 | 4,002 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Fayette | Brazos | 075996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Fayette | Colorado | 075996 | 534 | 534 | 534 | 534 | 534 | 534 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Fayette | Guadalupe | 075996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Fayette | Lavaca | 075996 | 20 | 20 | 20 | 20 | 20 | 20 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Gillespie | Colorado | 086996 | 880 | 880 | 880 | 880 | 880 | 880 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Gillespie | Guadalupe | 086996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Hays | Colorado | 105996 | 41 | 41 | 41 | 41 | 41 | 41 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Llano | Colorado | 150996 | 440 | 440 | 440 | 440 | 440 | 440 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Matagorda | Brazos-Colorado | 161996 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Matagorda | Colorado | 161996 | 900 | 900 | 900 | 900 | 900 | 900 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Matagorda | Colorado-Lavaca | 161996 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Mills | Brazos | 167996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Mills | Colorado | 167996 | 2,378 | 2,378 | 2,378 | 2,378 | 2,378 | 2,378 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | San Saba | Colorado | 206996 | 8,800 | 8,800 | 8,800 | 8,800 | 8,800 | 8,800 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Travis | Brazos | 227996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Travis | Colorado | 227996 | 756 | 756 | 756 | 756 | 756 | 756 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Travis | Guadalupe | 227996 | 124 | 124 | 124 | 124 | 124 | 124 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Wharton | Brazos-Colorado | 241996 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Wharton | Colorado | 241996 | 7,650 | 7,650 | 7,650 | 7,650 | 7,650 | 7,650 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Wharton | Colorado-Lavaca | 241996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Irrigation Local Supply | 0 | K | Williamson | Colorado | 246996 | 0 | 0 | 0 | 0 | 0 | 0 | TWDB IRLS table |
| Livestock Local Supply | 0 | K | | Brazos | 12997 | 566 | 566 | 566 | 566 | 566 | 566 | 2001 Plan: Sum of Demands |
| Livestock Local Supply | 0 | K | | Brazos-Colorado | 13997 | 394 | 394 | 394 | 394 | 394 | 394 | 2001 Plan: Sum of Demands |
| Livestock Local Supply | 0 | K | | Colorado | 14997 | 6,262 | 6,262 | 6,262 | 6,262 | 6,262 | 6,262 | 2001 Plan: Sum of Demands |
| Livestock Local Supply | 0 | K | | Colorado-Lavaca | 15997 | 289 | 289 | 289 | 289 | 289 | 289 | 2001 Plan: Sum of Demands |
| Livestock Local Supply | 0 | K | | Guadalupe | 18997 | 298 | 298 | 298 | 298 | 298 | 298 | 2001 Plan: Sum of Demands |
| Livestock Local Supply | 0 | K | | Lavaca | 16997 | 649 | 649 | 649 | 649 | 649 | 649 | 2001 Plan: Sum of Demands |
| Other Local Supply | 0 | K | | Brazos-Colorado | 13999 | 1,696 | 1,746 | 1,793 | 1,844 | 1,900 | 1,900 | TWDB |
| Other Local Supply | 0 | K | | Colorado | 14999 | 19,282 | 20,890 | 22,717 | 24,883 | 27,470 | 27,470 | TWDB |
| Carrizo-Wilcox | 1 | K | Bastrop | Brazos | 01110 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | Lost Pines GCD, checked 05/2009 |
| Carrizo-Wilcox | 1 | K | Bastrop | Colorado | 01110 | 24,916 | 24,916 | 24,916 | 24,916 | 24,916 | 24,916 | Lost Pines GCD, checked 05/2009 |
| Carrizo-Wilcox | 1 | K | Bastrop | Guadalupe | 01110 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | 1,340 | Lost Pines GCD, checked 05/2009 |
| Carrizo-Wilcox | 1 | K | Fayette | Colorado | 07510 | 290 | 290 | 290 | 290 | 290 | 290 | based on % of area |
| Carrizo-Wilcox | 1 | K | Fayette | Guadalupe | 07510 | 66 | 66 | 66 | 66 | 66 | 66 | based on % of area |
| Carrizo-Wilcox | 1 | K | Fayette | Lavaca | 07510 | 44 | 44 | 44 | 44 | 44 | 44 | based on % of area |
| Edwards-BFZ | 1 | K | Hays | Colorado | 10511 | 2,576 | 2,576 | 2,576 | 2,576 | 2,576 | 2,576 | BSEACD, updated 05/2009 |

| Source Name | Source Type | Source RWPG | Source County | Source Basin | Source Identifier | Water Availability (ac-ft/yr) | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 | |
| Edwards-BFZ | 1 | K | Travis | Brazos | 22711 | 275 | 275 | 275 | 275 | 275 | 275 | MAG (GMA-8), updated 05/2009 |
| Edwards-BFZ | 1 | K | Travis | Colorado | 22711 | 6,608 | 6,608 | 6,608 | 6,608 | 6,608 | 6,608 | BSEACD, MAG (GMA-8), updated 05/2009 |
| Edwards-BFZ | 1 | K | Travis | Guadalupe | 22711 | 27 | 27 | 27 | 27 | 27 | 27 | BSEACD, updated 05/2009 |
| Edwards-BFZ | 1 | K | Williamson | Brazos | 24611 | 6 | 6 | 6 | 6 | 6 | 6 | MAG (GMA-8), updated 05/2009 |
| Edwards-BFZ | 1 | K | Williamson | Colorado | 24611 | 4 | 4 | 4 | 4 | 4 | 4 | MAG (GMA-8), updated 05/2009 |
| Edwards-Trinity (Plateau) | 1 | K | Blanco | Colorado | 01613 | 0 | 0 | 0 | 0 | 0 | 0 | Blanco-Pedernales GCD, updated 05/2009 |
| Edwards-Trinity (Plateau) | 1 | K | Blanco | Guadalupe | 01613 | 0 | 0 | 0 | 0 | 0 | 0 | Blanco-Pedernales GCD, updated 05/2009 |
| Edwards-Trinity (Plateau) | 1 | K | Gillespie | Colorado | 08613 | 1,410 | 1,410 | 1,410 | 1,410 | 1,410 | 1,410 | based on % of area |
| Edwards-Trinity (Plateau) | 1 | K | Gillespie | Guadalupe | 08613 | 90 | 90 | 90 | 90 | 90 | 90 | based on % of area |
| Ellenburger-San Saba | 1 | K | Blanco | Colorado | 01614 | 2,849 | 2,849 | 2,849 | 2,849 | 2,849 | 2,849 | based on % of area |
| Ellenburger-San Saba | 1 | K | Blanco | Guadalupe | 01614 | 1,025 | 1,025 | 1,025 | 1,025 | 1,025 | 1,025 | based on % of area |
| Ellenburger-San Saba | 1 | K | Burnet | Brazos | 02714 | 123 | 123 | 123 | 123 | 123 | 123 | MAG (GMA-8), updated 12/2009 |
| Ellenburger-San Saba | 1 | K | Burnet | Colorado | 02714 | 5,403 | 5,403 | 5,403 | 5,403 | 5,403 | 5,403 | MAG (GMA-8), updated 12/2009 |
| Ellenburger-San Saba | 1 | K | Gillespie | Colorado | 08614 | 5,535 | 5,535 | 5,535 | 5,535 | 5,535 | 5,535 | based on % of area |
| Ellenburger-San Saba | 1 | K | Gillespie | Guadalupe | 08614 | 65 | 65 | 65 | 65 | 65 | 65 | based on % of area |
| Ellenburger-San Saba | 1 | K | Llano | Colorado | 15014 | 758 | 758 | 758 | 758 | 758 | 758 | TWDB GW-U table |
| Ellenburger-San Saba | 1 | K | Mills | Brazos | 16714 | 5 | 5 | 5 | 5 | 5 | 5 | MAG (GMA-8), updated 02/2010 |
| Ellenburger-San Saba | 1 | K | Mills | Colorado | 16714 | 494 | 494 | 494 | 494 | 494 | 494 | MAG (GMA-8), updated 02/2010 |
| Ellenburger-San Saba | 1 | K | San Saba | Colorado | 20614 | 10,194 | 10,194 | 10,194 | 10,194 | 10,194 | 10,194 | TWDB GW-U table |
| Gulf Coast | 1 | K | Colorado | Brazos-Colorado | 04515 | 11,506 | 11,506 | 11,506 | 11,506 | 11,506 | 11,506 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Colorado | Colorado | 04515 | 17,436 | 17,436 | 17,436 | 17,436 | 17,436 | 17,436 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Colorado | Lavaca | 04515 | 18,915 | 18,915 | 18,915 | 18,915 | 18,915 | 18,915 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Fayette | Brazos | 07515 | 65 | 65 | 65 | 65 | 65 | 65 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Fayette | Colorado | 07515 | 3,300 | 3,300 | 3,300 | 3,300 | 3,300 | 3,300 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Fayette | Guadalupe | 07515 | 144 | 144 | 144 | 144 | 144 | 144 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Fayette | Lavaca | 07515 | 5,188 | 5,188 | 5,188 | 5,188 | 5,188 | 5,188 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Matagorda | Brazos-Colorado | 16115 | 22,423 | 22,423 | 22,423 | 22,423 | 22,423 | 22,423 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Matagorda | Colorado | 16115 | 3,218 | 3,218 | 3,218 | 3,218 | 3,218 | 3,218 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Matagorda | Colorado-Lavaca | 16115 | 23,580 | 23,580 | 23,580 | 23,580 | 23,580 | 23,580 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Wharton | Brazos-Colorado | 24115 | 42,295 | 42,295 | 42,295 | 42,295 | 42,295 | 42,295 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Wharton | Colorado | 24115 | 41,812 | 41,812 | 41,812 | 41,812 | 41,812 | 41,812 | based on % of area, no updates as of 05/2009 |
| Gulf Coast | 1 | K | Wharton | Colorado-Lavaca | 24115 | 8,543 | 8,543 | 8,543 | 8,543 | 8,543 | 8,543 | based on % of area, no updates as of 05/2009 |
| Hickory | 1 | K | Blanco | Colorado | 01616 | 747 | 747 | 747 | 747 | 747 | 747 | based on % of area |
| Hickory | 1 | K | Blanco | Guadalupe | 01616 | 165 | 165 | 165 | 165 | 165 | 165 | based on % of area |
| Hickory | 1 | K | Burnet | Brazos | 02716 | 0 | 0 | 0 | 0 | 0 | 0 | MAG, updated 12/2009 |
| Hickory | 1 | K | Burnet | Colorado | 02716 | 2,148 | 2,148 | 2,148 | 2,148 | 2,148 | 2,148 | MAG, updated 12/2009 |
| Hickory | 1 | K | Gillespie | Colorado | 08616 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | based on % of area |
| Hickory | 1 | K | Gillespie | Guadalupe | 08616 | 66 | 66 | 66 | 66 | 66 | 66 | based on % of area |
| Hickory | 1 | K | Llano | Colorado | 15016 | 12,517 | 12,517 | 12,517 | 12,517 | 12,517 | 12,517 | TWDB GW-U table |
| Hickory | 1 | K | Mills | Brazos | 16716 | 1 | 1 | 1 | 1 | 1 | 1 | MAG (GMA-8), updated 02/2010 |
| Hickory | 1 | K | Mills | Colorado | 16716 | 35 | 35 | 35 | 35 | 35 | 35 | MAG (GMA-8), updated 02/2010 |
| Hickory | 1 | K | San Saba | Colorado | 20616 | 6,540 | 6,540 | 6,540 | 6,540 | 6,540 | 6,540 | TWDB GW-U table |
| Marble Falls | 1 | K | Blanco | Colorado | 01619 | 300 | 300 | 300 | 300 | 300 | 300 | GWbyBasin file 9/24/99 |
| Marble Falls | 1 | K | Burnet | Brazos | 02719 | 93 | 93 | 93 | 93 | 93 | 93 | MAG (GMA-8), updated 07/2009 |
| Marble Falls | 1 | K | Burnet | Colorado | 02719 | 1,885 | 1,885 | 1,885 | 1,885 | 1,885 | 1,885 | MAG (GMA-8), updated 07/2009 |
| Marble Falls | 1 | K | San Saba | Colorado | 20619 | 12,380 | 12,380 | 12,380 | 12,380 | 12,380 | 12,380 | TWDB GW-U table |
| Queen City | 1 | K | Bastrop | Brazos | 01124 | 227 | 227 | 227 | 227 | 227 | 227 | based on % of area |
| Queen City | 1 | K | Bastrop | Colorado | 01124 | 2,126 | 2,126 | 2,126 | 2,126 | 2,126 | 2,126 | based on % of area |
| Queen City | 1 | K | Bastrop | Guadalupe | 01124 | 403 | 403 | 403 | 403 | 403 | 403 | based on % of area |
| Queen City | 1 | K | Fayette | Colorado | 07524 | 1,034 | 1,034 | 1,034 | 1,034 | 1,034 | 1,034 | based on % of area |
| Queen City | 1 | K | Fayette | Guadalupe | 07524 | 175 | 175 | 175 | 175 | 175 | 175 | based on % of area |
| Queen City | 1 | K | Fayette | Lavaca | 07524 | 26 | 26 | 26 | 26 | 26 | 26 | based on % of area |
| Sparta | 1 | K | Bastrop | Brazos | 01127 | 49 | 49 | 49 | 49 | 49 | 49 | based on % of area |
| Sparta | 1 | K | Bastrop | Colorado | 01127 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | based on % of area |
| Sparta | 1 | K | Bastrop | Guadalupe | 01127 | 340 | 340 | 340 | 340 | 340 | 340 | based on % of area |
| Sparta | 1 | K | Fayette | Colorado | 07527 | 3,667 | 3,667 | 3,667 | 3,667 | 3,667 | 3,667 | based on % of area |
| Sparta | 1 | K | Fayette | Guadalupe | 07527 | 598 | 598 | 598 | 598 | 598 | 598 | based on % of area |
| Sparta | 1 | K | Fayette | Lavaca | 07527 | 235 | 235 | 235 | 235 | 235 | 235 | based on % of area |
| Trinity | 1 | K | Bastrop | Colorado | 01128 | 12 | 12 | 10 | 10 | 8 | 8 | GWbyBasin file 9/24/99 |
| Trinity | 1 | K | Blanco | Colorado | 01628 | 1,149 | 1,149 | 1,149 | 1,149 | 942 | 942 | based on % of area |

## Region K Current Water Availability Sources

| Source Name | Source Type | Source RWPG | Source County | Source Basin | Source Identifier | Water Availability (ac-ft/yr) Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trinity | 1 | K | Blanco | Guadalupe | 01628 | 451 | 451 | 451 | 451 | 373 | 373 | based on % of area |
| Trinity | 1 | K | Burnet | Brazos | 02728 | 2,723 | 2,723 | 2,723 | 2,723 | 2,723 | 2,723 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Burnet | Colorado | 02728 | 823 | 823 | 823 | 823 | 823 | 823 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Gillespie | Colorado | 08628 | 3,354 | 3,354 | 3,354 | 3,354 | 3,354 | 3,354 | Based on HCUWCD Data |
| Trinity | 1 | K | Gillespie | Guadalupe | 08628 | 46 | 46 | 46 | 46 | 46 | 46 | Based on HCUWCD Data |
| Trinity | 1 | K | Hays | Colorado | 10528 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Mills | Brazos | 16728 | 1,273 | 1,273 | 1,273 | 1,273 | 1,273 | 1,273 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Mills | Colorado | 16728 | 1,128 | 1,128 | 1,128 | 1,128 | 1,128 | 1,128 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Travis | Brazos | 22728 | 8 | 8 | 8 | 8 | 8 | 8 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Travis | Colorado | 22728 | 3,882 | 3,882 | 3,882 | 3,882 | 3,882 | 3,882 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Travis | Guadalupe | 22728 | 33 | 33 | 33 | 33 | 33 | 33 | GAM |
| Trinity | 1 | K | Williamson | Brazos | 24628 | 157 | 157 | 157 | 157 | 157 | 157 | MAG (GMA-8), updated 05/2009 |
| Trinity | 1 | K | Williamson | Colorado | 24628 | 61 | 61 | 61 | 61 | 61 | 61 | MAG (GMA-8), updated 05/2009 |
| Yegua-Jackson | 1 | K | Fayette | Colorado | 07531 | 17,000 | 17,000 | 17,000 | 17,000 | 17,000 | 17,000 | Fayette County GCD |
| Yegua-Jackson | 1 | K | Fayette | Guadalupe | 07531 | 2,700 | 2,700 | 2,700 | 2,700 | 2,700 | 2,700 | Fayette County GCD |
| Yegua-Jackson | 1 | K | Fayette | Lavaca | 07531 | 300 | 300 | 300 | 300 | 300 | 300 | Fayette County GCD |
| Other Aquifer | 1 | K | Bastrop | Brazos | 01122 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Bastrop | Colorado | 01122 | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 | 5,340 | Alluvial supplies |
| Other Aquifer | 1 | K | Bastrop | Guadalupe | 01122 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Blanco | Colorado | 01622 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Burnet | Colorado | 02722 | 305 | 305 | 305 | 305 | 305 | 305 | Alluvial supplies |
| Other Aquifer | 1 | K | Colorado | Colorado | 04522 | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 | Alluvial supplies |
| Other Aquifer | 1 | K | Fayette | Brazos | 07522 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Fayette | Colorado | 07522 | 3,696 | 3,696 | 3,696 | 3,696 | 3,696 | 3,696 | Alluvial supplies |
| Other Aquifer | 1 | K | Fayette | Guadalupe | 07522 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Fayette | Lavaca | 07522 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Gillespie | Colorado | 08622 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Hays | Colorado | 10522 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Llano | Colorado | 15022 | 109 | 109 | 109 | 109 | 109 | 109 | Alluvial supplies |
| Other Aquifer | 1 | K | Mills | Brazos | 16722 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Mills | Colorado | 16722 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | San Saba | Colorado | 20622 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Travis | Brazos | 22722 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Travis | Colorado | 22722 | 1,818 | 1,835 | 1,848 | 1,853 | 1,856 | 1,860 | Alluvial supplies |
| Other Aquifer | 1 | K | Travis | Guadalupe | 22722 | 25 | 30 | 34 | 37 | 40 | 43 | Alluvial supplies |
| Other Aquifer | 1 | K | Williamson | Brazos | 24622 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Aquifer | 1 | K | Williamson | Colorado | 24622 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | | | Region K Subtotal | 1,328,579 | 1,302,848 | 1,298,737 | 1,295,062 | 1,291,524 | 1,285,811 | |

| Source Name | Source Type | Source RWPG | Source County | Source Basin | Source Identifier | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Brownwood | 0 | F | | Colorado | 14140 | 10 | 10 | 8 | 8 | 8 | 7 | Based on Brookesmith SUD |
| Brazos River Authority System | 0 | G | | Brazos | 120B0 | 318 | 413 | 511 | 606 | 707 | 827 | Estimate based on TCEQ maximum production capacity at treatment plant (Stillhouse Reservoir) multiplied by the percent of Kempner demand in Region K. |
| Edwards-BFZ | 1 | G | Williamson | Brazos | 24611G | 8 | 8 | 8 | 8 | 8 | 8 | Based on Chisholm Trail SUD |
| Canyon Lake | 0 | L | | Guadalupe | 18020 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | Estimate based on CLWSC Water Availability Report and demand. |
| | | | | | Subtotal | 3,136 | 3,231 | 3,327 | 3,422 | 3,523 | 3,642 | |
| | | | | | **TOTAL** | **1,331,715** | **1,306,079** | **1,302,064** | **1,298,484** | **1,295,047** | **1,289,453** | |

Note: Downstream water availability does not include return flows.

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AQUA WSC | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 5,952 | 5,952 | 5,952 | 5,952 | 5,952 | 5,952 | New WUG: Supply Estimate based on Aqua WSC 3/29/04 |
| AQUA WSC | BASTROP | L | Caldwell | Guadalupe | 02810 | Carrizo-Wilcox | 3,489 | 3,251 | 3,050 | 2,912 | 2,766 | 2,592 | Source changed from Highland Lakes to Carrizo-Wilcox Aquifer in Caldwell County (Region L) 5,000 ac-ft split between Bastrop, Fayette, and Travis 08/09 |
| BASTROP | BASTROP | K | Bastrop | Colorado | 01122 | Other Aquifer | 1,927 | 1,927 | 1,927 | 1,927 | 1,927 | 1,927 | Supply estimate based on TCEQ total production. 2/8/05 |
| BASTROP COUNTY WCID #2 | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 1,171 | 1,171 | 1,171 | 1,171 | 1,171 | 1,171 | New WUG: Supply based on Bastrop County WCID #2 9/20/04 |
| COUNTY-OTHER | BASTROP | K | Bastrop | Brazos | 01110 | Carrizo-Wilcox | 363 | 422 | 486 | 524 | 536 | 536 | 2001 Plan: Demand |
| COUNTY-OTHER | BASTROP | K | | Colorado | 140B0 | Highland Lakes | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 | 1,634 | Updated number 08/09, Extend contract 5/2009 |
| COUNTY-OTHER | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 446 | 446 | 446 | 446 | 446 | 446 | Aqua WSC email 3/29/04 |
| COUNTY-OTHER | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 805 | 561 | 222 | 0 | 0 | 0 | 2001 Plan: Demand - other supplies |
| COUNTY-OTHER | BASTROP | K | Bastrop | Guadalupe | 01124 | Queen City | 196 | 196 | 196 | 196 | 196 | 196 | 2001 Plan: A-ALL, % & Tbl 4 |
| CREEDMOOR-MAHA WSC | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 6 | 6 | 6 | 6 | 6 | 6 | New WUG: Supply Estimate based on Aqua WSC email 3/29/04 |
| CREEDMOOR-MAHA WSC | BASTROP | K | Travis | Colorado | 22711 | Edwards-BFZ | 13 | 20 | 27 | 37 | 45 | 56 | Rearranged Creedmoor-Maha demands to reduce # of strategies needed 10/26/07 New WUG: Supply Estimate based on BSEACD |
| ELGIN | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 1,679 | 1,674 | 1,671 | 1,670 | 1,670 | 1,671 | Based on TCEQ maximum production capacity and proportioned by total demand. 1/14/05 |
| LEE COUNTY WSC | BASTROP | K | Bastrop | Brazos | 01110 | Carrizo-Wilcox | 725 | 725 | 725 | 725 | 725 | 725 | New WUG: Supply based on Lee County WSC 9/20/04 |
| LEE COUNTY WSC | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 1,123 | 1,075 | 1,006 | 952 | 891 | 804 | New WUG: Supply based on Lee County WSC 9/20/04 |
| MANVILLE WSC | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 127 | 131 | 133 | 136 | 140 | 146 | New WUG: Supply estimated from TCEQ well production capacities and proportioned by total population. 1/11/05 |
| MANVILLE WSC | BASTROP | K | Bastrop | Colorado | 01122 | Other Aquifer | 41 | 42 | 46 | 52 | 60 | 68 | New WUG: Supply estimated from TCEQ well production capacities and proportioned by total population. 1/11/05 |
| MANVILLE WSC | BASTROP | K | Travis | Colorado | 22722 | Other Aquifer | 0 | 0 | 0 | 0 | 7 | 52 | Water from Travis County wells |
| POLONIA WSC | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 25 | 24 | 25 | 25 | 27 | 30 | New WUG: Supply estimated from TCEQ well production capacities and proportioned by total population. 1/20/05 |
| SMITHVILLE | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 830 | 922 | 1,025 | 1,072 | 1,283 | 1,283 | 2001 Plan: Demand |
| IRRIGATION | BASTROP | K | Bastrop | Brazos | 01124 | Queen City | 23 | 23 | 23 | 23 | 23 | 23 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BASTROP | K | Bastrop | Brazos | 01127 | Sparta | 5 | 5 | 5 | 5 | 5 | 5 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BASTROP | K | Bastrop | Colorado | 011996 | Irrigation Local Supply | 750 | 750 | 750 | 750 | 750 | 750 | 2001 Plan: TWDB |
| IRRIGATION | BASTROP | K | Bastrop | Colorado | 01127 | Sparta | 500 | 500 | 500 | 500 | 500 | 500 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BASTROP | K | Bastrop | Colorado | 01124 | Queen City | 213 | 213 | 213 | 213 | 213 | 213 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BASTROP | K | Bastrop | Guadalupe | 01124 | Queen City | 40 | 40 | 40 | 40 | 40 | 40 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BASTROP | K | Bastrop | Guadalupe | 01127 | Sparta | 34 | 34 | 34 | 34 | 34 | 34 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | BASTROP | K | Bastrop | Brazos | 01127 | Sparta | 39 | 39 | 39 | 39 | 39 | 39 | 2001 Plan: AllocFile10 90% reduced |
| LIVESTOCK | BASTROP | K | | Brazos | 12997 | Livestock Local Supply | 154 | 154 | 154 | 154 | 154 | 154 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | BASTROP | K | Bastrop | Brazos | 01124 | Queen City | 141 | 141 | 141 | 141 | 141 | 141 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | BASTROP | K | Bastrop | Colorado | 01124 | Queen City | 1,322 | 1,322 | 1,322 | 1,322 | 1,322 | 1,322 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | BASTROP | K | Bastrop | Colorado | 01127 | Sparta | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2001 Plan: AllocFile10 90% reduced |
| LIVESTOCK | BASTROP | K | | Colorado | 14997 | Livestock Local Supply | 696 | 696 | 696 | 696 | 696 | 696 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | BASTROP | K | Bastrop | Guadalupe | 01124 | Queen City | 125 | 125 | 125 | 125 | 125 | 125 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | BASTROP | K | | Guadalupe | 18997 | Livestock Local Supply | 5 | 5 | 5 | 5 | 5 | 5 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | BASTROP | K | Bastrop | Guadalupe | 01127 | Sparta | 272 | 272 | 272 | 272 | 272 | 272 | 2001 Plan: AllocFile10 90% reduced |
| MANUFACTURING | BASTROP | K | Bastrop | Brazos | 01110 | Carrizo-Wilcox | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: Demand - other supplies |
| MANUFACTURING | BASTROP | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 38 | 46 | 54 | 64 | 75 | 75 | 2001 Plan: Demand - other supplies |
| MANUFACTURING | BASTROP | K | | Colorado | 14999 | Other Local Supply | 48 | 48 | 48 | 48 | 48 | 48 | 2001 Plan: LCRA Provided data |
| MANUFACTURING | BASTROP | K | Bastrop | Guadalupe | 01110 | Carrizo-Wilcox | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: Demand |
| MINING | BASTROP | K | Bastrop | Brazos | 01124 | Queen City | 23 | 23 | 23 | 23 | 23 | 23 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | BASTROP | K | Bastrop | Brazos | 01127 | Sparta | 5 | 5 | 5 | 5 | 5 | 5 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | BASTROP | K | Bastrop | Colorado | 01124 | Queen City | 213 | 213 | 213 | 4 | 3 | 4 | Reduced supply due to reduced demand |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MINING | BASTROP | K | Bastrop | Colorado | 01127 | Sparta | 500 | 500 | 500 | 7 | 7 | 7 | Reduced supply due to reduced demand |
| MINING | BASTROP | K | | Colorado | 14999 | Other Local Supply | 10 | 8 | 7 | 7 | 9 | 9 | 2001 Plan: LCRA Provided data |
| MINING | BASTROP | K | Bastrop | Guadalupe | 01124 | Queen City | 40 | 40 | 40 | 40 | 40 | 40 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | BASTROP | K | Bastrop | Guadalupe | 01127 | Sparta | 34 | 34 | 34 | 34 | 34 | 34 | 2001 Plan: AllocFile10 9/24/99 |
| STEAM ELECTRIC POWER | BASTROP | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | BASTROP | K | | Colorado | 140B0 | Highland Lakes | 5,970 | 5,970 | 5,970 | 5,970 | 5,970 | 5,970 | Extend contract 5/2009 |
| STEAM ELECTRIC POWER | BASTROP | K | | Colorado | 140B0 | Highland Lakes | 10,750 | 10,750 | 10,750 | 10,750 | 10,750 | 10,750 | Region K WAM Run 3 Cutoff; TCEQ WAM 5/6/05; LCRA Cooling Water |
| STEAM ELECTRIC POWER | BASTROP | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| BLANCO | BLANCO | | Blanco | Guadalupe | 18120 | Blanco Reservoir | 596 | 596 | 596 | 596 | 596 | 596 | TCEQ WAM 2/21/05 |
| BLANCO | BLANCO | K | Blanco | Guadalupe | 01628 | Trinity | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: A-ALL, LIMIT |
| BLANCO | BLANCO | L | | Guadalupe | 18020 | Canyon Lake | 600 | 600 | 600 | 600 | 600 | 600 | New GBRA contract 09/2009 |
| CANYON LAKE WSC | BLANCO | L | | Guadalupe | 18020 | Canyon Lake | 188 | 263 | 334 | 397 | 466 | 545 | New WUG: Supply Estimate based on CLWSC Water Availability Report and demand 2/4/05 |
| COUNTY-OTHER | BLANCO | K | Blanco | Colorado | 01614 | Ellenburger-San Saba | 150 | 150 | 150 | 150 | 150 | 150 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | BLANCO | K | Blanco | Colorado | 01616 | Hickory | 60 | 60 | 60 | 60 | 60 | 60 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | BLANCO | K | | Colorado | 14999 | Other Local Supply | 43 | 49 | 55 | 57 | 56 | 56 | 2001 Plan: LCRA Provided data |
| COUNTY-OTHER | BLANCO | K | Blanco | Colorado | 01628 | Trinity | 1,148 | 1,148 | 1,148 | 1,148 | 941 | 941 | Reallocation strategy from 2006 Region K Plan |
| COUNTY-OTHER | BLANCO | K | Blanco | Guadalupe | 01613 | Edwards-Trinity (Plateau) | 0 | 0 | 0 | 0 | 0 | 0 | Blanco Pedernales GCD 05/2009 |
| COUNTY-OTHER | BLANCO | K | Blanco | Guadalupe | 01628 | Trinity | 160 | 173 | 187 | 197 | 174 | 174 | Updated supply numbers based on usage (demand) and availability 09/2009 |
| JOHNSON CITY | BLANCO | K | Blanco | Colorado | 01614 | Ellenburger-San Saba | 887 | 887 | 887 | 887 | 887 | 887 | 2001 Plan: A-ALL, LIMIT |
| IRRIGATION | BLANCO | K | Blanco | Colorado | 01614 | Ellenburger-San Saba | 667 | 667 | 667 | 667 | 667 | 667 | 2001 Plan: A-ALL, % & Tbl 4 |
| IRRIGATION | BLANCO | K | Blanco | Guadalupe | 016996 | Irrigation Local Supply | 9 | 9 | 9 | 9 | 9 | 9 | 2001 Plan: LCRA Provided data |
| IRRIGATION | BLANCO | K | Blanco | Guadalupe | 01628 | Trinity | 89 | 89 | 89 | 89 | 76 | 76 | 2001 Plan: A-ALL, 100% reduced |
| LIVESTOCK | BLANCO | K | | Colorado | 14997 | Livestock Local Supply | 101 | 101 | 101 | 101 | 101 | 101 | 2001 Plan: Demand, LCRA provided data |
| LIVESTOCK | BLANCO | K | Blanco | Colorado | 01614 | Ellenburger-San Saba | 749 | 749 | 749 | 749 | 749 | 749 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | BLANCO | K | Blanco | Guadalupe | 01628 | Trinity | 69 | 69 | 69 | 69 | 56 | 56 | 2001 Plan: A-ALL, 42.6% reduced |
| LIVESTOCK | BLANCO | K | | Guadalupe | 18997 | Livestock Local Supply | 101 | 101 | 101 | 101 | 101 | 101 | 2001 Plan: Demand, LCRA provided data |
| MANUFACTURING | BLANCO | K | Blanco | Colorado | 01628 | Trinity | 1 | 1 | 1 | 1 | 1 | 1 | Updated supply to meet demand (Reallocation strategy from 2006 Region K Plan) |
| MANUFACTURING | BLANCO | K | Blanco | Guadalupe | 01628 | Trinity | 9 | 9 | 9 | 9 | 7 | 7 | 2001 Plan: AllocFile10 100% reduced |
| MINING | BLANCO | K | Blanco | Colorado | 01614 | Ellenburger-San Saba | 285 | 285 | 285 | 285 | 285 | 285 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | BLANCO | K | Blanco | Guadalupe | 01628 | Trinity | 43 | 43 | 43 | 43 | 35 | 35 | 2001 Plan: AllocFile10 9/24/99 |
| STEAM ELECTRIC POWER | BLANCO | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | BLANCO | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| BERTRAM | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 500 | 500 | 500 | 500 | 500 | 500 | Changed basin, increased supply as told by Bertram 10/09 |
| BURNET | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 1,862 | 1,862 | 1,862 | 1,862 | 1,862 | 1,862 | 2001 Plan: A-ALL, LIMIT |
| BURNET | BURNET | K | | Colorado | 140B0 | Highland Lakes | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | 4,100 | Extend contract 5/2009 |
| CHISHOLM TRAIL SUD | BURNET | G | | Brazos | 120B0 | Brazos River Authority System | 20 | 32 | 45 | 58 | 71 | 86 | Supply by BRA based on discussion with HDR 01/12/10 |
| CHISHOLM TRAIL SUD | BURNET | G | Williamson | Brazos | 24611G | Edwards-BFZ | 8 | 8 | 8 | 8 | 8 | 8 | New WUG: less than 1% of population in Region K. All currently served by groundwater but contracts in place for Colorado River and Brazos River water. 1/11/05 |
| COTTONWOOD SHORES | BURNET | K | | Colorado | 140B0 | Highland Lakes | 138 | 138 | 138 | 138 | 138 | 138 | Extend contract 5/2009 |
| COUNTY-OTHER | BURNET | K | Burnet | Brazos | 02714 | Ellenburger-San Saba | 0 | 0 | 0 | 0 | 55 | 110 | Reduced due to decreased availability 7/2009 |
| COUNTY-OTHER | BURNET | K | Burnet | Brazos | 02728 | Trinity | 972 | 960 | 947 | 934 | 921 | 921 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 10 | 2 | 0 | 0 | 0 | 0 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | BURNET | K | Burnet | Colorado | 02716 | Hickory | 54 | 54 | 54 | 54 | 54 | 54 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | BURNET | K | | Colorado | 140B0 | Highland Lakes | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 | 3,265 | Updated number 08/09, Extend contract 5/2009 |
| COUNTY-OTHER | BURNET | K | Burnet | Colorado | 02719 | Marble Falls | 21 | 21 | 21 | 21 | 21 | 21 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | BURNET | K | Burnet | Colorado | 02728 | Trinity | 227 | 227 | 192 | 192 | 157 | 157 | 2001 Plan: A-ALL, % & Tbl 4 |
| GRANITE SHOALS | BURNET | K | | Colorado | 140B0 | Highland Lakes | 830 | 830 | 830 | 830 | 830 | 830 | Extend contract 5/2009 |
| KEMPNER WSC | BURNET | G | | Brazos | 120B0 | Brazos River Authority System | 298 | 381 | 466 | 548 | 636 | 741 | Total Kempner demand in Region K met by BRA, based on discussion with HDR (Region G) on 1/12/10 |
| KINGSLAND WSC | BURNET | K | | Colorado | 140B0 | Highland Lakes | 78 | 78 | 78 | 78 | 78 | 78 | Extend contract 5/2009, split with Llano |
| LAKE LBJ MUD | BURNET | K | | Colorado | 140B0 | Highland Lakes | 259 | 294 | 327 | 358 | 389 | 425 | Extend contract 5/2009 |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MARBLE FALLS | BURNET | K | | Colorado | 140B0 | Highland Lakes | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | Extend contract 5/2009 |
| MARBLE FALLS | BURNET | K | | Colorado | 140B0 | Highland Lakes | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | Extend contract 5/2009 |
| MEADOWLAKES | BURNET | K | | Colorado | 14999 | Other Local Supply | 486 | 486 | 486 | 486 | 486 | 486 | 2001 Plan: TCB & LCRA provided data |
| MEADOWLAKES | BURNET | K | | Colorado | 140B0 | Highland Lakes | 75 | 75 | 75 | 75 | 75 | 75 | Updated LCRA Commitment list 07/2009 |
| IRRIGATION | BURNET | K | Burnet | Brazos | 02728 | Trinity | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: AllocFile10 18.4% reduced |
| IRRIGATION | BURNET | K | Burnet | Colorado | 02716 | Hickory | 1,540 | 1,540 | 1,540 | 1,540 | 1,540 | 1,540 | Reduced due to decreased availability 5/2009 |
| IRRIGATION | BURNET | K | Burnet | Colorado | 02719 | Marble Falls | 533 | 533 | 533 | 533 | 533 | 533 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BURNET | K | Burnet | Colorado | 02728 | Trinity | 104 | 104 | 88 | 88 | 72 | 72 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | BURNET | K | Burnet | Colorado | 027996 | Irrigation Local Supply | 276 | 276 | 276 | 276 | 276 | 276 | 2001 Plan: TWDB |
| IRRIGATION | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: ALLOC-F10 9/24/99 |
| LIVESTOCK | BURNET | K | Burnet | Brazos | 02728 | Trinity | 45 | 45 | 45 | 45 | 45 | 45 | 2001 Plan: A-ALL, 12.6% reduced |
| LIVESTOCK | BURNET | K | | Brazos | 12997 | Livestock Local Supply | 341 | 341 | 341 | 341 | 341 | 341 | 2001 Plan: Demand |
| LIVESTOCK | BURNET | K | Burnet | Colorado | 02716 | Hickory | 189 | 189 | 189 | 189 | 189 | 189 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | BURNET | K | | Colorado | 14997 | Livestock Local Supply | 210 | 210 | 210 | 210 | 210 | 210 | 2001 Plan: Demand |
| LIVESTOCK | BURNET | K | Burnet | Colorado | 02728 | Trinity | 71 | 71 | 60 | 60 | 50 | 50 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | BURNET | K | Burnet | Colorado | 02719 | Marble Falls | 1,208 | 1,208 | 1,208 | 1,208 | 1,208 | 1,208 | Reduced due to decreased availability 5/2009 |
| LIVESTOCK | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: A-ALL, LIMIT |
| MANUFACTURING | BURNET | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| MANUFACTURING | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: ALLOC-F10 9/24/99 |
| MANUFACTURING | BURNET | K | | Colorado | 14999 | Other Local Supply | 1,367 | 1,503 | 1,643 | 1,761 | 1,933 | 1,933 | 2001 Plan: LCRA Provided data |
| MANUFACTURING | BURNET | K | | Colorado | 140B0 | Highland Lakes | 500 | 500 | 500 | 500 | 500 | 500 | Supply Estimate based on LCRA 4/9/04 |
| MINING | BURNET | K | Burnet | Brazos | 02728 | Trinity | 54 | 54 | 54 | 45 | 45 | 45 | 2001 Plan: A-ALL, 5% reduced |
| MINING | BURNET | K | | Colorado | 14999 | Other Local Supply | 747 | 762 | 778 | 801 | 826 | 826 | 2001 Plan:  LCRA provided data |
| MINING | BURNET | K | Burnet | Colorado | 02719 | Marble Falls | 123 | 123 | 123 | 123 | 123 | 123 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | BURNET | K | Burnet | Colorado | 02716 | Hickory | 315 | 315 | 315 | 315 | 315 | 315 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | BURNET | K | Burnet | Colorado | 02728 | Trinity | 4 | 4 | 3 | 3 | 3 | 3 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: A-ALL, LIMIT |
| STEAM ELECTRIC POWER | BURNET | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | BURNET | K | Burnet | Colorado | 02714 | Ellenburger-San Saba | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: AllFile10 9/24 Limit |
| COLUMBUS | COLORADO | K | Colorado | Colorado | 04515 | Gulf Coast | 1,350 | 1,350 | 1,350 | 1,350 | 1,350 | 1,350 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | COLORADO | K | Colorado | Brazos-Colorado | 04515 | Gulf Coast | 122 | 122 | 122 | 122 | 122 | 122 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | COLORADO | K | Colorado | Colorado | 04515 | Gulf Coast | 800 | 800 | 800 | 800 | 800 | 800 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | COLORADO | K | Colorado | Lavaca | 04515 | Gulf Coast | 250 | 250 | 250 | 250 | 250 | 250 | 2001 Plan: A-ALL, % & Tbl 4 |
| EAGLE LAKE | COLORADO | K | Colorado | Brazos-Colorado | 04515 | Gulf Coast | 418 | 418 | 418 | 418 | 418 | 418 | Revised supplies based on demands 09/2009 |
| EAGLE LAKE | COLORADO | K | Colorado | Colorado | 04515 | Gulf Coast | 452 | 452 | 452 | 452 | 452 | 452 | Revised supplies based on demands 09/2009 |
| WEIMAR | COLORADO | K | Fayette | Colorado | 07515 | Gulf Coast | 1,804 | 1,804 | 1,804 | 1,804 | 1,804 | 1,804 | 2001 Plan: A-ALL, LIMIT |
| WEIMAR | COLORADO | K | Fayette | Lavaca | 07515 | Gulf Coast | 2,119 | 2,119 | 2,119 | 2,119 | 2,119 | 2,119 | 2001 Plan: A-ALL, LIMIT 2218 reduced |
| IRRIGATION | COLORADO | K | | Colorado | 3461405475 | LCRA - Lakeside ROR | 6,340 | 6,331 | 6,331 | 6,331 | 6,331 | 6,331 | Region K WAM Run 3 Cutoff; Lakeside ROR split between 3 basins. |
| IRRIGATION | COLORADO | K | | Colorado | 3461405434A | LCRA - Garwood ROR | 25,143 | 25,143 | 25,143 | 25,143 | 25,143 | 25,143 | Region K WAM Run 3 Cutoff; 70% of Garwood ROR water in a minimum year (LCRA) split between 3 basins. |
| IRRIGATION | COLORADO | K | Colorado | Brazos-Colorado | 04515 | Gulf Coast | 7,775 | 7,775 | 7,775 | 7,775 | 7,775 | 7,775 | 2001 Plan: Demand |
| IRRIGATION | COLORADO | K | | Colorado | 3461405475 | LCRA - Lakeside ROR | 3,078 | 3,073 | 3,073 | 3,073 | 3,073 | 3,073 | Region K WAM Run 3 Cutoff; Lakeside ROR split between 3 basins. |
| IRRIGATION | COLORADO | K | Colorado | Colorado | 04515 | Gulf Coast | 11,191 | 11,191 | 11,191 | 11,191 | 11,191 | 11,191 | 2001 Plan: Demand |
| IRRIGATION | COLORADO | K | Colorado | Colorado | 045996 | Irrigation Local Supply | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 2001 Plan: LCRA Provided data |
| IRRIGATION | COLORADO | K | | Colorado | 3461405434A | LCRA - Garwood ROR | 12,207 | 12,207 | 12,207 | 12,207 | 12,207 | 12,207 | Region K WAM Run 3 Cutoff; 70% of Garwood ROR water in a minimum year (LCRA) split between 3 basins. |
| IRRIGATION | COLORADO | K | | Colorado | 3461405475 | LCRA - Lakeside ROR | 13,553 | 13,534 | 13,534 | 13,534 | 13,534 | 13,534 | Region K WAM Run 3 Cutoff; Lakeside ROR split between 3 basins. |
| IRRIGATION | COLORADO | K | Colorado | Lavaca | 04515 | Gulf Coast | 14,050 | 14,050 | 14,050 | 14,050 | 14,050 | 14,050 | 2001 Plan: Demand |
| IRRIGATION | COLORADO | K | Colorado | Lavaca | 045996 | Irrigation Local Supply | 4,002 | 4,002 | 4,002 | 4,002 | 4,002 | 4,002 | 2001 Plan: LCRA Provided data |
| IRRIGATION | COLORADO | K | | Colorado | 3461405434A | LCRA - Garwood ROR | 53,749 | 53,749 | 53,749 | 53,749 | 53,749 | 53,749 | Region K WAM Run 3 Cutoff; 70% of Garwood ROR water in a minimum year (LCRA) split between 3 basins. |
| LIVESTOCK | COLORADO | K | Colorado | Brazos-Colorado | 04515 | Gulf Coast | 65 | 65 | 65 | 65 | 65 | 65 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | COLORADO | K | | Brazos-Colorado | 13997 | Livestock Local Supply | 39 | 39 | 39 | 39 | 39 | 39 | 2001 Plan: LCRA Provided data |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LIVESTOCK | COLORADO | K | | Colorado | 14997 | Livestock Local Supply | 860 | 860 | 860 | 860 | 860 | 860 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | COLORADO | K | Colorado | Colorado | 04515 | Gulf Coast | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: A-ALL, LIMIT |
| LIVESTOCK | COLORADO | K | | Lavaca | 16997 | Livestock Local Supply | 177 | 177 | 177 | 177 | 177 | 177 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | COLORADO | K | Colorado | Lavaca | 04515 | Gulf Coast | 283 | 283 | 283 | 283 | 283 | 283 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | COLORADO | K | Colorado | Brazos-Colorado | 04515 | Gulf Coast | 27 | 27 | 27 | 27 | 27 | 27 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | COLORADO | K | | Colorado | 14999 | Other Local Supply | 1,215 | 1,285 | 1,353 | 1,418 | 1,481 | 1,481 | 2001 Plan: A-ALL, TCB |
| MANUFACTURING | COLORADO | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| MINING | COLORADO | K | Colorado | Brazos-Colorado | 04515 | Gulf Coast | 100 | 100 | 100 | 100 | 100 | 100 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | COLORADO | K | | Colorado | 14999 | Other Local Supply | 10,508 | 11,391 | 12,443 | 13,785 | 15,402 | 15,402 | 2001 Plan: A-ALL and LCRA provided data |
| MINING | COLORADO | K | Colorado | Lavaca | 04515 | Gulf Coast | 1,627 | 1,627 | 1,627 | 1,627 | 1,627 | 1,627 | 2001 Plan: A-ALL, 100% reduced |
| STEAM ELECTRIC POWER | COLORADO | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | COLORADO | K | Colorado | Colorado | 04515 | Gulf Coast | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: AllFile10 9/24 Limit |
| STEAM ELECTRIC POWER | COLORADO | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| AQUA WSC | FAYETTE | L | Caldwell | Guadalupe | 02810 | Carrizo-Wilcox | 90 | 115 | 135 | 150 | 168 | 194 | Source changed from Highland Lakes to Carrizo-Wilcox Aquifer in Caldwell County (Region L) 5,000 ac-ft split between Bastrop, Fayette, and Travis 08/09 |
| COUNTY-OTHER | FAYETTE | K | Fayette | Brazos | 07515 | Gulf Coast | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | FAYETTE | K | Fayette | Colorado | 07515 | Gulf Coast | 154 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: A-ALL, LIMIT; adjusted year 2000 value based on reduced total available Gulf Coast supplies 2/7/05 |
| COUNTY-OTHER | FAYETTE | K | Fayette | Colorado | 07524 | Queen City | 90 | 90 | 90 | 90 | 90 | 90 | 2001 Plan: AllFile10 limit |
| COUNTY-OTHER | FAYETTE | K | Fayette | Colorado | 07527 | Sparta | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | FAYETTE | K | | Colorado | 140B0 | Highland Lakes | 102 | 102 | 102 | 102 | 102 | 102 | Extend contract 5/2009 |
| COUNTY-OTHER | FAYETTE | K | Fayette | Guadalupe | 07515 | Gulf Coast | 76 | 76 | 76 | 76 | 76 | 76 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | FAYETTE | K | Fayette | Guadalupe | 07527 | Sparta | 90 | 90 | 90 | 90 | 90 | 90 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 226 | 204 | 96 | 9 | 0 | 0 | 2001 Plan: A-ALL, % & Tbl 4 |
| FAYETTE WSC | FAYETTE | K | Fayette | Colorado | 07524 | Queen City | 282 | 282 | 282 | 282 | 282 | 282 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells and proportioned based on demand per basin. 1/13/05 |
| FAYETTE WSC | FAYETTE | K | Fayette | Colorado | 07515 | Gulf Coast | 675 | 675 | 675 | 675 | 675 | 675 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells and proportioned based on demand per basin. 1/13/05 |
| FAYETTE WSC | FAYETTE | K | Fayette | Lavaca | 07524 | Queen City | 25 | 25 | 25 | 25 | 25 | 25 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells and proportioned based on demand per basin. 1/13/05 |
| FAYETTE WSC | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 59 | 59 | 59 | 59 | 59 | 59 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells and proportioned based on demand per basin. 1/13/05 |
| FLATONIA | FAYETTE | K | Fayette | Guadalupe | 07531 | Yegua-Jackson | 145 | 145 | 145 | 145 | 145 | 145 | Supply Estimate based on TCEQ maximum production capacity for listed wells (168). 1/20/05 Total supply was reduced due to limited Carrizo supplies in Fayette County. |
| FLATONIA | FAYETTE | K | Fayette | Lavaca | 07531 | Yegua-Jackson | 101 | 101 | 101 | 101 | 101 | 101 | New permit data from Fayette GCD 08/2009 |
| FLATONIA | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 269 | 269 | 269 | 269 | 269 | 269 | New permit data from Fayette GCD 08/2009 |
| LA GRANGE | FAYETTE | K | Fayette | Colorado | 07524 | Queen City | 662 | 662 | 662 | 662 | 662 | 662 | Supply available to Queen City aquifer in Fayette County, Colorado basin minus supply to Fayette WSC and County Other. |
| LA GRANGE | FAYETTE | K | Fayette | Colorado | 07527 | Sparta | 1,850 | 1,850 | 1,850 | 1,850 | 1,850 | 1,850 | 2001 Plan: A-ALL, 100% reduced |
| LEE COUNTY WSC | FAYETTE | K | Fayette | Colorado | 07510 | Carrizo-Wilcox | 290 | 290 | 290 | 290 | 290 | 290 | Supply available to Carrizo-Wilcox aquifer in Fayette County, Colorado basin |
| LEE COUNTY WSC | FAYETTE | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 0 | 48 | 117 | 171 | 232 | 319 | Water from Bastrop County wells |
| SCHULENBURG | FAYETTE | K | Fayette | Lavaca | 07531 | Yegua-Jackson | 113 | 113 | 113 | 113 | 113 | 113 | New permit data from Fayette GCD 08/2009 |
| SCHULENBURG | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 706 | 706 | 706 | 706 | 706 | 706 | New permit data from Fayette GCD 08/2009 |
| IRRIGATION | FAYETTE | K | Fayette | Brazos | 07515 | Gulf Coast | 1 | 1 | 1 | 1 | 1 | 1 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | FAYETTE | K | Fayette | Colorado | 07515 | Gulf Coast | 150 | 150 | 150 | 150 | 150 | 150 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | FAYETTE | K | Fayette | Colorado | 075996 | Irrigation Local Supply | 534 | 534 | 534 | 534 | 534 | 534 | 2001 Plan: LCRA provided data and Demand |
| IRRIGATION | FAYETTE | K | Fayette | Colorado | 07510 | Carrizo-Wilcox | 0 | 0 | 0 | 0 | 0 | 0 | Reduced supply due to over allocation of Carrizo-Wilcox in Fayette County Colorado basin 2/7/05 |
| IRRIGATION | FAYETTE | K | Fayette | Colorado | 07527 | Sparta | 484 | 484 | 484 | 484 | 484 | 484 | 2001 Plan: AllocFile10 9/24/99 |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | FAYETTE | K | Fayette | Guadalupe | 07515 | Gulf Coast | 2 | 2 | 2 | 2 | 2 | 2 | 2001 Plan: AllocFile10 10% reduced |
| IRRIGATION | FAYETTE | K | Fayette | Guadalupe | 07527 | Sparta | 60 | 60 | 60 | 60 | 60 | 60 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 14 | 14 | 14 | 14 | 14 | 14 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | FAYETTE | K | Fayette | Lavaca | 07527 | Sparta | 3 | 3 | 3 | 3 | 3 | 3 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | FAYETTE | K | | Brazos | 12997 | Livestock Local Supply | 2 | 2 | 2 | 2 | 2 | 2 | 2001 Plan: Demand |
| LIVESTOCK | FAYETTE | K | Fayette | Colorado | 07515 | Gulf Coast | 140 | 140 | 140 | 140 | 140 | 140 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | FAYETTE | K | Fayette | Colorado | 07527 | Sparta | 733 | 733 | 733 | 733 | 733 | 733 | 2001 Plan: A-ALL, 30% reduced |
| LIVESTOCK | FAYETTE | K | | Colorado | 14997 | Livestock Local Supply | 1,746 | 1,746 | 1,746 | 1,746 | 1,746 | 1,746 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | FAYETTE | K | Fayette | Guadalupe | 07527 | Sparta | 179 | 179 | 179 | 179 | 179 | 179 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | FAYETTE | K | | Guadalupe | 18997 | Livestock Local Supply | 142 | 142 | 142 | 142 | 142 | 142 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | FAYETTE | K | Fayette | Guadalupe | 07515 | Gulf Coast | 2 | 2 | 2 | 2 | 2 | 2 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 176 | 176 | 176 | 176 | 176 | 176 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | FAYETTE | K | Fayette | Lavaca | 07527 | Sparta | 71 | 71 | 71 | 71 | 71 | 71 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | FAYETTE | K | | Lavaca | 16997 | Livestock Local Supply | 472 | 472 | 472 | 472 | 472 | 472 | 2001 Plan: LCRA Provided data |
| MANUFACTURING | FAYETTE | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| MANUFACTURING | FAYETTE | K | Fayette | Colorado | 07515 | Gulf Coast | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: AllocFile10 9/24/99 |
| MANUFACTURING | FAYETTE | K | Fayette | Guadalupe | 07527 | Sparta | 22 | 22 | 22 | 22 | 22 | 22 | 2001 Plan: AllocFile10 9/24/99 |
| MANUFACTURING | FAYETTE | K | Fayette | Lavaca | 07527 | Sparta | 8 | 8 | 8 | 8 | 8 | 8 | 2001 Plan: AllocFile10 9/24/99 |
| MANUFACTURING | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 152 | 152 | 152 | 152 | 152 | 152 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | FAYETTE | K | Fayette | Brazos | 07515 | Gulf Coast | 42 | 25 | 7 | 1 | 0 | 0 | 2001 Plan: A-ALL, 100% reduced |
| MINING | FAYETTE | K | Fayette | Colorado | 07527 | Sparta | 367 | 367 | 367 | 367 | 367 | 367 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | FAYETTE | K | Fayette | Colorado | 07515 | Gulf Coast | 103 | 103 | 103 | 103 | 103 | 103 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | FAYETTE | K | Fayette | Guadalupe | 07527 | Sparta | 60 | 60 | 60 | 60 | 60 | 60 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | FAYETTE | K | Fayette | Lavaca | 07515 | Gulf Coast | 10 | 10 | 10 | 10 | 10 | 10 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | FAYETTE | K | Fayette | Lavaca | 07527 | Sparta | 24 | 24 | 24 | 24 | 24 | 24 | 2001 Plan: AllocFile10 9/24/99 |
| STEAM ELECTRIC POWER | FAYETTE | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | FAYETTE | K | | Colorado | 3461405471A-SE | City of Austin - ROR (Steam Elec.) | 1,267 | 1,267 | 1,267 | 1,267 | 1,267 | 1,267 | Region K WAM Run 3 Cutoff; FPP |
| STEAM ELECTRIC POWER | FAYETTE | K | | Colorado | 140B0 | Highland Lakes | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 | 38,101 | Region K WAM Run 3 Cutoff; TCEQ WAM 5/6/05; LCRA Cooling Water |
| STEAM ELECTRIC POWER | FAYETTE | K | | Colorado | 140B0 | Highland Lakes | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | Extend contract 5/2009 |
| STEAM ELECTRIC POWER | FAYETTE | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | FAYETTE | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Colorado | 08613 | Edwards-Trinity (Plateau) | 968 | 968 | 968 | 968 | 968 | 968 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Colorado | 08614 | Ellenburger-San Saba | 436 | 436 | 436 | 436 | 436 | 436 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Colorado | 08616 | Hickory | 596 | 596 | 596 | 596 | 596 | 596 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | | Colorado | 140B0 | Highland Lakes | 56 | 56 | 56 | 56 | 56 | 56 | Updated LCRA contracts 08/2009 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Colorado | 08628 | Trinity | 1,123 | 1,123 | 1,123 | 1,123 | 1,123 | 1,123 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Guadalupe | 08613 | Edwards-Trinity (Plateau) | 90 | 90 | 90 | 90 | 90 | 90 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Guadalupe | 08614 | Ellenburger-San Saba | 65 | 65 | 65 | 65 | 65 | 65 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Guadalupe | 08616 | Hickory | 66 | 66 | 66 | 66 | 66 | 66 | Hill Country UWCD 5/14/04 |
| COUNTY-OTHER | GILLESPIE | K | Gillespie | Guadalupe | 08628 | Trinity | 26 | 26 | 26 | 26 | 26 | 26 | Hill Country UWCD 5/14/04 |
| FREDERICKSBURG | GILLESPIE | K | Gillespie | Colorado | 08614 | Ellenburger-San Saba | 3,174 | 3,174 | 3,174 | 3,174 | 3,174 | 3,174 | Hill Country UWCD 5/14/04 |
| FREDERICKSBURG | GILLESPIE | K | Gillespie | Colorado | 08616 | Hickory | 662 | 662 | 662 | 662 | 662 | 662 | Hill Country UWCD 5/14/04 |
| IRRIGATION | GILLESPIE | K | Gillespie | Colorado | 08613 | Edwards-Trinity (Plateau) | 71 | 71 | 71 | 71 | 71 | 71 | 2001 Plan: A-ALL, LIMIT reduced |
| IRRIGATION | GILLESPIE | K | Gillespie | Colorado | 086996 | Irrigation Local Supply | 880 | 880 | 880 | 880 | 880 | 880 | 2001 Plan: LCRA provided data? |
| IRRIGATION | GILLESPIE | K | Gillespie | Colorado | 08628 | Trinity | 1,149 | 1,149 | 1,149 | 1,149 | 1,149 | 1,149 | Hill Country UWCD 5/14/04 |
| IRRIGATION | GILLESPIE | K | Gillespie | Colorado | 08616 | Hickory | 210 | 210 | 210 | 210 | 210 | 210 | Hill Country UWCD 5/14/04 |
| IRRIGATION | GILLESPIE | K | Gillespie | Colorado | 08614 | Ellenburger-San Saba | 1,239 | 1,239 | 1,239 | 1,239 | 1,239 | 1,239 | Hill Country UWCD 5/14/04 |
| IRRIGATION | GILLESPIE | K | Gillespie | Guadalupe | 08628 | Trinity | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: AllocFile10 10% reduced |
| LIVESTOCK | GILLESPIE | K | | Colorado | 14997 | Livestock Local Supply | 515 | 515 | 515 | 515 | 515 | 515 | 2001 Plan: Demand |
| LIVESTOCK | GILLESPIE | K | Gillespie | Colorado | 08613 | Edwards-Trinity (Plateau) | 266 | 266 | 266 | 266 | 266 | 266 | Hill Country UWCD 5/14/04 |
| LIVESTOCK | GILLESPIE | K | Gillespie | Colorado | 08614 | Ellenburger-San Saba | 266 | 266 | 266 | 266 | 266 | 266 | Hill Country UWCD 5/14/04 |
| LIVESTOCK | GILLESPIE | K | Gillespie | Colorado | 08616 | Hickory | 266 | 266 | 266 | 266 | 266 | 266 | Hill Country UWCD 5/14/04 |
| LIVESTOCK | GILLESPIE | K | Gillespie | Colorado | 08628 | Trinity | 932 | 932 | 932 | 932 | 932 | 932 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | GILLESPIE | K | Gillespie | Guadalupe | 08628 | Trinity | 20 | 20 | 20 | 20 | 20 | 20 | 2001 Plan: A-ALL, 17.6% reduced |
| LIVESTOCK | GILLESPIE | K | | Guadalupe | 18997 | Livestock Local Supply | 13 | 13 | 13 | 13 | 13 | 13 | 2001 Plan: Demand |
| MANUFACTURING | GILLESPIE | K | Gillespie | Colorado | 08613 | Edwards-Trinity (Plateau) | 34 | 34 | 34 | 34 | 34 | 34 | Hill Country UWCD 5/14/04 |
| MANUFACTURING | GILLESPIE | K | Gillespie | Colorado | 08614 | Ellenburger-San Saba | 398 | 398 | 398 | 398 | 398 | 398 | Hill Country UWCD 5/14/04 |
| MANUFACTURING | GILLESPIE | K | Gillespie | Colorado | 08616 | Hickory | 150 | 150 | 150 | 150 | 150 | 150 | Hill Country UWCD 5/14/04 |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MANUFACTURING | GILLESPIE | K | | Colorado | 14999 | Other Local Supply | 158 | 158 | 158 | 158 | 158 | 158 | 2001 Plan: Demand |
| MANUFACTURING | GILLESPIE | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| MINING | GILLESPIE | K | Gillespie | Colorado | 08616 | Hickory | 50 | 50 | 50 | 50 | 50 | 50 | Hill Country UWCD 5/14/04 |
| MINING | GILLESPIE | K | Gillespie | Colorado | 08628 | Trinity | 150 | 150 | 150 | 150 | 150 | 150 | Hill Country UWCD 5/14/04 |
| MINING | GILLESPIE | K | Gillespie | Colorado | 08613 | Edwards-Trinity (Plateau) | 71 | 71 | 71 | 71 | 71 | 71 | 2001 Plan: AllFile10 9/24 Limit reduced |
| MINING | GILLESPIE | K | Gillespie | Colorado | 08614 | Ellenburger-San Saba | 22 | 22 | 22 | 22 | 22 | 22 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | GILLESPIE | K | Gillespie | Guadalupe | 08628 | Trinity | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: AllocFile10 10% reduced |
| STEAM ELECTRIC POWER | GILLESPIE | K | Gillespie | Colorado | 08613 | Edwards-Trinity (Plateau) | 0 | 0 | 0 | 0 | 0 | 0 | Hill Country UWCD 5/14/04 |
| STEAM ELECTRIC POWER | GILLESPIE | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| BUDA | HAYS | K | Hays | Colorado | 10511 | Edwards-BFZ | 591 | 591 | 591 | 591 | 591 | 591 | BSEACD 10/24/07 |
| BUDA | HAYS | L | | | 18020 | Canyon Lake | 1,120 | 1,680 | 1,680 | 1,680 | 1,680 | 1,680 | City of Buda, 09/2009 |
| CIMARRON PARK WATER COMPANY | HAYS | | Hays | Colorado | 10511 | Edwards-BFZ | 253 | 253 | 253 | 253 | 253 | 253 | BSEACD 12/18/07 New WUG: BSEACD 3/9/04 |
| COUNTY-OTHER | HAYS | K | | Colorado | 140B0 | Highland Lakes | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 | 1,425 | Revised contract amounts 07/2009, Extend contract 5/2009 |
| COUNTY-OTHER | HAYS | K | Hays | Colorado | 10511 | Edwards-BFZ | 1,014 | 921 | 1,031 | 1,031 | 1,028 | 1,028 | BSEACD 10/24/07 Permittees plus 10% exempt pumpage; 2050 and 2060 subtract 3 for livestock |
| COUNTY-OTHER | HAYS | L | | | 18020 | Canyon Lake | 1,680 | 1,680 | 1,680 | 1,680 | 1,680 | 1,680 | Updated strategy to supply 09/2009 |
| DRIPPING SPRINGS | HAYS | K | | Colorado | 140B0 | Highland Lakes | 506 | 506 | 506 | 506 | 506 | 506 | Extend contract 5/2009: Supply Estimate based on LCRA 4/9/04 (from Dripping Springs WSC) |
| DRIPPING SPRINGS WSC | HAYS | K | | Colorado | 140B0 | Highland Lakes | 560 | 560 | 560 | 560 | 560 | 560 | 07/2009 LCRA commitment list |
| DRIPPING SPRINGS WSC | HAYS | K | Hays | Colorado | 10528 | Trinity | 240 | 240 | 240 | 240 | 240 | 240 | New WUG: Supply based on Dripping Springs WSC 9/20/04 |
| HILL COUNTRY WSC | HAYS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: Supply Estimate based on COA email 2/18/04 |
| HILL COUNTRY WSC | HAYS | K | | Colorado | 140B0 | Highland Lakes | 440 | 702 | 980 | 1,249 | 1,582 | 1,844 | New WUG: Retail customer of West Travis RWS. Subtracted demand from West Travis Contract. 2/10/05 |
| MOUNTAIN CITY | HAYS | | Hays | Colorado | 10511 | Edwards-BFZ | 93 | 93 | 93 | 93 | 93 | 93 | BSEACD 12/18/07 New WUG: BSEACD 3/9/04 |
| IRRIGATION | HAYS | K | Hays | Colorado | 10511 | Edwards-BFZ | 10 | 10 | 10 | 10 | 10 | 10 | BSEACD 10/24/07 (permitted amount) |
| IRRIGATION | HAYS | K | Hays | Colorado | 10528 | Trinity | 2 | 2 | 2 | 2 | 1 | 1 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | HAYS | K | Hays | Colorado | 105996 | Irrigation Local Supply | 41 | 41 | 41 | 41 | 41 | 41 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | HAYS | K | | Colorado | 14997 | Livestock Local Supply | 192 | 192 | 192 | 192 | 192 | 192 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | HAYS | K | Hays | Colorado | 10528 | Trinity | 30 | 30 | 30 | 30 | 25 | 25 | 2001 Plan: A-ALL, 17.6% reduced |
| LIVESTOCK | HAYS | K | Hays | Colorado | 10511 | Edwards-BFZ | 0 | 0 | 0 | 0 | 3 | 3 | Reduced due to demand being met by other sources (livestock demand = 220) and reduced availability in Edwards-BFZ 10/24/07 |
| MANUFACTURING | HAYS | K | Hays | Colorado | 10511 | Edwards-BFZ | 598 | 598 | 598 | 598 | 598 | 598 | BSEACD 12/18/07 BSEACD 3/9/04 855 ac-ft/yr; rest Plan2001 |
| MINING | HAYS | K | Hays | Colorado | 10511 | Edwards-BFZ | 0 | 0 | 0 | 0 | 0 | 0 | Reduced due to lack of demand (mining demand <=12) and reduced availability in Edwards-BFZ 10/24/07 |
| MINING | HAYS | K | Hays | Colorado | 10528 | Trinity | 12 | 12 | 12 | 12 | 10 | 10 | 2001 Plan: A-ALL, 3.5% reduced |
| STEAM ELECTRIC POWER | HAYS | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| COUNTY-OTHER | LLANO | K | Llano | Colorado | 15014 | Ellenburger-San Saba | 120 | 120 | 120 | 120 | 120 | 120 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | LLANO | K | Llano | Colorado | 15016 | Hickory | 42 | 42 | 42 | 42 | 42 | 42 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | LLANO | K | | Colorado | 140B0 | Highland Lakes | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 | 2,222 | Updated number 08/09, Extend contract 5/2009 |
| KINGSLAND WSC | LLANO | K | | Colorado | 140B0 | Highland Lakes | 405 | 405 | 405 | 405 | 405 | 405 | Updated number 08/09, Extend contract 5/2009 |
| KINGSLAND WSC | LLANO | K | Llano | Colorado | 15022 | Other Aquifer | 109 | 109 | 109 | 109 | 109 | 109 | New WUG: Supply Estimate based on TCEQ capacity for listed wells. Assumes all GW is supplied within Llano County. 1/14/05 |
| LAKE LBJ MUD | LLANO | K | | Colorado | 140B0 | Highland Lakes | 1,530 | 1,495 | 1,462 | 1,431 | 1,400 | 1,364 | Extend contract 5/2009 |
| LLANO | LLANO | K | | Colorado | 140B0 | Highland Lakes | 87 | 87 | 87 | 87 | 87 | 87 | Extend contract 5/2009 |
| LLANO | LLANO | K | | Colorado | 14520 | Llano Reservoir | 0 | 0 | 0 | 0 | 0 | 0 | Region K WAM Run 3 Cutoff |
| SUNRISE BEACH VILLAGE | LLANO | K | | Colorado | 140B0 | Highland Lakes | 278 | 278 | 278 | 278 | 278 | 278 | New WUG: Supply Estimate based on TCEQ maximum production capacity for system. 1/14/05 |
| SUNRISE BEACH VILLAGE | LLANO | K | Llano | Colorado | 15016 | Hickory | 65 | 65 | 65 | 65 | 65 | 65 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells. 1/14/05 |
| IRRIGATION | LLANO | K | Llano | Colorado | 150996 | Irrigation Local Supply | 440 | 440 | 440 | 440 | 440 | 440 | 2001 Plan: LCRA Provided data |
| IRRIGATION | LLANO | K | Llano | Colorado | 15016 | Hickory | 10,051 | 10,051 | 10,051 | 10,051 | 10,051 | 10,051 | 2001 Plan: A-ALL, % & Tbl 4 |

## Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | LLANO | K | Llano | Colorado | 15014 | Ellenburger-San Saba | 76 | 76 | 76 | 76 | 76 | 76 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | LLANO | K | | Colorado | 14997 | Livestock Local Supply | 393 | 393 | 393 | 393 | 393 | 393 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | LLANO | K | Llano | Colorado | 15016 | Hickory | 288 | 288 | 288 | 288 | 288 | 288 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | LLANO | K | Llano | Colorado | 15014 | Ellenburger-San Saba | 8 | 8 | 8 | 8 | 8 | 8 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | LLANO | K | Llano | Colorado | 15016 | Hickory | 3 | 3 | 3 | 3 | 3 | 3 | Updated supply to meet demand (Reallocation strategy from 2006 Region K Plan) |
| MINING | LLANO | K | Llano | Colorado | 15016 | Hickory | 1,252 | 1,252 | 1,252 | 1,252 | 1,252 | 1,252 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | LLANO | K | Llano | Colorado | 15014 | Ellenburger-San Saba | 76 | 76 | 76 | 76 | 76 | 76 | 2001 Plan: A-ALL, % & Tbl 4 |
| STEAM ELECTRIC POWER | LLANO | K | | Colorado | 140B0 | Highland Lakes | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 | 15,700 | Region K WAM Run 3 Cutoff; TCEQ WAM 5/6/05; LCRA Cooling Water |
| BAY CITY | MATAGORDA | K | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 6,255 | 6,255 | 6,255 | 6,255 | 6,255 | 6,255 | 2001 Plan: A-ALL, LIMIT 9725 reduced |
| COUNTY-OTHER | MATAGORDA | | | Colorado | 140B0 | Highland Lakes | 0 | 0 | 0 | 0 | 0 | 0 | Updated LCRA Commitment list 07/2009 |
| COUNTY-OTHER | MATAGORDA | K | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 1,936 | 1,933 | 1,932 | 1,932 | 1,933 | 1,933 | 2001 Plan: ALLOC-F10 9/24/99 |
| COUNTY-OTHER | MATAGORDA | K | Matagorda | Colorado | 16115 | Gulf Coast | 250 | 250 | 250 | 250 | 250 | 250 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | MATAGORDA | | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 789 | 789 | 789 | 789 | 789 | 789 | |
| COUNTY-OTHER | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 3,900 | 2001 Plan: A-ALL, % & Tbl 4 |
| ORBIT SYSTEMS INC | MATAGORDA | | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 2 | 2 | 2 | 2 | 2 | 2 | Updated supply to meet demand (Reallocation strategy from 2006 Region K Plan) |
| PALACIOS | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 2,152 | 2,152 | 2,152 | 2,152 | 2,152 | 2,152 | 2001 Plan: A-ALL, LIMIT |
| SOUTHWEST UTILITIES | MATAGORDA | | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 140 | 140 | 140 | 140 | 140 | 140 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells. 1/13/05 |
| IRRIGATION | MATAGORDA | K | | Colorado | 3461405476A | LCRA - Gulf Coast ROR | 21,069 | 20,464 | 20,464 | 20,464 | 20,464 | 20,464 | Region K WAM Run 3 Cutoff; Gulf Coast ROR split by basin. |
| IRRIGATION | MATAGORDA | K | Matagorda | Brazos-Colorado | 161996 | Irrigation Local Supply | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2001 Plan: TWDB |
| IRRIGATION | MATAGORDA | K | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 4,082 | 4,082 | 4,082 | 4,082 | 4,082 | 4,082 | 2001 Plan: Demand |
| IRRIGATION | MATAGORDA | K | | Colorado | 3461405476A | LCRA - Gulf Coast ROR | 2,689 | 2,612 | 2,612 | 2,612 | 2,612 | 2,612 | Region K WAM Run 3 Cutoff; Gulf Coast ROR split by basin. |
| IRRIGATION | MATAGORDA | K | Matagorda | Colorado | 16115 | Gulf Coast | 1,389 | 1,389 | 1,389 | 1,389 | 1,389 | 1,389 | 2001 Plan: Demand |
| IRRIGATION | MATAGORDA | K | Matagorda | Colorado | 161996 | Irrigation Local Supply | 900 | 900 | 900 | 900 | 900 | 900 | 2001 Plan: TWDB |
| IRRIGATION | MATAGORDA | K | | Colorado | 3461405476A | LCRA - Gulf Coast ROR | 21,069 | 20,464 | 20,464 | 20,464 | 20,464 | 20,464 | Region K WAM Run 3 Cutoff; Gulf Coast ROR split by basin. |
| IRRIGATION | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 7,108 | 7,108 | 7,108 | 7,108 | 7,108 | 7,108 | 2001 Plan: Demand |
| IRRIGATION | MATAGORDA | K | Matagorda | Colorado-Lavaca | 161996 | Irrigation Local Supply | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 | 2001 Plan: TWDB |
| LIVESTOCK | MATAGORDA | K | | Brazos-Colorado | 13997 | Livestock Local Supply | 206 | 206 | 206 | 206 | 206 | 206 | 2001 Plan: Demand |
| LIVESTOCK | MATAGORDA | K | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 875 | 875 | 875 | 875 | 875 | 875 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | MATAGORDA | K | | Colorado | 14997 | Livestock Local Supply | 25 | 25 | 25 | 25 | 25 | 25 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | MATAGORDA | K | Matagorda | Colorado | 16115 | Gulf Coast | 171 | 171 | 171 | 171 | 171 | 171 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | MATAGORDA | K | | Colorado-Lavaca | 15997 | Livestock Local Supply | 215 | 215 | 215 | 215 | 215 | 215 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 215 | 215 | 215 | 215 | 215 | 215 | 2001 Plan: A-ALL, LIMIT |
| MANUFACTURING | MATAGORDA | K | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 1,823 | 1,823 | 1,823 | 1,823 | 1,823 | 1,823 | 2001 Plan: ALLOC-F10 8% reduced |
| MANUFACTURING | MATAGORDA | K | | Colorado | 140B0 | Highland Lakes | 7,438 | 7,438 | 7,438 | 7,438 | 7,438 | 7,438 | Extend contract 5/2009 |
| MANUFACTURING | MATAGORDA | K | Matagorda | Colorado | 16115 | Gulf Coast | 929 | 929 | 929 | 929 | 929 | 929 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | MATAGORDA | K | | Colorado | 140B0 | Highland Lakes | 6,784 | 6,784 | 6,784 | 6,784 | 6,784 | 6,784 | Extend contract 5/2009 |
| MANUFACTURING | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 2,537 | 2,537 | 2,537 | 2,537 | 2,537 | 2,537 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | MATAGORDA | K | Matagorda | Brazos-Colorado | 16115 | Gulf Coast | 182 | 182 | 182 | 182 | 182 | 182 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | MATAGORDA | K | Matagorda | Colorado | 16115 | Gulf Coast | 0 | 0 | 0 | 0 | 0 | 0 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 664 | 664 | 664 | 664 | 664 | 664 | 2001 Plan: A-ALL, % & Tbl 4 |
| STEAM ELECTRIC POWER | MATAGORDA | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | MATAGORDA | K | Matagorda | Colorado | 16115 | Gulf Coast | 443 | 443 | 443 | 443 | 443 | 443 | 2001 Plan: A-ALL, % & Tbl 4 |
| STEAM ELECTRIC POWER | MATAGORDA | K | | Colorado | 3461405437 | STP Nuclear Operating Co. - ROR | 51,857 | 46,072 | 46,072 | 46,072 | 46,072 | 46,072 | Region K WAM Run 3 Cutoff |
| STEAM ELECTRIC POWER | MATAGORDA | K | | Colorado | 140B0 | Highland Lakes | 27,507 | 32,480 | 32,480 | 32,480 | 32,480 | 32,360 | Region K WAM Run 3 Cutoff; LCRA contract: Back-up of STP WR , Need strategy for LCRA contract with White Stallion (30,000) |
| STEAM ELECTRIC POWER | MATAGORDA | K | Matagorda | Colorado-Lavaca | 16115 | Gulf Coast | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | Groundwater for STP |
| BROOKSMITH SUD | MILLS | F | | Colorado | 14140 | Lake Brownwood | 10 | 10 | 8 | 8 | 8 | 7 | New WUG: Supply based on Brookesmith SUD 9/20/04 |
| COUNTY-OTHER | MILLS | K | Mills | Brazos | 16728 | Trinity | 259 | 259 | 227 | 227 | 186 | 186 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | MILLS | K | Mills | Colorado | 16728 | Trinity | 285 | 335 | 294 | 294 | 241 | 241 | 2001 Plan: A-ALL, % & Tbl 4 |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GOLDTHWAITE | MILLS | K | Mills | Brazos | 16728 | Trinity | 1 | 1 | 1 | 1 | 1 | 1 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells and proportioned based on demand per basin. 1/20/05 |
| GOLDTHWAITE | MILLS | K | | Colorado | 14350 | Goldthwaite Reservoir | 0 | 0 | 0 | 0 | 0 | 0 | Region K WAM Run 3 Cutoff; New WUG: TCEQ WAM 5/6/05 |
| GOLDTHWAITE | MILLS | K | | Colorado | 14350 | Goldthwaite Reservoir | 0 | 0 | 0 | 0 | 0 | 0 | Region K WAM Run 3 Cutoff; New WUG: TCEQ WAM 5/6/05 |
| GOLDTHWAITE | MILLS | K | Mills | Colorado | 16728 | Trinity | 67 | 67 | 67 | 67 | 68 | 68 | Supply Estimate based on TCEQ maximum production capacity for listed wells and proportioned based on demand per basin. 1/20/05 |
| IRRIGATION | MILLS | K | Mills | Brazos | 16728 | Trinity | 143 | 143 | 125 | 125 | 103 | 103 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | MILLS | K | Mills | Colorado | 16728 | Trinity | 76 | 76 | 66 | 66 | 54 | 54 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | MILLS | K | Mills | Colorado | 167996 | Irrigation Local Supply | 2,378 | 2,378 | 2,378 | 2,378 | 2,378 | 2,378 | 2001 Plan: TWDB |
| LIVESTOCK | MILLS | K | Mills | Brazos | 16728 | Trinity | 438 | 438 | 438 | 438 | 438 | 438 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | MILLS | K | Mills | Colorado | 16728 | Trinity | 407 | 407 | 357 | 357 | 293 | 293 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | MILLS | K | | Colorado | 14997 | Livestock Local Supply | 314 | 314 | 314 | 314 | 314 | 314 | 2001 Plan: LCRA Provided data |
| MANUFACTURING | MILLS | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| MANUFACTURING | MILLS | K | Mills | Colorado | 16728 | Trinity | 1 | 1 | 1 | 1 | 1 | 1 | Updated supply to meet demand (Reallocation strategy from 2006 Region K Plan) |
| MINING | MILLS | K | Mills | Brazos | 16728 | Trinity | 143 | 143 | 125 | 125 | 103 | 103 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | MILLS | K | Mills | Colorado | 16728 | Trinity | 133 | 133 | 117 | 117 | 96 | 96 | 2001 Plan: AllocFile10 9/24/99 |
| STEAM ELECTRIC POWER | MILLS | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | MILLS | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| COUNTY-OTHER | SAN SABA | K | San Saba | Colorado | 20614 | Ellenburger-San Saba | 7,744 | 7,744 | 7,744 | 7,744 | 7,744 | 7,744 | Supply available to Ellenburger-San Saba aquifer in San Saba County, Colorado basin minus supply to Richland and San Saba WUG. |
| COUNTY-OTHER | SAN SABA | K | San Saba | Colorado | 20616 | Hickory | 50 | 50 | 50 | 50 | 50 | 50 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | SAN SABA | K | San Saba | Colorado | 20619 | Marble Falls | 250 | 250 | 250 | 250 | 250 | 250 | 2001 Plan: A-ALL, LIMIT |
| COUNTY-OTHER | SAN SABA | K | | Colorado | 140B0 | Highland Lakes | 20 | 20 | 20 | 20 | 20 | 20 | Extend contract 5/2009 |
| RICHLAND SUD | SAN SABA | K | San Saba | Colorado | 20614 | Ellenburger-San Saba | 210 | 210 | 210 | 210 | 210 | 210 | New WUG: Supply Estimate based on TCEQ maximum production capacity for listed wells. 1/14/05 |
| SAN SABA | SAN SABA | K | San Saba | Colorado | 20614 | Ellenburger-San Saba | 2,240 | 2,240 | 2,240 | 2,240 | 2,240 | 2,240 | 2001 Plan: Plant verbal confirmation |
| IRRIGATION | SAN SABA | K | San Saba | Colorado | 20616 | Hickory | 4,715 | 4,715 | 4,715 | 4,715 | 4,715 | 4,715 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | SAN SABA | K | San Saba | Colorado | 20619 | Marble Falls | 4,643 | 4,643 | 4,643 | 4,643 | 4,643 | 4,643 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | SAN SABA | K | San Saba | Colorado | 206996 | Irrigation Local Supply | 8,800 | 8,800 | 8,800 | 8,800 | 8,800 | 8,800 | 2001 Plan: TWDB |
| LIVESTOCK | SAN SABA | K | San Saba | Colorado | 20619 | Marble Falls | 2,612 | 2,612 | 2,612 | 2,612 | 2,612 | 2,612 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | SAN SABA | K | | Colorado | 14997 | Livestock Local Supply | 224 | 224 | 224 | 224 | 224 | 224 | 2001 Plan: Demand |
| LIVESTOCK | SAN SABA | K | San Saba | Colorado | 20616 | Hickory | 994 | 994 | 994 | 994 | 994 | 994 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | SAN SABA | K | San Saba | Colorado | 20616 | Hickory | 144 | 144 | 144 | 144 | 144 | 144 | 2001 Plan: AllocFile10 9/24/99 |
| MANUFACTURING | SAN SABA | K | San Saba | Colorado | 20619 | Marble Falls | 2,612 | 2,612 | 2,612 | 2,612 | 2,612 | 2,612 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | SAN SABA | K | San Saba | Colorado | 20619 | Marble Falls | 1,238 | 1,238 | 1,238 | 1,238 | 1,238 | 1,238 | 2001 Plan: AllocFile10 9/24/99 |
| MINING | SAN SABA | K | San Saba | Colorado | 20616 | Hickory | 301 | 301 | 301 | 301 | 301 | 301 | 2001 Plan: A-ALL, % & Tbl 4 |
| STEAM ELECTRIC POWER | SAN SABA | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| ANDERSON MILL MUD | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Name: Supply Estimate based on OLD name & COA meeting 3/16/04 |
| AQUA WSC | TRAVIS | L | Caldwell | Guadalupe | 02810 | Carrizo-Wilcox | 1,421 | 1,634 | 1,815 | 1,938 | 2,066 | 2,214 | Source changed from Highland Lakes to Carrizo-Wilcox Aquifer in Caldwell County (Region L) 5,000 ac-ft split between Bastrop, Fayette, and Travis 08/09 |
| AUSTIN | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 162,341 | 152,267 | 142,065 | 127,408 | 116,926 | 106,263 | Region K WAM Run 3 Cutoff; remaining supply after wholesale commitment allocation |
| AUSTIN | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 2520 | 3335 | 3351 | 3370 | 3377 | 3377 | Region K WAM Run 3 Cutoff; remaining supply after wholesale commitment allocation 5/2009 |
| AUSTIN | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 112,410 | 120,534 | 120,534 | 120,534 | 120,534 | 120,521 | Region K WAM Run 3 Cutoff; COA contract with LCRA after ROR (this supply makes the COA municipal and manufacturing supply total 325,000 ac-ft/yr) |
| BARTON CREEK WEST WSC | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 348 | 348 | 348 | 348 | 348 | 348 | Served by West Travis RWS, New WUG: Supply Estimate based on LCRA 4/9/04 |

# Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEE CAVE VILLAGE | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 241 | 241 | 241 | 241 | 241 | 241 | Served by West Travis RWS, New WUG: Supply Estimate based on LCRA 4/9/04 |
| BRIARCLIFF VILLAGE | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 300 | 300 | 300 | 300 | 300 | 300 | Extend contract 5/2009 |
| CEDAR PARK | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 188 | 290 | 384 | 443 | 506 | 570 | Extend contract 5/2009: Supply Estimate based on LCRA 4/9/04 (split by region); Contract to Williamson-Travis MUD #1 has been taken from 2000 and 2010 planning periods. |
| COUNTY-OTHER | TRAVIS | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 64 | 64 | 64 | 64 | 64 | 64 | Aqua WSC email 3/29/04 |
| COUNTY-OTHER | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 4,477 | 4,649 | 4,243 | 4,104 | 4,268 | 4,656 | Based on information from COA 10/27/09(portion of demand) |
| COUNTY-OTHER | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 900 | 880 | 860 | 842 | 829 | 816 | BSEACD 11/01/07 San Leanna's supply taken out |
| COUNTY-OTHER | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 1 | 1 | 1 | 1 | 1 | 1 | BSEACD 3/9/04 |
| COUNTY-OTHER | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 19,172 | 19,174 | 19,176 | 19,177 | 19,177 | 19,177 | Extend contract 5/2009 Supply based on LCRA revised data 07/2009 (Travis County WCID #19 supply taken out) |
| COUNTY-OTHER | TRAVIS | K | Travis | Colorado | 22728 | Trinity | 592 | 592 | 592 | 592 | 485 | 485 | 2001 Plan: A-ALL, 100% reduced |
| CREEDMOOR-MAHA WSC | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 596 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09(portion of demand) |
| CREEDMOOR-MAHA WSC | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 321 | 286 | 272 | 252 | 236 | 223 | Reduced supply to reduce # of strategies needed 10/26/07New WUG: Supply Estimate based on BSEACD 3/9/04 (Proportioned by basin demand) |
| CREEDMOOR-MAHA WSC | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 16 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09(portion of demand) |
| CREEDMOOR-MAHA WSC | TRAVIS | K | Travis | Guadalupe | 22711 | Edwards-BFZ | 0 | 19 | 21 | 23 | 25 | 27 | Rearranged demands to reduce # of strategies needed 10/26/07 New WUG: Supply Estimate based on BSEACD 3/9/04 (Proportioned by basin demand) |
| ELGIN | TRAVIS | K | Bastrop | Colorado | 01110 | Carrizo-Wilcox | 14 | 20 | 22 | 23 | 23 | 22 | New WUG: Supply Estimate based on TCEQ maximum production capacity for groundwater treatment facility and proportioned by total demand. 1/14/05 |
| GOFORTH WSC | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 19 | 18 | 17 | 15 | 15 | 15 | BSEACD 12/18/07 revised supply based on 70%. |
| HILL COUNTRY WSC | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09 |
| HILL COUNTRY WSC | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 238 | 364 | 484 | 555 | 633 | 714 | New WUG: Retail customer of West Travis RWS. Subtracted demand from West Travis Contract. 2/10/05 |
| JONESTOWN | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 338 | 315 | 296 | 284 | 270 | 255 | Extend contract 5/2009 Jonestown WSC split between Jonestown and Jonestown WSC WUGs. |
| JONESTOWN WSC | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 122 | 145 | 164 | 176 | 190 | 205 | Extend contract 5/2009: Supply Estimate based on LCRA 7/2009; supply split between Jonestown and Jonestown WSC |
| LAGO VISTA | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 | Extend contract 5/2009; Updated LCRA supplies 07/2009 |
| LAKEWAY | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 | 3,069 | Extend contract 5/2009 |
| LAKEWAY MUD | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: Supply Estimate based on revised LCRA data. 2/2/05 |
| LOOP 360 WSC | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 | Extend contract 5/2009; Updated LCRA supplies 07/2009 |
| LOST CREEK MUD | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 935 | 921 | 906 | 891 | 882 | 882 | Assume COA contract extended 5/2009 |
| MANOR | TRAVIS | K | Travis | Colorado | 22722 | Other Aquifer | 661 | 661 | 661 | 661 | 661 | 661 | Supply estimate based on TCEQ total production. 2/8/05 |
| MANOR | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 1,680 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09(portion of demand) |
| MANOR | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 280 | | | | | | 5-year agreement to purchase from Pflugerville 10/2009 |
| MANVILLE WSC | TRAVIS | K | | Colorado | 140B1 | Highland Lakes | 1,008 | 1,008 | 1,008 | | | | Contract with Pflugerville to purchase 0.9 MGD 10/2009 |
| MANVILLE WSC | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 2,240 | 2,240 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09 |

## Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MANVILLE WSC | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: Supply reduced from estimated from TCEQ well production capacities due to other supplies and reduction of Edwards-BFZ in Travis County Colorado Basin 2/7/05 |
| MANVILLE WSC | TRAVIS | K | Travis | Colorado | 22722 | Other Aquifer | 1,064 | 1,063 | 1,059 | 1,053 | 1,038 | 985 | New WUG: Supply estimated from TCEQ well production capacities and proportioned for percent total population. 1/14/05 |
| MUSTANG RIDGE | TRAVIS | K | Travis | Colorado | 22722 | Other Aquifer | 93 | 111 | 128 | 139 | 150 | 162 | New WUG: No Data; Assumed alluvial supplies (no major or minor aquifers in the area) |
| MUSTANG RIDGE | TRAVIS | K | Travis | Guadalupe | 22722 | Other Aquifer | 25 | 30 | 34 | 37 | 40 | 43 | New WUG: No Data; Assumed alluvial supplies (no major or minor aquifers in the area) |
| NORTH AUSTIN MUD #1 | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 109 | 107 | 106 | 103 | 102 | 102 | Extend contract 05/2009 |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 514 | 792 | 1,045 | 1,196 | 1,366 | 1,540 | Extend contract 5/2009 TCEQ database shows MUD as annexed by Pflugerville 2/8/05 (Met Demand from Pflugerville supplies) |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | TCEQ database shows MUD as annexed by Pflugerville 2/8/05 (Met Demand from Pflugerville supplies) |
| PFLUGERVILLE | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 10,198 | 10,200 | 9,947 | 10,804 | 10,634 | 10,460 | Extend contract 5/2009 Supply Estimate based on LCRA 4/9/04 (12000 reduced by North Travis County MUD 5) |
| PFLUGERVILLE | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | COA email 2/18/04; COA contract expires 12/31/07 and is replaced with LCRA contract (11201 reduced by North Travis County MUD 5) |
| PFLUGERVILLE | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 0 | 0 | 0 | 0 | 0 | 0 | Supply reduced from estimated from City of Pflugerville Update due to other supplies and reduction of Edwards-BFZ in Travis County Colorado Basin 2/7/05 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 900 | 900 | 900 | 900 | 900 | 900 | Extend contract 5/2009 |
| ROLLINGWOOD | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 377 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09 |
| ROUND ROCK | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09 |
| ROUND ROCK | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 241 | 266 | 264 | 240 | 223 | 210 | New WUG: Supply estimated from TCEQ well production capacities and proportioned for percent total demand. 1/14/05 |
| SAN LEANNA | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 100 | 120 | 140 | 158 | 171 | 184 | NEW WUG 05/2009 subtact from county-other |
| SAN LEANNA | TRAVIS | K | Travis | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 100 | | | | | | New WUG 05/2009 |
| SHADY HOLLOW MUD | TRAVIS | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 747 | 731 | 716 | 700 | 694 | 694 | Assume COA contract extended 5/2009 |
| THE HILLS | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 | Extend contract 5/2009 |
| TRAVIS COUNTY WCID #17 | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 | 9,354 | Extend contract 5/2009 |
| TRAVIS COUNTY WCID #18 | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 | Extend contract 5/2009 |
| TRAVIS COUNTY WCID #19 | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 376 | 374 | 372 | 371 | 371 | 371 | Extend contract 5/2009 : Supply based on demand and Travis County WCID No. 19 9/20/04 (supplied by Travis County MUD #4 which is contained in Travis County Other) |
| TRAVIS COUNTY WCID #20 | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 | 1,135 | Extend contract 5/2009 |
| WELLS BRANCH MUD | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 1,539 | 1,520 | 1,502 | 1,474 | 1,464 | 1,464 | Assume COA contract extended 5/2009, Include supply for Region G demands 01/05/10 |
| WEST LAKE HILLS | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 1,605 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09 |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 10,042 | 9,654 | 9,256 | 8,916 | 8,505 | 8,162 | Updated LCRA contract numbers 08/0009 New WUG: Supply Estimate based on LCRA. Retail supplies to various WUGs have been subtracted out. 2/10/05 |
| WILLIAMSON-TRAVIS COUNTY MUD #1 | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 198 | 274 | 344 | 385 | 433 | 482 | Extend contract 5/2009 Supply based on Williamson-Travis Counties MUD No. 1 (supplied by Cedar Park) |
| WINDERMERE UTILITY COMPANY | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 2,157 | 0 | 0 | 0 | 0 | 0 | Based on information from COA 10/27/09 |

## Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WINDERMERE UTILITY COMPANY | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: Supply reduced from estimated from Windermere Utility Co. numbers due to other supplies and reduction of Edwards-BFZ in Travis County Colorado Basin 2/7/05 |
| IRRIGATION | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 319 | 319 | 319 | 319 | 319 | 319 | BSEACD permitted supply 10/26/07 |
| IRRIGATION | TRAVIS | K | Travis | Colorado | 227996 | Irrigation Local Supply | 756 | 756 | 756 | 756 | 756 | 756 | Updated supply to meet demand (Reallocation strategy from 2006 Region K Plan) |
| IRRIGATION | TRAVIS | K | Travis | Brazos | 22711 | Edwards-BFZ | 5 | 5 | 5 | 5 | 5 | 5 | New WUG Basin: AllocFile10 9/24/99 |
| IRRIGATION | TRAVIS | K | Travis | Colorado | 22728 | Trinity | 85 | 85 | 85 | 85 | 70 | 70 | 2001 Plan: AllocFile10 9/24/99 |
| IRRIGATION | TRAVIS | K | Travis | Guadalupe | 227996 | Irrigation Local Supply | 124 | 124 | 124 | 124 | 124 | 124 | Updated supply to meet demand (Reallocation strategy from 2006 Region K Plan) |
| LIVESTOCK | TRAVIS | K | Travis | Brazos | 22711 | Edwards-BFZ | 1 | 1 | 1 | 1 | 1 | 1 | New WUG Basin: AllocFile10 9/24/99 |
| LIVESTOCK | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 0 | 0 | 0 | 0 | 0 | 0 | Livestock demand met by local livestock supply, and lack of permits for Edwards-BFZ 10/26/07 Reduced 2001 Plan value to account for reduction in available Edwards-BFZ supply to Travis County Colorado Basin 2/7/05 |
| LIVESTOCK | TRAVIS | K | | Colorado | 14997 | Livestock Local Supply | 870 | 870 | 870 | 870 | 870 | 870 | 2001 Plan: LCRA provided data and Demand |
| LIVESTOCK | TRAVIS | K | Travis | Colorado | 22728 | Trinity | 2 | 2 | 2 | 2 | 1 | 1 | 2001 Plan: AllocFile10 9/24/99 |
| LIVESTOCK | TRAVIS | K | | Guadalupe | 18997 | Livestock Local Supply | 36 | 36 | 36 | 36 | 36 | 36 | 2001 Plan: A-ALL, Demand |
| MANUFACTURING | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 167 | 167 | 167 | 167 | 167 | 167 | 2001 Plan: AllocFile10 9/24/99 |
| MANUFACTURING | TRAVIS | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 22,309 | 27,601 | 37,815 | 49,790 | 57,010 | 63,959 | Based on COA discussion 10/20/09 (portion of demand) |
| MANUFACTURING | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 526 | 526 | 526 | 526 | 526 | 526 | Extend contract 5/2009; Updated LCRA supplies 07/2009 |
| MINING | TRAVIS | K | | Colorado | 14999 | Other Local Supply | 4,700 | 5,200 | 5,745 | 6,361 | 7,070 | 7,070 | Revised 2001 number by 46 ac-ft/yr since supply was over allocated 2/7/05 |
| MINING | TRAVIS | K | Travis | Colorado | 22711 | Edwards-BFZ | 187 | 187 | 187 | 187 | 187 | 187 | Reduced 2001 Plan value to account for reduction in available Edwards-BFZ supply to Travis County Colorado Basin 2/7/05 |
| MINING | TRAVIS | K | Travis | Colorado | 22728 | Trinity | 171 | 171 | 171 | 171 | 140 | 140 | 2001 Plan: AllocFile10 9/24/99 |
| STEAM ELECTRIC POWER | TRAVIS | K | | Colorado | 140B0 | Highland Lakes | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 | Region K WAM Run 3 Cutoff (firms up Town Lake and Decker supply) 05/2009 |
| STEAM ELECTRIC POWER | TRAVIS | K | | Colorado | 3461405471A-SE | City of Austin - ROR (Steam Elec.) | 6,171 | 6,171 | 6,171 | 6,171 | 6,171 | 6,171 | Region K WAM Run 3 Cutoff; Town Lake 05/2009 |
| STEAM ELECTRIC POWER | TRAVIS | K | | Colorado | 3461405489A-SE | City of Austin - ROR (Steam Elec.) | 982 | 982 | 982 | 982 | 982 | 982 | Region K WAM Run 3 Cutoff; Decker 05/2009 |
| STEAM ELECTRIC POWER | TRAVIS | K | Travis | Colorado | 22728 | Trinity | 3 | 3 | 3 | 3 | 3 | 3 | 2001 Plan: AllocFile10 9/24/99 |
| STEAM ELECTRIC POWER | TRAVIS | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| COUNTY-OTHER | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 5,592 | 5,584 | 5,583 | 5,587 | 5,590 | 5,593 | 2001 Plan: A-ALL, 100% reduced |
| COUNTY-OTHER | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 1,106 | 1,106 | 1,106 | 1,106 | 1,106 | 1,106 | 2001 Plan: A-ALL, % & Tbl 4 |
| COUNTY-OTHER | WHARTON | K | Wharton | Colorado-Lavaca | 24115 | Gulf Coast | 299 | 299 | 299 | 299 | 299 | 299 | 2001 Plan: A-ALL, % & Tbl 4 |
| EAST BERNARD | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 277 | 285 | 286 | 282 | 279 | 276 | NEW WUG 05/2009 subtract from county-other |
| WHARTON | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 5,636 | 5,636 | 5,636 | 5,636 | 5,636 | 5,636 | 2001 Plan: 2/3 OF DEMAND |
| WHARTON | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 540 | 540 | 540 | 540 | 540 | 540 | 2001 Plan: 1/3 OF DEMAND |
| IRRIGATION | WHARTON | K | | Colorado | 3461405434A | LCRA - Garwood ROR | 21,275 | 21,275 | 21,275 | 21,275 | 21,275 | 21,275 | Region K WAM Run 3 Cutoff; 30% of Garwood ROR water in a minimum year (LCRA) split between 3 basins. |
| IRRIGATION | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 25,816 | 25,816 | 25,816 | 25,816 | 25,816 | 25,816 | 2001 Plan: Demand |
| IRRIGATION | WHARTON | K | Wharton | Brazos-Colorado | 241996 | Irrigation Local Supply | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2001 Plan: TWDB |
| IRRIGATION | WHARTON | K | | Colorado | 3461405477 | LCRA - Pierce Ranch ROR | 7,692 | 7,692 | 7,692 | 7,692 | 7,692 | 7,692 | Region K WAM Run 3 Cutoff; Pierce Ranch ROR split by basin. |
| IRRIGATION | WHARTON | K | | Colorado | 3461405434A | LCRA - Garwood ROR | 11,045 | 11,045 | 11,045 | 11,045 | 11,045 | 11,045 | Region K WAM Run 3 Cutoff; 30% of Garwood ROR water in a minimum year (LCRA) split between 3 basins. |
| IRRIGATION | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 29,567 | 29,567 | 29,567 | 29,567 | 29,567 | 29,567 | 2001 Plan: Demand |
| IRRIGATION | WHARTON | K | Wharton | Colorado | 241996 | Irrigation Local Supply | 7,650 | 7,650 | 7,650 | 7,650 | 7,650 | 7,650 | 2001 Plan: TWDB |
| IRRIGATION | WHARTON | K | | Colorado | 3461405477 | LCRA - Pierce Ranch ROR | 3,994 | 3,994 | 3,994 | 3,994 | 3,994 | 3,994 | Region K WAM Run 3 Cutoff; Pierce Ranch ROR split by basin. |

## Region K Water Supply Table (by WUG and water source)

| WUG Name | WUG County | RWPG Water Source | Water Source County Name | Water Source Basin Name | Specific Source Identifier | Specific Source Name | Year 2010 SUPPLY (ac-ft/yr) | Year 2020 SUPPLY (ac-ft/yr) | Year 2030 SUPPLY (ac-ft/yr) | Year 2040 SUPPLY (ac-ft/yr) | Year 2050 SUPPLY (ac-ft/yr) | Year 2060 SUPPLY (ac-ft/yr) | Source of Data* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | WHARTON | K | | Colorado | 3461405434A | LCRA - Garwood ROR | 6,722 | 6,722 | 6,722 | 6,722 | 6,722 | 6,722 | Region K WAM Run 3 Cutoff; 30% of Garwood ROR water in a minimum year (LCRA) split between 3 basins. |
| IRRIGATION | WHARTON | K | Wharton | Colorado-Lavaca | 24115 | Gulf Coast | 7,060 | 7,060 | 7,060 | 7,060 | 7,060 | 7,060 | 2001 Plan: Demand |
| IRRIGATION | WHARTON | K | | Colorado | 3461405477 | LCRA - Pierce Ranch ROR | 2,430 | 2,430 | 2,430 | 2,430 | 2,430 | 2,430 | Region K WAM Run 3 Cutoff; Pierce Ranch ROR split by basin. |
| LIVESTOCK | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 222 | 222 | 222 | 222 | 222 | 222 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | WHARTON | K | | Brazos-Colorado | 13997 | Livestock Local Supply | 149 | 149 | 149 | 149 | 149 | 149 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | WHARTON | K | | Colorado | 14997 | Livestock Local Supply | 115 | 115 | 115 | 115 | 115 | 115 | 2001 Plan: LCRA Provided data |
| LIVESTOCK | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 171 | 171 | 171 | 171 | 171 | 171 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | WHARTON | K | Wharton | Colorado-Lavaca | 24115 | Gulf Coast | 113 | 113 | 113 | 113 | 113 | 113 | 2001 Plan: A-ALL, % & Tbl 4 |
| LIVESTOCK | WHARTON | K | | Colorado-Lavaca | 15997 | Livestock Local Supply | 74 | 74 | 74 | 74 | 74 | 74 | 2001 Plan: LCRA Provided data |
| MANUFACTURING | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 90 | 90 | 90 | 90 | 90 | 90 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 335 | 335 | 335 | 335 | 335 | 335 | 2001 Plan: A-ALL, % & Tbl 4 |
| MANUFACTURING | WHARTON | K | Wharton | Colorado-Lavaca | 24115 | Gulf Coast | 165 | 165 | 165 | 165 | 165 | 165 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | WHARTON | K | | Brazos-Colorado | 13999 | Other Local Supply | 1,696 | 1,746 | 1,793 | 1,844 | 1,900 | 1,900 | 2001 Plan: LCRA Provided data |
| MINING | WHARTON | K | Wharton | Brazos-Colorado | 24115 | Gulf Coast | 850 | 850 | 850 | 850 | 850 | 850 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 1,005 | 1,005 | 1,005 | 1,005 | 1,005 | 1,005 | 2001 Plan: A-ALL, % & Tbl 4 |
| MINING | WHARTON | K | Wharton | Colorado-Lavaca | 24115 | Gulf Coast | 23 | 23 | 23 | 23 | 23 | 23 | 2001 Plan: A-ALL, % & Tbl 4 |
| STEAM ELECTRIC POWER | WHARTON | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| STEAM ELECTRIC POWER | WHARTON | K | | Brazos-Colorado | 3461303421 | San Bernard ROR | 665 | 597 | 597 | 597 | 597 | 597 | New WUG: Based on TCEQ water rights database; Reliability of WR has not been verified 2/8/05 |
| STEAM ELECTRIC POWER | WHARTON | K | | Colorado | 140B0 | Highland Lakes | 0 | 0 | 0 | 0 | 0 | 0 | Need strategy for LCRA contract for new water user (Navasota Energy, 2,300 ac-ft)) |
| STEAM ELECTRIC POWER | WHARTON | K | Wharton | Colorado | 24115 | Gulf Coast | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 | 2,300 | New WUG: Based on information from GCD |
| STEAM ELECTRIC POWER | WHARTON | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG: 0 Demand, therefore 0 Supply |
| ANDERSON MILL MUD | WILLIAMSON | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | No longer a WUG, annexed by COA 5/2009 |
| AUSTIN | WILLIAMSON | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 5,457 | 7,398 | 9,691 | 12,161 | 14,834 | 17,693 | Based on information from COA 10/27/09 |
| AUSTIN | WILLIAMSON | K | | Colorado | 3461405489A | City of Austin - ROR (Municipal) | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin: Supply Estimate based on OLD basin 2/21/04 |
| AUSTIN | WILLIAMSON | K | | Colorado | 140B0 | Highland Lakes | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin: Supply Estimate based on OLD basin 2/21/04 |
| COUNTY-OTHER | WILLIAMSON | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 2,401 | 2,729 | 3,118 | 3,536 | 3,989 | 4,469 | Based on information from COA 10/27/09 |
| COUNTY-OTHER | WILLIAMSON | K | Williamson | Brazos | 24628 | Trinity | 49 | 53 | 57 | 58 | 58 | 58 | New WUG Basin: Supply available to Trinity aquifer in Williamson County, Brazos basin minus Mining Demand. 2/7/05 |
| COUNTY-OTHER | WILLIAMSON | K | Williamson | Brazos | 24611 | Edwards-BFZ | 6 | 6 | 6 | 6 | 6 | 6 | New WUG Basin: Supply available to Edwards-BFZ aquifer in Williamson County, Brazos basin. 05/2009 |
| NORTH AUSTIN MUD #1 | WILLIAMSON | K | | Colorado | 3461405471A | City of Austin - ROR (Municipal) | 983 | 968 | 952 | 928 | 920 | 920 | Assume COA contract extended 5/2009 |
| IRRIGATION | WILLIAMSON | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin: 0 Demand, therefore 0 Supply |
| LIVESTOCK | WILLIAMSON | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin: 0 Demand, therefore 0 Supply |
| MANUFACTURING | WILLIAMSON | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin: 0 Demand, therefore 0 Supply |
| MINING | WILLIAMSON | K | Williamson | Brazos | 24628 | Trinity | 9 | 5 | 1 | 0 | 0 | 0 | New WUG Basin: Met Demand. |
| MINING | WILLIAMSON | K | Williamson | Brazos | 24611 | Edwards-BFZ | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin |
| STEAM ELECTRIC POWER | WILLIAMSON | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | New WUG Basin: 0 Demand, therefore 0 Supply |
| | | | | | | | 1,167,768 | 1,167,846 | 1,169,634 | 1,171,158 | 1,173,623 | 1,173,881 | |

BSEACD = Barton Springs Edwards Aquifer Conservation District
TWDB = Texas Water Development Board
A-ALL = TWDB allocation tables
LIMIT = Volume limitation based on TWDB allocation
% & Tbl 4 = Percent of available supply identified in 2001 Region K Table 4 based on TWDB allocation
LCRA = Lower Colorado River Authority (modeling results or contract amounts)
2001 Plan: Demand = Based on historic use
COA = City of Austin
Hill Country UWCD = Hill Country Underground Conservation District
TCEQ = Texas Commission on Environmental Quality
WUG = Water User Group

# Water Availability Results Comparison

| Legend |
|---|
| 2001 Region K Plan |
| 2006 Region K Plan |
| 2011 Region K Plan |

| 2006 Water Source | 2010 (ac-ft/yr) | | | | 2020 | | | | 2030 | | | | 2040 | | | | 2050 | | | | 2060 | | | Comment on Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2001 Plan | 2006 Plan | Draft 2011 Plan | ***Difference (Draft 2011 Plan - 2006 Plan)*** | 2001 Plan | 2006 Plan | Draft 2011 Plan | ***Difference (Draft 2011 Plan - 2006 Plan)*** | 2001 Plan | 2006 Plan | Draft 2011 Plan | ***Difference (Draft 2011 Plan - 2006 Plan)*** | 2001 Plan | 2006 Plan | Draft 2011 Plan | ***Difference (Draft 2011 Plan - 2006 Plan)*** | 2001 Plan | 2006 Plan | Draft 2011 Plan | ***Difference (Draft 2011 Plan - 2006 Plan)*** | 2006 Plan | Draft 2011 Plan | ***Difference (Draft 2011 Plan - 2006 Plan)*** | |
| City of Austin - ROR Municipal | 172,673 | 181,657 | 212,590 | 30,933 | 172,673 | 182,261 | 204,466 | 22,205 | 172,673 | 182,865 | 204,466 | 21,601 | 172,673 | 183,469 | 204,466 | 20,997 | 172,673 | 184,073 | 204,466 | 20,393 | 184,677 | 204,479 | 19,802 | 2008 CUTOFF VS. 2006 "NO CALL" |
| City of Austin - ROR Steam Electric | 7,159 | 9,477 | 8,420 | (1,057) | 7,159 | 9,341 | 8,420 | (921) | 7,159 | 9,205 | 8,420 | (785) | 7,159 | 9,069 | 8,420 | (649) | 7,159 | 8,933 | 8,420 | (513) | 8,795 | 8,420 | (375) | 2008 CUTOFF VS. 2006 "NO CALL" |
| LCRA - Garwood ROR | 50,000 | 111,740 | 130,141 | 18,401 | 50,000 | 111,740 | 130,141 | 18,401 | 50,000 | 130,141 | 130,141 | - | 50,000 | 130,141 | 130,141 | - | 50,000 | 130,141 | 130,141 | - | 130,141 | 130,141 | - | 2008 CUTOFF VS. 2006 "NO CALL" |
| LCRA - Gulf Coast ROR | - | 74,124 | 44,827 | (29,297) | - | 74,111 | 43,540 | (30,571) | - | 74,098 | 43,540 | (30,558) | - | 74,085 | 43,540 | (30,545) | - | 74,072 | 43,540 | (30,532) | 74,056 | 43,540 | (30,516) | 2008 CUTOFF VS. 2006 "NO CALL" |
| LCRA - Lakeside #1 ROR | - | 19,769 | 12,531 | (7,238) | - | 19,769 | 12,498 | (7,271) | - | 19,769 | 12,498 | (7,271) | - | 19,769 | 12,498 | (7,271) | - | 19,769 | 12,498 | (7,271) | 19,769 | 12,498 | (7,271) | 2008 CUTOFF VS. 2006 "NO CALL" |
| LCRA - Lakeside #2 ROR | 4,232 | 10,769 | 10,440 | (329) | 4,232 | 10,769 | 10,440 | (329) | 4,232 | 10,769 | 10,440 | (329) | 4,232 | 10,769 | 10,440 | (329) | 4,232 | 10,769 | 10,440 | (329) | 10,769 | 10,440 | (329) | 2008 CUTOFF VS. 2006 "NO CALL" |
| LCRA - Pierce Ranch ROR | - | 10,769 | 14,116 | 3,347 | - | 10,769 | 14,173 | 3,404 | - | 10,769 | 14,173 | 3,404 | - | 10,769 | 14,173 | 3,404 | - | 10,769 | 14,173 | 3,404 | 10,769 | 14,173 | 3,404 | 2008 CUTOFF VS. 2006 "NO CALL" |
| San Bernard ROR | - | 1,600 | 665 | (935) | - | 1,600 | 597 | (1,003) | - | 1,600 | 597 | (1,003) | - | 1,600 | 597 | (1,003) | - | 1,600 | 597 | (1,003) | 1,600 | 597 | (1,003) | Reliability of WR verified. |
| STP Nuclear Operating Co. ROR | 41,320 | 49,039 | 51,857 | 2,818 | 41,320 | 48,989 | 46,072 | (2,917) | 41,320 | 48,939 | 46,072 | (2,867) | 41,320 | 48,889 | 46,072 | (2,817) | 41,320 | 48,839 | 46,072 | (2,767) | 48,791 | 46,072 | (2,719) | 2008 CUTOFF VS. 2006 "NO CALL" |
| Highland Lakes | 445,766 | 381,545 | 402,172 | 20,627 | 445,766 | 380,166 | 390,001 | 9,835 | 445,766 | 378,787 | 384,001 | 5,214 | 445,766 | 377,408 | 378,101 | 693 | 445,766 | 376,029 | 372,201 | (3,828) | 374,642 | 366,468 | (8,174) | 2008 CUTOFF VS. 2006 "NO CALL" |
| Goldthwaite Reservoir | 400 | 144 | - | (144) | 400 | 144 | - | (144) | 400 | 145 | - | (145) | 400 | 145 | - | (145) | 400 | 145 | - | (145) | 145 | - | (145) | 2008 CUTOFF VS. 2006 "NO CALL" |
| Lake Bastrop | 1,000 | - | - | - | 1,000 | - | - | - | 1,000 | - | - | - | 1,000 | - | - | - | 1,000 | - | - | - | - | - | - | Included as part of Highland Lakes |
| Lake Fayette | 1,400 | - | - | - | 1,400 | - | - | - | 1,400 | - | - | - | 1,400 | - | - | - | 1,400 | - | - | - | - | - | - | Included as part of Highland Lakes |
| Llano Reservoir | 400 | 178 | - | (178) | 400 | 169 | - | (169) | 400 | 160 | - | (160) | 400 | 151 | - | (151) | 400 | 142 | - | (142) | 135 | - | (135) | 2008 CUTOFF VS. 2006 "NO CALL" |
| Walter E. Long (Decker Lake) | 1,000 | - | - | - | 1,000 | - | - | - | 1,000 | - | - | - | 1,000 | - | - | - | 1,000 | - | - | - | - | - | - | Included as part of Highland Lakes |
| Blanco Reservoir | 300 | 596 | 596 | - | 300 | 596 | 596 | - | 300 | 596 | 596 | - | 300 | 596 | 596 | - | 300 | 596 | 596 | - | 596 | 596 | - | RESPONSE VS. WAM |
| Irrigation Local Supply | 40,663 | 40,663 | 40,663 | - | 40,663 | 40,663 | 40,663 | - | 40,663 | 40,663 | 40,663 | - | 40,663 | 40,663 | 40,663 | - | 40,663 | 40,663 | 40,663 | - | 40,663 | 40,663 | - | This value shows as 40,704 in the 2001 Table 3.19, but only adds up to 40,663 in 2001 Table 4 (*Appendix 3E*). |
| Livestock Local Supply | 8,458 | 8,458 | 8,458 | - | 8,458 | 8,458 | 8,458 | - | 8,458 | 8,458 | 8,458 | - | 8,458 | 8,458 | 8,458 | - | 8,458 | 8,458 | 8,458 | - | 8,458 | 8,458 | - | |
| Other Local Supply | 20,978 | 20,978 | 20,978 | - | 22,636 | 22,636 | 22,636 | - | 24,510 | 24,510 | 24,510 | - | 26,727 | 26,727 | 26,727 | - | 29,370 | 29,370 | 29,370 | - | 29,370 | 29,370 | - | |
| Carrizo-Wilcox Aquifer | 22,350 | 28,400 | 28,400 | - | 22,350 | 28,400 | 28,400 | - | 22,350 | 28,400 | 28,400 | - | 22,350 | 28,400 | 28,400 | - | 22,350 | 28,400 | 28,400 | - | 28,400 | 28,400 | - | Lost Pine GCD availability number in Bastrop County. |
| Edwards Aquifer BFZ (Austin) | 20,995 | 8,375 | 9,496 | 1,121 | 20,995 | 8,375 | 9,496 | 1,121 | 20,995 | 8,375 | 9,496 | 1,121 | 20,995 | 8,375 | 9,496 | 1,121 | 20,995 | 8,375 | 9,496 | 1,121 | 8,375 | 9,496 | 1,121 | GMA-8 MAG, BSEACD, refer to Ch. 3 Section 3.2.2.1.3. |
| Edwards-Trinity Aquifer (Plateau) | 1,657 | 1,657 | 1,500 | (157) | 1,657 | 1,657 | 1,500 | (157) | 1,657 | 1,657 | 1,500 | (157) | 1,657 | 1,657 | 1,500 | (157) | 1,659 | 1,659 | 1,500 | (159) | 1,659 | 1,500 | (159) | Blanco-Pedernales GCD |
| Ellenburger-San Saba Aquifer | 23,574 | 23,574 | 26,451 | 2,877 | 23,574 | 23,574 | 26,451 | 2,877 | 23,574 | 23,574 | 26,451 | 2,877 | 23,574 | 23,574 | 26,451 | 2,877 | 23,574 | 23,574 | 26,451 | 2,877 | 23,574 | 26,451 | 2,877 | Central Texas GCD |
| Gulf Coast Aquifer | 198,425 | 198,425 | 198,425 | - | 198,425 | 198,425 | 198,425 | - | 198,425 | 198,425 | 198,425 | - | 198,425 | 198,425 | 198,425 | - | 198,425 | 198,425 | 198,425 | - | 198,425 | 198,425 | - | |
| Hickory Aquifer | 27,380 | 27,380 | 24,153 | (3,227) | 27,380 | 27,380 | 24,153 | (3,227) | 27,380 | 27,380 | 24,153 | (3,227) | 27,380 | 27,380 | 24,153 | (3,227) | 27,380 | 27,380 | 24,153 | (3,227) | 27,380 | 24,153 | (3,227) | Central Texas GCD |
| Marble Falls Aquifer | 18,305 | 18,305 | 14,658 | (3,647) | 18,305 | 18,305 | 14,658 | (3,647) | 18,305 | 18,305 | 14,658 | (3,647) | 18,305 | 18,305 | 14,658 | (3,647) | 18,305 | 18,305 | 14,658 | (3,647) | 18,305 | 14,658 | (3,647) | GMA-8 Draft MAG |
| Queen City Aquifer | 3,991 | 3,991 | 3,991 | - | 3,991 | 3,991 | 3,991 | - | 3,991 | 3,991 | 3,991 | - | 3,991 | 3,991 | 3,991 | - | 3,991 | 3,991 | 3,991 | - | 3,991 | 3,991 | - | |
| Sparta Aquifer | 9,889 | 9,889 | 9,889 | - | 9,889 | 9,889 | 9,889 | - | 9,889 | 9,889 | 9,889 | - | 9,889 | 9,889 | 9,889 | - | 9,889 | 9,889 | 9,889 | - | 9,889 | 9,889 | - | |
| Trinity Aquifer | 11,841 | 16,782 | 17,600 | 818 | 11,841 | 16,782 | 17,600 | 818 | 11,077 | 16,440 | 17,598 | 1,158 | 11,077 | 16,440 | 17,598 | 1,158 | 9,698 | 15,717 | 17,311 | 1,594 | 15,717 | 17,311 | 1,594 | GMA-8 MAG, refer to Ch. 3 Section 3.2.2.1.4. |
| Yegua-Jackson Aquifer | | | 20,000 | 20,000 | | | 20,000 | 20,000 | | | 20,000 | 20,000 | | | 20,000 | 20,000 | | | 20,000 | 20,000 | | 20,000 | 20,000 | Yegua-Jackson Aquifer added |
| Other Aquifer | 120,000 | 13,572 | 15,562 | 1,990 | 120,000 | 13,594 | 15,584 | 1,990 | 120,000 | 13,611 | 15,601 | 1,990 | 120,000 | 13,619 | 15,609 | 1,990 | 120,000 | 13,625 | 15,615 | 1,990 | 13,632 | 15,622 | 1,990 | Reduced Other Aquifer supplies to only represent areas that we know are supplied by alluvial sources. |
| Sources Outside the Region | | | 3,136 | 3,136 | | | 3,231 | 3,231 | | | 3,327 | 3,327 | | | 3,422 | 3,422 | | | 3,523 | 3,523 | | 3,642 | 3,642 | Added sources from outside region to table |
| **Region K Totals** | **1,254,156** | **1,271,856** | **1,331,715** | 59,859 | **1,255,814** | **1,272,553** | **1,306,079** | 33,526 | **1,256,924** | **1,291,521** | **1,302,064** | 10,543 | **1,259,141** | **1,292,763** | **1,298,484** | 5,721 | **1,260,407** | **1,293,708** | **1,295,047** | 1,339 | **1,292,723** | **1,289,453** | (3,270) | |

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## APPENDICES

# CHAPTER 4.0: IDENTIFICATION, EVALUATION, AND SELECTION OF WATER MANAGEMENT STRATEGIES BASED ON NEED

## 4.1 IDENTIFICATION OF WATER NEEDS

The comparison of water demands for each water user group (WUG) to the water supplies available to each WUG within the Lower Colorado Regional Water Planning Area (LCRWPA) is a simple mathematical comparison of the estimates developed in Chapters 2 and 3 of this report. This comparison was completed and summarized in three different ways. First, a comparison of water demands and supplies was completed on a county-by-county basis. Second, the comparison was completed and summarized for each of the six river basins. Finally, a comparison of the water demands and supplies for the two designated wholesale water providers within the LCRWPA was also completed.

Regionwide, the comparison of available water supplies and water demands identified 73 separate WUGs that have projected water supply shortages, or “needs,” by the year 2030, and an additional 19 WUGs with projected water supply shortages before the year 2060. **Note that throughout this chapter, the word “need” is consistently used to indicate a water supply shortage.** The estimated water need is approximately 297,000 acre-feet per year (ac-ft/yr) in 2030 and 367,000 ac-ft/yr in 2060. This identified shortage is based on conservative water availability estimates, which assume (1) only water that is available during a repeat of the historical drought of record (DOR), (2) that all water rights in the basin are being fully and simultaneously utilized, and (3) excludes both water available from the Lower Colorado River Authority (LCRA) on an interruptible basis and water projected to be available as a result of municipal return flows to the Colorado River. In Region K, return flows discharged by the City of Austin (COA) constitute the vast majority of municipal return flows. Based upon the assumptions above, water needs have been identified in all of the six water use categories. *Figure 4.1* contains an illustration of the distribution, by use category, of the number of WUGs with identified water needs in the years 2030 and 2060. *Figure 4.2* contains an illustration of the magnitude of the identified needs, by use category, for the years 2030 and 2060.

**Figure 4.1: Number of WUGs With Identified Water Needs in the LCRWPA**

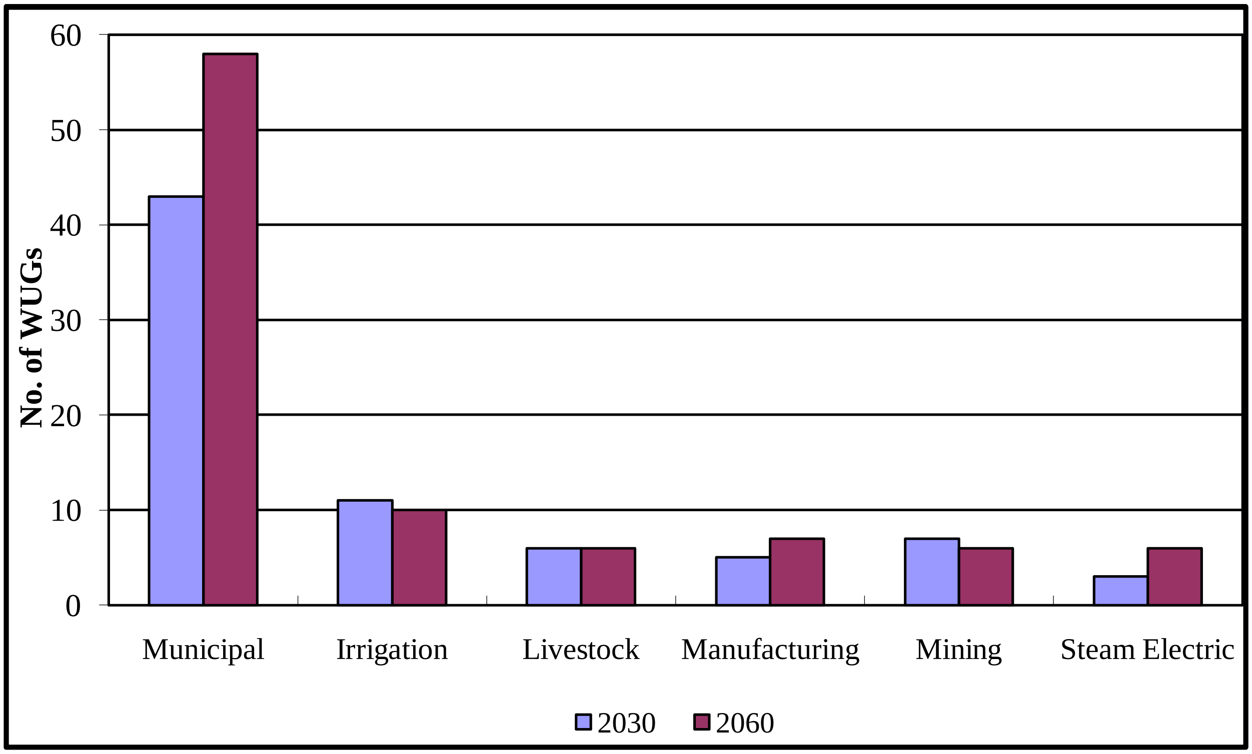
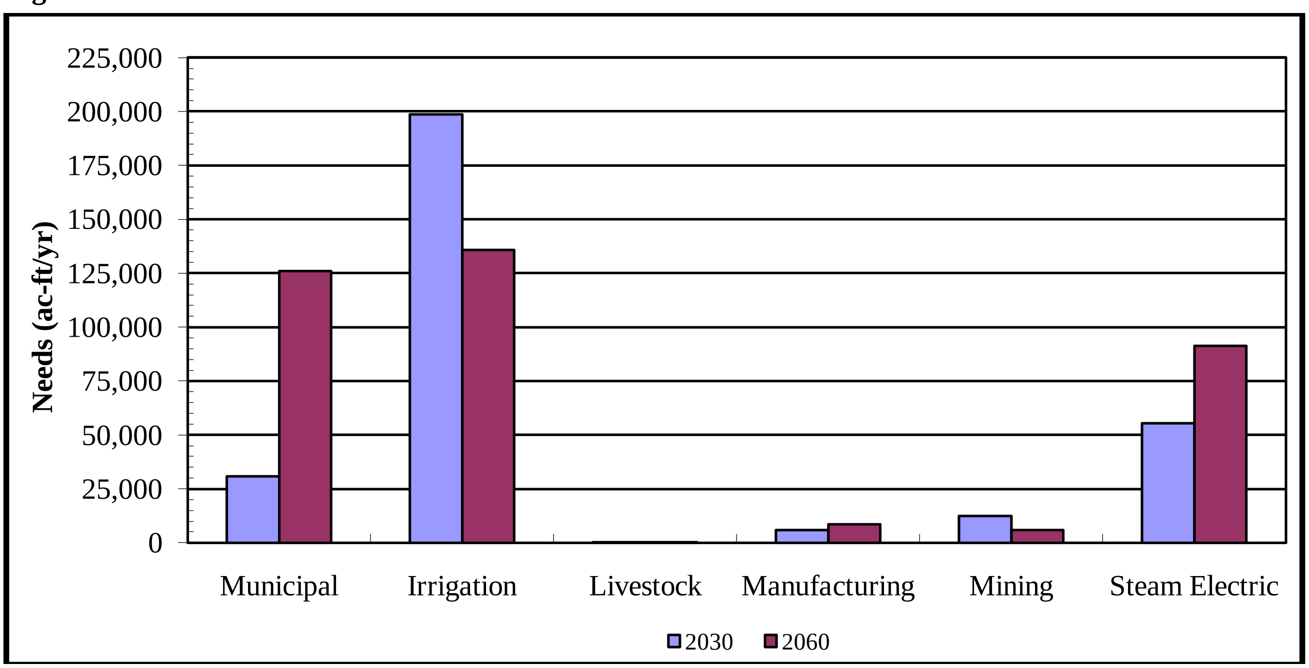



**Figure 4.2: Identified Amount of Water Needs in the LCRWPA**



The majority of the identified water supply shortages fall into three main categories. The first shortage is associated with rice irrigation demands in the lower three counties of Colorado, Matagorda and Wharton. It is estimated that irrigators in these three counties would experience a water supply shortage of approximately 235,000 ac-ft/yr under the existing demand conditions (year 2010 scenario), should a repeat of the driest year during the DOR occur. This shortage is estimated to decrease to 199,000 ac-ft/yr in 2030 (15 percent decrease) and to 136,000 ac-ft/yr in 2060 (42 percent decrease) due to projected declining rice irrigation acreage. These shortages would be reduced or eliminated through the implementation of water conservation and alternative water supply development measures under the LCRA-SAWS (San Antonio Water System) Water Project, the House Bill (HB) 1437 program, and the continued availability of interruptible water supplies and return flows over the planning period.

These estimated shortfalls are based on the available supply determined in Chapter 3. In accordance with Texas Water Development Board (TWDB) rules, the available supply of water for irrigation was estimated based on the available run-of-river (ROR) water rights and groundwater supplies in the area. The interruptible supply of water provided by the LCRA and municipal return flows were not considered in these calculations. As a result, the estimated shortages for rice irrigation in Colorado, Matagorda, and Wharton Counties are significantly overstated under typical conditions expected over the planning period. The continued use of interruptible water supplies to meet irrigation and other needs will be considered as one of the water management strategies.

The second category of identified shortages includes WUGs that purchase water from one of the two wholesale water providers within the LCRWPA - the COA and the LCRA. The renewal of these current wholesale water contracts will be assumed and shown as a continued supply, while expansion of these contracts will be considered as a water management strategy. However, the COA's current policy is that much of its water currently being supplied to wholesale customers may need to be provided by LCRA in the future. The COA will plan to continue to treat and transport this water.

LCRA is the major water supplier for the Lower Colorado Region. The COA also supplies a major portion of the municipal needs. LCRA holds water rights to use annually about 2.1 million acre-feet (ac-ft) of water and provides water to 125 to 150 entities for municipal, industrial, irrigation, recreational, environmental, and other purposes. LCRA's strategy for meeting the region's changing and future water needs will be predicated on LCRA's ability to continue to use all of its water rights as a system. This includes not only the amendment of its water rights to meet changing and future water needs, but also an aggressive water conservation program and the development of alternative water supplies and conjunctive water management strategies.

Programs seeking to accomplish this have included HB 1437 and the concept of the LCRA-SAWS Water Project (LSWP). The concept of the LSWP[1], was adopted in the first round of regional water planning. Legislative conditions on the proposed transfer of water to the San Antonio region include, but are not limited to, the protection of inbasin needs including adequate flows for environmental purposes, a limited contract term, and maintaining and enhancing average lake levels for recreational uses. Water provided under contract by LCRA to the Brazos River Authority (BRA) for BRA's customers in Williamson County under HB 1437 requires a "no net loss" of surface water to the Colorado River Basin through water replacement or offset strategies funded by a surcharge on the sale of water to BRA. Subject to regulatory approval, potential litigation and competing applications, LCRA is also actively pursuing the

[1] The project is the subject of litigation. For a description of the status of the project, *see* p. 4-34.

acquisition of any remaining unappropriated water and the voluntary purchase and reallocation of any strategic, unused water rights to help meet LCRA's legislative mandate as a regional water supplier.

The third category of identified shortages includes steam-electric demands. This is a water usage type that is expected to expand over the future decades, as population growth occurs throughout the electrical grid for Texas. The majority of the steam-electric water demands in the LCRWPA are in Matagorda County. Ways of meeting the shortages include contracts with LCRA, water rights permit amendments, and desalination.

Some of the strategies in this plan are predicated upon identified water needs or possible water supply scenarios which are affected by the outcomes of pending or future permitting processes at the Texas Commission on Environmental Quality (TCEQ). The planning group recognizes that the plan is typically updated on an every five-year cycle, providing regular opportunities to update future plans to reflect the resolution of such processes. This plan includes various alternative strategies, which may be needed depending on the outcome of pending or future litigation or permitting processes (see Section 4.15 Alternative Water Management Strategies for a discussion of alternative strategies included in the plan).

## 4.2 COUNTY SUMMARIES OF WATER NEEDS

The following sections provide summaries of the needs identified for each county within the LCRWPA. The tables presented in these sections provide a listing of individual WUGs with identified water supply needs (negative numbers in the tables indicate a water supply shortage). Following the information for the individual WUGs with water supply needs is a summation of the total needs identified within the county. This information is also included in the TWDB online database, DB12.

### 4.2.1 Bastrop County

The primary sources of water for Bastrop County are the Carrizo-Wilcox and Queen City aquifers. Surface water supplies are primarily associated with power generation and are supplied by firm water from the Highland Lakes. Local surface water supplies are available to irrigation and livestock users. Municipal water demands range from about one-third to two-thirds of the total demand in Bastrop County. Steam electric generation accounts for an additional one-third of the total demand. A summary of the estimated water shortages identified for Bastrop County is presented in *Table 4.1*.

**Table 4.1 Bastrop County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Aqua WSC | 0 | 0 | (602) | (3,709) | (6,221) | (9,415) |
| Bastrop | (65) | (812) | (1,532) | (2,590) | (3,455) | (4,542) |
| Bastrop County WCID #2 | 0 | 0 | 0 | 0 | 0 | (144) |
| County-Other | 0 | (663) | (1,879) | (3,437) | (4,528) | (5,880) |
| Elgin | 0 | (604) | (1,176) | (2,033) | (2,734) | (3,624) |
| Manville WSC | 0 | 0 | 0 | 0 | (7) | (52) |
| Polonia WSC | 0 | (2) | (7) | (16) | (23) | (30) |
| Smithville | (74) | (311) | (526) | (946) | (1,115) | (1,601) |
| Irrigation | (119) | (50) | (40) | (31) | (24) | (17) |
| Manufacturing | (8) | (17) | (28) | (38) | (46) | (60) |
| Mining | (4,293) | (4,297) | (4,298) | 0 | 0 | 0 |
| Steam Electric Power | 0 | 0 | 0 | (1,280) | (2,780) | (2,780) |
| **Bastrop County Total Needs** | **(4,559)** | **(6,756)** | **(10,088)** | **(14,080)** | **(20,933)** | **(28,145)** |

### 4.2.2 Blanco County

Groundwater is available to users in Blanco County from the Ellenburger-San Saba, Trinity, Edwards-Trinity Plateau, and Hickory aquifers. Surface water supplies in the county are available from the City of Blanco's reservoirs and other local supplies. Municipal water demands account for well over one-half of the total water demands in Blanco County. The remainder of the demand consists primarily of irrigation and livestock needs. A summary of the estimated water shortages identified for Blanco County is presented in *Table 4.2*.

**Table 4.2 Blanco County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | 0 | 0 | 0 | 0 | (41) | (64) |
| **Blanco County Total Needs** | **0** | **0** | **0** | **0** | **(41)** | **(64)** |

### 4.2.3 Burnet County

Groundwater is available to users in Burnet County from the Ellenburger-San Saba, Trinity, Marble Falls, and Hickory aquifers. Surface water supplies in the county are available from the Highland Lakes through contracts with the LCRA and other local supplies. Municipal water demands account for over one-half of the total water demands in Burnet County. A summary of the estimated water shortages identified for Burnet County is presented in *Table 4.3*.

**Table 4.3 Burnet County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Bertram | 0 | 0 | 0 | (27) | (74) | (130) |
| Cottonwood Shores | (26) | (198) | (386) | (601) | (840) | (1,130) |
| County-Other | 0 | 0 | (232) | (898) | (1,345) | (1,720) |
| Granite Shoals | 0 | 0 | 0 | 0 | (14) | (95) |
| Kingsland WSC | 0 | 0 | 0 | 0 | (7) | (17) |
| Marble Falls | 0 | (211) | (976) | (1,719) | (2,154) | (2,653) |
| Meadowlakes | (318) | (576) | (857) | (1,130) | (1,292) | (1,470) |
| Livestock | (23) | (23) | (23) | (23) | (23) | (23) |
| Mining | (688) | (766) | (800) | (833) | (853) | (898) |
| **Burnet County Total Needs** | **(1,055)** | **(1,774)** | **(3,274)** | **(5,231)** | **(6,602)** | **(8,136)** |

### 4.2.4 Colorado County

The primary source of groundwater in Colorado County is the Gulf Coast aquifer. Surface water supplies are available pursuant to LCRA's ROR rights, presently being used within LCRA's Lakeside and Garwood Irrigation Divisions, as well as other local supply sources. Irrigation demands in Colorado County represent 90 percent of the water demand in the county and are the primary water supply shortage identified. A summary of the estimated water shortages identified for Colorado County is presented in *Table 4.4*.

**Table 4.4 Colorado County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | (105) | (109) | (106) | (97) | (93) | (90) |
| Irrigation | (49,300) | (42,090) | (35,089) | (28,312) | (21,723) | (15,416) |
| Livestock | (25) | (25) | (25) | (25) | (25) | (25) |
| Mining | (8,569) | (8,079) | (7,246) | (6,111) | (4,692) | (4,867) |
| **Colorado County Total Needs** | **(57,999)** | **(50,303)** | **(42,466)** | **(34,545)** | **(26,533)** | **(20,398)** |

### 4.2.5 Fayette County

Groundwater supplies in Fayette County are available from the Carrizo-Wilcox, Gulf Coast, Sparta, Queen City, and Yegua-Jackson aquifers. Surface water is available for steam electric generation through the LCRA and the COA. Steam electric generation represents more than three-fourths of the total water demand in the county with the remainder of the demand split primarily between municipal and livestock needs. The estimated water shortages identified for Fayette are presented in *Table 4.5*.

**Table 4.5 Fayette County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | (118) | (115) | (14) | (32) | (25) | (16) |
| Fayette WSC | 0 | (257) | (552) | (782) | (1,062) | (1,433) |
| Lee County WSC | 0 | (48) | (117) | (171) | (232) | (319) |
| Schulenburg | 0 | 0 | 0 | (34) | (100) | (193) |
| Irrigation | (20) | (18) | (16) | (14) | (12) | (10) |
| Livestock | (22) | (22) | (22) | (22) | (22) | (22) |
| Manufacturing | (45) | (70) | (94) | (117) | (137) | (162) |
| Mining | 0 | (4) | (22) | (28) | (29) | (29) |
| Steam Electric Power | 0 | 0 | 0 | (20,975) | (20,975) | (26,885) |
| **Fayette County Total Needs** | **(205)** | **(534)** | **(837)** | **(22,175)** | **(22,594)** | **(29,069)** |

### 4.2.6 Gillespie County

Groundwater supplies in Gillespie County are available from the Ellenburger-San Saba, Edwards-Trinity, Trinity, and Hickory aquifers. Surface water is available from local sources. Municipal water demands represent more than one-half of the total water demand in the county. Livestock and irrigation needs make up the majority of the remaining water demand. There are no water shortages expected for Gillespie County.

### 4.2.7 Hays County

Groundwater supplies in Hays County are available from the Edwards-Balcones Fault Zone (BFZ) and Trinity aquifers. Surface water is available from the Highland Lakes System and COA ROR rights. Municipal demand represents over 80 percent of the total demand in the county and represents the majority of supply shortages identified for Hays County, as presented in *Table 4.6*.

**Table 4.6 Hays County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Buda | 0 | 0 | (332) | (817) | (1,395) | (1,869) |
| Cimarron Park Water Company | (150) | (236) | (329) | (423) | (536) | (629) |
| County-Other | 0 | (728) | (2,072) | (3,440) | (5,144) | (6,482) |
| Dripping Springs | (574) | (1,350) | (1,791) | (2,239) | (2,794) | (3,230) |
| Dripping Springs WSC | 0 | 0 | 0 | (17) | (213) | (366) |
| Mountain City | (25) | (23) | (23) | (22) | (22) | (22) |
| Manufacturing | (93) | (211) | (330) | (450) | (558) | (657) |
| **Hays County Total Needs** | **(842)** | **(2,548)** | **(4,877)** | **(7,408)** | **(10,662)** | **(13,255)** |

### 4.2.8 Llano County

Groundwater supplies in Llano County are available from the Hickory and Ellenburger-San Saba aquifers. Surface water is available from the City of Llano Reservoir, the Highland Lakes, and local sources. Municipal demands represent approximately one-half of the total demand in the county and all of the identified water supply shortage. A summary of the estimated water shortages identified for Llano County is presented in *Table 4.7*.

**Table 4.7 Llano County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | 0 | 0 | (44) | (224) | (400) | (586) |
| Kingsland WSC | (175) | (220) | (217) | (215) | (223) | (237) |
| Lake LBJ MUD | (135) | (290) | (338) | (382) | (439) | (510) |
| Llano | (1,090) | (1,171) | (1,183) | (1,192) | (1,207) | (1,232) |
| Livestock | (62) | (62) | (62) | (62) | (62) | (62) |
| **Llano County Total Needs** | **(1,462)** | **(1,743)** | **(1,844)** | **(2,075)** | **(2,331)** | **(2,627)** |

### 4.2.9 Matagorda County

The primary source of groundwater in Matagorda County is the Gulf Coast aquifer. Surface water supplies are available pursuant to LCRA's ROR rights, presently being used within LCRA's Gulf Coast Irrigation Division, and the LCRA-STPNOC water right, STPNOC's contract with LCRA for backup firm water, as well as LCRA firm water contracts for other industrial needs and other local supply sources. Irrigation demands in Matagorda County represent 70 percent of the water demand in the county with steam electric generation being the second largest demand. Significant water supply shortages have been identified for irrigation, manufacturing, and steam electric generation. A summary of the estimated water shortages identified for Matagorda County is presented in *Table 4.8*.

**Table 4.8 Matagorda County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Irrigation | (126,742) | (121,053) | (114,334) | (107,897) | (101,703) | (95,731) |
| Livestock | (56) | (56) | (56) | (56) | (56) | (56) |
| Manufacturing | 0 | 0 | 0 | 0 | 0 | (47) |
| Steam Electric Power | (193) | (53,005) | (53,005) | (53,005) | (53,005) | (53,125) |
| **Matagorda County Total Needs** | **(126,991)** | **(174,114)** | **(167,395)** | **(160,958)** | **(154,764)** | **(148,959)** |

### 4.2.10 Mills County

The primary source of groundwater in Mills County is the Trinity aquifer. Surface water supplies are available through the City of Goldthwaite Reservoir and other local supply sources. Irrigation demands in Mills County represent 60 percent of the water demand in the county with most of the remainder of the demand being livestock and municipal demand. A summary of the estimated water shortages identified for Mills County is presented in *Table 4.9*.

**Table 4.9 Mills County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | 0 | 0 | *0* | *0* | *(34)* | *(54)* |
| Goldthwaite | (501) | (553) | (561) | (555) | (548) | (547) |
| Irrigation | (339) | (275) | (241) | (180) | (193) | (186) |
| **Mills County Total Needs** | **(840)** | **(828)** | **(802)** | **(735)** | **(775)** | **(787)** |

### 4.2.11 San Saba County

Groundwater supplies in San Saba County are available from the Ellenburger-San Saba, Marble Falls, and Hickory aquifers. Surface water availability is primarily limited to local sources. Irrigation demand represents over half of the total demand in the county with the remaining demand being livestock and municipal demands. The water needs for San Saba County are listed in Table *4.10*.

**Table 4.10 San Saba County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Richland SUD | 0 | 0 | 0 | (3) | (3) | (5) |
| **San Saba County Total Needs** | **0** | **0** | **0** | **(3)** | **(3)** | **(5)** |

### 4.2.12 Travis County

Groundwater supplies in Travis County are available from the Edwards-BFZ and Trinity aquifers. Surface water is available through the LCRA and COA ROR water rights. Municipal water demands represent approximately 85 percent of the total demand in the county. Manufacturing and steam electric generation account for most of the remaining demands. A summary of the estimated water shortages identified for Travis County is presented in *Table 4.11*.

**Table 4.11 Travis County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Austin | 0 | 0 | 0 | 0 | (30,459) | (62,934) |
| Barton Creek West WSC | (53) | (50) | (47) | (45) | (43) | (43) |
| Bee Cave Village | (936) | (1,172) | (1,406) | (1,615) | (1,768) | (1,923) |
| Briarcliff Village | 0 | 0 | (45) | (87) | (117) | (149) |
| Creedmoor-Maha WSC | 0 | (431) | (548) | (632) | (715) | (807) |
| Elgin | 0 | 0 | 0 | 0 | (1) | (3) |
| Goforth WSC | (11) | (21) | (30) | (37) | (43) | (48) |
| Jonestown | (129) | (233) | (329) | (416) | (481) | (554) |
| Lakeway | (1,681) | (2,613) | (3,513) | (4,338) | (4,954) | (5,572) |
| Manor | 0 | (940) | (1,173) | (1,390) | (1,552) | (1,717) |
| Manville WSC | 0 | 0 | (831) | (2,184) | (2,577) | (2,982) |
| Pflugerville | 0 | 0 | 0 | 0 | (918) | (1,981) |
| River Place on Lake Austin | (570) | (823) | (823) | (817) | (817) | (817) |
| Rollingwood | 0 | (376) | (374) | (372) | (371) | (373) |
| Round Rock | (158) | (339) | (528) | (669) | (813) | (957) |
| Travis County WCID #18 | 0 | 0 | 0 | (4) | (135) | (283) |
| West Lake Hills | 0 | (1,833) | (2,049) | (2,178) | (2,320) | (2,471) |
| Windermere Urility Company | 0 | (2,222) | (2,201) | (2,180) | (2,180) | (2,180) |
| Steam Electric Power | 0 | 0 | (170) | (1,170) | (5,170) | (6,170) |
| **Travis Co. Total Needs** | **(3,538)** | **(11,053)** | **(14,067)** | **(18,134)** | **(55,434)** | **(91,964)** |

### 4.2.13 Wharton County

The primary source of groundwater in Wharton County is the Gulf Coast aquifer. Surface water supplies are available pursuant to LCRA's ROR rights, presently being used within LCRA's Lakeside, Garwood Irrigation Divisions and by Pierce Ranch. In addition, surface water is available from other local supply sources. Irrigation demands in Wharton County represent over 95 percent of the water demand in the county with municipal demands being the second largest demand. A summary of the estimated water shortages identified for Wharton County is presented in *Table 4.12*.

**Table 4.12 Wharton County Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Wharton | 0 | 0 | (4) | (4) | 0 | 0 |
| Irrigation | (58,218) | (53,525) | (48,997) | (44,636) | (40,429) | (24,462) |
| Manufacturing | 0 | 0 | 0 | 0 | 0 | (8) |
| Steam-Electric | (2,300) | (2,300) | (2,300) | (2,300) | (2,300) | (2,382) |
| **Wharton County Total Needs** | **(60,518)** | **(55,825)** | **(51,301)** | **(46,940)** | **(42,729)** | **(26,852)** |

### 4.2.14 Williamson County

Groundwater supplies in Williamson County are available from the Trinity and Edwards-BFZ aquifers. Surface water is available through the COA and LCRA. Municipal water demands represent 99 percent of the demand in the County. Both of the supply shortages identified for Williamson County are associated with municipal demands and wholesale contract expirations. There are no water shortages expected for Williamson County within the LCRWPA.

### 4.2.15 County-Wide Surpluses

As part of the 2011 regional water planning process, areas with water supply surpluses were identified as well as areas with water supply needs. This analysis was conducted by comparing the countywide estimated water supplies with the countywide estimated water demands. It is important to note that although a particular county may have a countywide water supply surplus, individual WUGs within that county may have water supply needs because they do not have access to the surplus water. *Table 4.13* contains a summary of the water supply condition within each county. It is also important to note that the regional totals shown in *Table 4.13* are less than the water supply needs identified in *Figure 4.2* due to surpluses in some counties. The fact that the regional totals show water supply needs despite considering the surpluses in some counties indicates that additional strategies must be developed to meet all of the needs in the LCRWPA. Simply moving surplus water from one area to another will not be sufficient to meet the needs of all WUGs in the LCRWPA. Additionally, movement of surplus water can be very costly, in some cases.

**Table 4.13 County and Regional Water Supply Condition Summary (surplus/deficit, ac-ft/yr)**

| County[1] | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Bastrop | 12,970 | 5,488 | (1,050) | (5,942) | (13,033) | (20,420) |
| Blanco | 3,994 | 3,846 | 3,706 | 3,589 | 3,176 | 2,990 |
| Burnet | 11,128 | 8,647 | 5,884 | 3,196 | 1,536 | (411) |
| Colorado | (50,101) | (41,370) | (32,433) | (23,351) | (14,331) | (7,330) |
| Fayette | 17,677 | 16,924 | 13,076 | (18,189) | (18,670) | (25,288) |
| Gillespie | 5,758 | 5,102 | 4,853 | 4,925 | 4,963 | 4,944 |
| Hays | 688 | (2,056) | (4,683) | (7,352) | (10,611) | (13,204) |
| Llano | 24,041 | 23,510 | 23,283 | 9,567 | 9,323 | 9,038 |
| Matagorda | (108,545) | (156,979) | (151,072) | (145,305) | (139,629) | (134,783) |
| Mills | (160) | (156) | (304) | (203) | (410) | (371) |
| San Saba | 30,876 | 30,961 | 31,049 | 31,135 | 31,238 | 31,323 |
| Travis | 177,469 | 132,149 | 78,224 | 29,259 | (19,323) | (57,538) |
| Wharton | (46,704) | (40,460) | (34,237) | (28,193) | (22,368) | (220) |
| Williamson | 55 | 59 | 63 | 64 | 64 | 64 |
| **Regional Totals[2]** | **78,861** | **(14,543)** | **(63,780)** | **(146,898)** | **(188,134)** | **(211,206)** |

[1] Overall County Surplus/Deficit = Countywide Water Supply – Countywide Water Demand
[2] Overall Regional Surplus/Deficit = Summation of County Surplus/Deficit

By comparison, *Table 4.14* shows all of the water supply needs by county in Region K if the surpluses are not taken into account. Region K is tasked with developing water management strategies to meet all of these needs. One potential strategy is to identify the WUGs with surpluses and determine if it is possible for this surplus water to meet the needs of WUGs with shortages.

**Table 4.14 County and Regional Water Supply Condition Summary Excluding Surpluses (deficit, ac-ft/yr)**

| County[1] | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Bastrop | (4,559) | (6,756) | (10,088) | (14,080) | (20,933) | (28,145) |
| Blanco | 0 | 0 | 0 | 0 | (41) | (64) |
| Burnet | (1,055) | (1,813) | (3,370) | (5,378) | (6,798) | (8,389) |
| Colorado | (57,999) | (50,303) | (42,466) | (34,545) | (26,533) | (20,398) |
| Fayette | (205) | (534) | (837) | (22,175) | (22,594) | (29,069) |
| Gillespie | 0 | 0 | 0 | 0 | 0 | 0 |
| Hays | (842) | (2,548) | (4,877) | (7,408) | (10,662) | (13,255) |
| Llano | (1,462) | (1,743) | (1,844) | (2,075) | (2,331) | (2,627) |
| Matagorda | (126,991) | (174,114) | (167,395) | (160,958) | (154,764) | (148,959) |
| Mills | (840) | (828) | (802) | (735) | (775) | (787) |
| San Saba | 0 | 0 | 0 | (3) | (3) | (5) |
| Travis | (3,538) | (11,053) | (14,067) | (18,134) | (55,434) | (91,964) |
| Wharton | (60,518) | (55,825) | (51,301) | (46,940) | (42,729) | (26,852) |
| Williamson | 0 | 0 | 0 | 0 | 0 | 0 |
| **Regional Totals[2]** | **(258,009)** | **(305,517)** | **(297,047)** | **(312,431)** | **(343,597)** | **(370,514)** |

[1] Overall County Deficit
[2] Overall Regional Deficit = Summation of County Deficit

## 4.3 BASIN SUMMARY OF WATER NEEDS

The following sections contain summaries of the water shortages identified in each of the six basins located wholly or in part within the LCRWPA.

### 4.3.1 Brazos River Basin

The majority of shortages identified in the Brazos River Basin were the result of expiring contracts to municipalities. Smaller shortages were associated with other communities, irrigation, livestock, and mining. *Table 4.15* contains the detailed information.

**Table 4.15 Brazos River Basin Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Bertram | 0 | 0 | 0 | (27) | (74) | (130) |
| County-Other | 0 | 0 | 0 | 0 | (1) | (9) |
| Goldthwaite | (8) | (9) | (9) | (9) | (8) | (8) |
| Irrigation | (241) | (223) | (224) | (208) | (217) | (203) |
| Livestock | (45) | (45) | (45) | (45) | (45) | (45) |
| Mining | (7) | (14) | (34) | (50) | (53) | (54) |
| **Brazos River Basin Total Needs** | **(301)** | **(291)** | **(31)** | **(339)** | **(398)** | **(449)** |

### 4.3.2 Brazos-Colorado Coastal River Basin

Surface water supply is available in the irrigation divisions operated by LCRA through its ROR water rights and through Highland Lakes' water as interruptible supply. Water supply shortages in the Brazos-Colorado Coastal River Basin were identified for irrigation in Colorado, Matagorda, and Wharton Counties. In addition, various shortages in manufacturing and mining were identified. *Table 4.16* contains the detailed information.

**Table 4.16 Brazos-Colorado Coastal River Basin Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Irrigation | (120,679) | (112,140) | (103,310) | (94,812) | (86,603) | (69,653) |
| Mining | (19) | (22) | (23) | (24) | (25) | (26) |
| Steam-Electric Power | 0 | 0 | 0 | 0 | 0 | (82) |
| **Brazos-Colorado River Basin Total Needs** | **(120,698)** | **(112,162)** | **(103,333)** | **(94,836)** | **(86,628)** | **(69,761)** |

### 4.3.3 Colorado River Basin

Water supply shortages were identified throughout the Colorado River Basin. *Table 4.17* contains information detailing these shortages.

**Table 4.17 Colorado River Basin Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Aqua WSC | 0 | 0 | (602) | (3,709) | (6,221) | (9,415) |
| Austin | 0 | 0 | 0 | 0 | (30,459) | (62,934) |
| Barton Creek West WSC | (53) | (50) | (47) | (45) | (43) | (43) |
| Bastrop | (65) | (812) | (1,532) | (2,590) | (3,455) | (4,542) |
| Bastrop County WCID #2 | 0 | 0 | 0 | 0 | 0 | (144) |
| Bee Cave Village | (936) | (1,172) | (1,406) | (1,615) | (1,768) | (1,923) |
| Briarcliff Village | 0 | 0 | (45) | (87) | (117) | (149) |
| Buda | 0 | 0 | (332) | (817) | (1,395) | (1,869) |
| Cimarron Park Water Company | (150) | (236) | (329) | (423) | (536) | (629) |
| Cottonwood Shores | (26) | (198) | (386) | (601) | (840) | (1,130) |
| County-Other | (118) | (1,506) | (4,241) | (7,999) | (11,450) | (14,697) |
| Creedmoor-Maha WSC | 0 | (431) | (548) | (632) | (715) | (807) |
| Dripping Springs | (574) | (1,350) | (1,791) | (2,239) | (2,794) | (3,230) |
| Dripping Springs WSC | 0 | 0 | 0 | (17) | (213) | (366) |
| Elgin | 0 | (604) | (1,176) | (2,033) | (2,735) | (3,627) |
| Fayette WSC | 0 | (236) | (507) | (719) | (976) | (1,317) |
| Goforth WSC | (11) | (21) | (30) | (37) | (43) | (48) |
| Goldthwaite | (493) | (544) | (552) | (546) | (540) | (539) |
| Granite Shoals | 0 | 0 | 0 | 0 | (14) | (95) |

**Table 4.17 Colorado River Basin Water Supply Needs (ac-ft/yr) (continued)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Jonestown | (129) | (233) | (329) | (416) | (481) | (554) |
| Kingsland WSC | (175) | (220) | (217) | (215) | (230) | (254) |
| Lake LBJ MUD | (135) | (290) | (338) | (382) | (439) | (510) |
| Lakeway | (1,681) | (2,613) | (3,513) | (4,338) | (4,954) | (5,572) |
| Lee County WSC | 0 | (48) | (117) | (171) | (232) | (319) |
| Llano | (1,090) | (1,171) | (1,183) | (1,192) | (1,207) | (1,232) |
| Manor | 0 | (940) | (1,173) | (1,390) | (1,552) | (1,717) |
| Manville WSC | 0 | 0 | (831) | (2,184) | (2,584) | (3,034) |
| Marble Falls | 0 | (211) | (976) | (1,719) | (2,154) | (2,653) |
| Meadowlakes | (318) | (576) | (857) | (1,130) | (1,292) | (1,470) |
| Mountain City | (25) | (23) | (23) | (22) | (22) | (22) |
| Pflugerville | 0 | 0 | 0 | 0 | (918) | (1,981) |
| Polonia WSC | 0 | (2) | (7) | (16) | (23) | (30) |
| Richland SUD | 0 | 0 | 0 | (3) | (3) | (5) |
| River Place on Lake Austin | (570) | (823) | (823) | (817) | (817) | (817) |
| Rollingwood | 0 | (376) | (374) | (372) | (371) | (373) |
| Round Rock | (158) | (339) | (528) | (669) | (813) | (957) |
| Smithville | (74) | (311) | (526) | (946) | (1,115) | (1,601) |
| Travis County WCID #18 | 0 | 0 | 0 | (4) | (135) | (283) |
| West Lake Hills | 0 | (1,833) | (2,049) | (2,178) | (2,320) | (2,471) |
| Wharton | 0 | 0 | (4) | (4) | 0 | 0 |
| Windemere Utility Company | 0 | (2,222) | (2,201) | (2,180) | (2,180) | (2,180) |
| Irrigation | (6,822) | (6,365) | (5,917) | (5,477) | (5,102) | (4,744) |
| Livestock | (76) | (76) | (76) | (76) | (76) | (76) |
| Manufacturing | (93) | (218) | (347) | (475) | (590) | (748) |
| Mining | (13,424) | (12,978) | (12,158) | (6,730) | (5,312) | (5,515) |
| Steam-Electric Power | (2,493) | (55,305) | (55,475) | (78,730) | (84,230) | (91,260) |
| **Colorado River Basin Total Needs** | **(29,689)** | **(94,333)** | **(103,566)** | **(135,945)** | **(183,466)** | **(237,882)** |

### 4.3.4 Colorado-Lavaca Coastal River Basin

Surface water supply is available in the irrigation divisions operated by LCRA through its ROR water rights and through Highland Lakes' water as interruptible supply. The greatest water needs identified in the Colorado-Lavaca River Basin were associated with irrigation usage in Matagorda County. *Table 4.18* contains the detailed information.

**Table 4.18 Colorado-Lavaca Coastal River Basin Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Irrigation | (73,845) | (70,046) | (65,801) | (61,727) | (57,807) | (51,166) |
| Livestock | (56) | (56) | (56) | (56) | (56) | (56) |
| Manufacturing | 0 | 0 | 0 | 0 | 0 | (8) |
| **Colorado-Lavaca River Basin Total Needs** | **(73,901)** | **(70,102)** | **(65,857)** | **(61,783)** | **(57,863)** | **(51,230)** |

### 4.3.5 Lavaca River Basin

Surface water supply is available in the irrigation divisions operated by LCRA through its ROR water rights and through Highland Lakes' water as interruptible supply. The majority of shortages in the Lavaca River Basin were associated with irrigation in Colorado County. Several minor shortages were also recognized and are listed below in *Table 4.19*.

**Table 4.19 Lavaca River Basin Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | (105) | (109) | (106) | (129) | (118) | (106) |
| Fayette WSC | 0 | (21) | (45) | (63) | (86) | (116) |
| Schulenburg | 0 | 0 | 0 | (34) | (100) | (193) |
| Irrigation | (33,151) | (28,237) | (23,465) | (18,846) | (14,355) | (10,056) |
| Livestock | (11) | (11) | (11) | (11) | (11) | (11) |
| Manufacturing | (45) | (70) | (94) | (117) | (137) | (162) |
| Mining | (100) | (132) | (151) | (168) | (184) | (199) |
| **Lavaca River Basin Total Needs** | **(33,412)** | **(28,580)** | **(23,872)** | **(19,368)** | **(14,991)** | **(10,843)** |

### 4.3.6 Guadalupe River Basin

Water supply shortages in the Guadalupe River Basin were identified for Bastrop and Blanco Counties. *Table 4.20* contains the detailed information.

**Table 4.20 Guadalupe River Basin Water Supply Needs (ac-ft/yr)**

| Water User Group Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| County-Other | 0 | 0 | 0 | 0 | (41) | (80) |
| Manufacturing | (8) | (10) | (11) | (13) | (14) | (16) |
| **Guadalupe River Basin Total Needs** | **(8)** | **(10)** | **(11)** | **(13)** | **(55)** | **(96)** |

## 4.4 WHOLESALE WATER PROVIDER NEEDS

As previously discussed, the LCRA and COA have been identified as wholesale water providers within the LCRWPA. The following sections present a comparison of the water supplies for these two entities and their water supply commitments.

### 4.4.1 Lower Colorado River Authority

The LCRA has two major sources for its water. These sources include the Highland Lakes System and ROR water rights in the lower portion of the basin. The LCRA has commitments to provide water to individual users and cities throughout the basin. In addition, the LCRA uses water at its electric generating facilities. Finally, LCRA provides water to meet requirements for environmental needs of the river and bay according to the LCRA Water Management Plan. *Table 4.21* contains a comparison of LCRA's Highland Lakes supplies and water commitments. *Table 4.22* contains a comparison of LCRA's Irrigation water supplies and water commitments.

**Table 4.21 LCRA Municipal, Manufacturing, and Steam Electric Water Supply/Commitment Comparison (ac-ft/yr)**

| LCRA Water Supply | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Highland Lakes Firm Water Supply | 402,172 | 390,001 | 384,001 | 378,101 | 372,201 | 366,468 |
| Firm Water Commitments | 402,723 | 415,820 | 415,820 | 415,820 | 415,820 | 415,687 |
| **Water Surplus/Deficit** | **(551)** | **(25,819)** | **(31,819)** | **(37,719)** | **(43,619)** | **(49,219)** |

Note: The water supply is detailed in *Table 3.24*. The water commitments are detailed in *Tables 2.20* and *3.25*. The Firm Water Commitments presented in *Table 4.21* represent LCRA's Highland Lakes water commitments and their anticipated expiration dates. The contract extensions presented in this table represent the value of water required to extend LCRA's Highland Lakes contracts through 2060. Commitments include the out-of-basin 25,000 ac-ft/yr demand from Region G in Williamson County under the HB 1437 program and other current, separate out-of-region commitments (Leander, Cedar Park, and Lometa).

**Table 4.22 LCRA Irrigation Water Supply/Commitment[2] Comparison (ac-ft/yr)**

| LCRA Water Supply | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Irrigation Water Supply | 212,055 | 210,792 | 210,792 | 210,792 | 210,792 | 210,792 |
| Irrigation Water Commitments | 415,152 | 399,449 | 384,322 | 369,728 | 355,610 | 335,851 |
| **Water Surplus/Deficit** | **(203,097)** | **(188,657)** | **(173,530)** | **(158,936)** | **(144,818)** | **(125,059)** |

Note: The water supply is detailed in Table 3.24. The water commitments are detailed in Tables 2.20 and 3.25. The total water commitment presented in Table 4.22 includes a portion of the rice irrigation demands for Region K (ratio for Colorado, Matagorda and Wharton Counties applied from the 2001 plan: 0.75, 0.87 and 0.55).

These tables indicate that the LCRA does not have enough water to meet all of its water commitments under the assumptions being used in this plan. How LCRA proposes to meet these additional needs is discussed in Section 4.6.1. It is also important to recognize that this analysis does not include

[2] The irrigation water commitments discussed here reflect the projected demands within LCRA's Irrigation Divisions and Pierce Ranch which are currently being met by LCRA's ROR water rights and supplemental interruptible stored water from lakes Buchanan and Travis in accordance with LCRA's Water Management Plan on an annual contract basis.

interruptible water supplies projected to be available over the planning horizon through the implementation of the Water Management Plan (WMP) or projected municipal return flows. These supplies are discussed later in this chapter as water management strategies.

### 4.4.2 City of Austin

The COA currently has two major sources for its surface water. These sources include the ROR water rights and a contract with LCRA to receive firm water from any source under the LCRA water rights system. These rights are separated by the use of the water. The COA has separate rights for municipal and manufacturing uses and steam electric power generation. *Tables 4.23* and *4.24* contain comparisons of the COA's water supplies to its water commitments in these two areas.

**Table 4.23 COA Municipal and Manufacturing Water Supply/Commitment Comparison (ac-ft/yr)**

| COA Water Supply | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Municipal and Manufacturing Water Supply | 325,000 | 325,000 | 325,000 | 325,000 | 325,000 | 325,000 |
| Municipal and Manufacturing Water Commitment | 197,877 | 228,695 | 271,486 | 314,731 | 355,430 | 387,905 |
| **Water Surplus/Need** | **127,123** | **96,305** | **53,514** | **10,269** | **(30,430)** | **(62,905)** |

Note: The water supply is detailed in *Table 3.26*. The water commitments are detailed in *Tables 2.18* and *3.27*. The Water Commitments presented in *Table 4.23* represent the COA's water commitments. Note that some current COA wholesale customers will be getting new LCRA raw water contracts, but as a requirement of their contract, COA will continue to treat and transport their potable water supplies. These customers/contracts are listed in *Table 4.31*.

This table indicates that the COA has sufficient water to meet its municipal and manufacturing needs through the year 2040. By the year 2050, it is anticipated that the COA will have a deficit of approximately 30,000 ac-ft/yr. By the year 2060, it is anticipated that the COA will have a deficit of approximately 63,000 ac-ft/yr.

**Table 4.24 COA Steam Electric Water Supply/Commitment Comparison (ac-ft/yr)**

| COA Water Supply | Year 2010 | Year 2020 | Year 2030 | Year 2040 | Year 2050 | Year 2060 |
|---|---|---|---|---|---|---|
| Steam Electric Water Supply | 27,094 | 27,094 | 27,094 | 27,094 | 27,094 | 27,094 |
| Steam Electric Water Commitment | 31,722 | 32,802 | 40,102 | 49,239 | 53,239 | 60,149 |
| **Water Surplus/Need** | **(4,628)** | **(5,708)** | **(13,008)** | **(22,145)** | **(26,145)** | **(33,055)** |

Note: The water supply is detailed in *Table 3.26*. The water commitments are detailed in *Tables 2.19* and *3.27*. The water commitments presented in *Table 4.24* represent all of the steam electric generating demands for Travis County plus a portion of the Fayette County demands (based on estimated current supply levels and approved projections).

This table indicates that by the year 2030, it is anticipated that the COA will have a deficit of approximately 13,000 ac-ft/yr. By 2060, the COA will have a deficit of approximately 33,000 ac-ft/yr.

## 4.5 EVALUATION AND SELECTION OF WATER MANAGEMENT STRATEGIES

The primary emphasis of the regional water planning effort is the development of regional water management strategies sufficient to meet the projected needs of WUGs throughout the state. Water needs are determined by comparing user group water demands to the water supplies available to that user group. The following sections present information concerning the identification, evaluation, and selection of specific water management strategies to meet specific projected water supply shortages for the LCRWPA (Region K). It should be noted that local plans that are not inconsistent with the regional water supply plan are also eligible to apply for TWDB financial assistance to implement those local plans even though they have not been specifically recommended in this plan.

Regionwide, the comparison of available water supplies and water demands identified 73 separate WUGs that have projected water supply shortages, or needs, by the year 2030, and an additional 19 WUGs with projected water supply shortages before the year 2060. The estimated water need is approximately 297,000 ac-ft/yr in 2030 and 370,000 ac-ft/yr in 2060. This identified shortage is based on conservative water availability estimates, which assume only water available during a repeat of the worst DOR, that all rights are being fully and simultaneously utilized, and exclude water available from LCRA on an interruptible basis and water available as a result of municipal return flows to the Colorado River. The water management strategies are intended to alleviate these projected water supply shortages. A table of the recommended water management strategies by WUG is contained in *Appendix 4A*. *Appendix 4B* contains the cost breakdown for each strategy and assumptions/methodology for the cost calculations.

In this plan, the LCRWPG looked at opportunities for the LCRA to expand their regional water supply to new areas, including portions of Bastrop County. The LCRWPG also looked at strategies such as off-channel reservoirs that would potentially help the LCRA to more efficiently manage their regional water system.

### 4.5.1 Utilization of Return Flows

Approximately 60 percent of all municipal diversions by the City of Austin (COA) and others are currently returned to the Colorado River as effluent discharges. Unless otherwise authorized by permit, once discharged to the river, this water is subject to diversion under existing water rights' permits. State law currently allows a water right holder to consumptively use all of the water authorized by permit, unless discharge is required by permit. Direct reuse is one possible manner in which a water right holder may increase consumptive use of the water authorized for diversion and use under the water right. The Region K Cutoff WAM for the Colorado River that was used for determining water supply in this round of planning excludes all sources of return flows from the model. The inclusion of return flows in the model is proposed as a water management strategy for the benefit of water rights and environmental flows and indirect reuse by the City of Austin in future regional water plans, consistent with a settlement agreement between Austin and the Lower Colorado River Authority.

The exclusion of all return flows in the determination of water supply leads to conservatively low estimates of available surface water supply for planning purposes. Water shortages for entities that currently use and rely upon the return flows may not be realistic as long as upstream return flow discharges continue into the future. For purposes of this plan, the water management strategies include use of projected state surface water that result from discharge of return flows by the COA, the City of Pflugerville, and Aqua Water Supply Corporation. Strategies related to COA's reuse of treated effluent are described in Section 4.6.2.2. This plan assumed projected levels of effluent to be discharged by the

City of Pflugerville and Aqua Water Supply Corporation of 60 percent of the total projected demand for raw water in 2060, or about 12,500 ac-ft/yr. Effluent not being directly reused by Austin as a strategy and these other projected levels of effluent were made available to help meet environmental flow needs of the river and Matagorda Bay and water rights, according to the prior appropriation doctrine. Therefore, return flow assumptions for purposes of developing LCRA's water strategies incorporate and reflect the COA's proposed strategies of direct reuse of effluent to meet municipal demand and demand at the Sand Hill Energy Center in Travis County and the return flow sharing strategy described in Section 4.5.1.1.

#### *4.5.1.1 COA Return Flows Strategy*

In 2007, the City of Austin and LCRA signed a settlement agreement that resolved several permitting disputes and outlined a proposed arrangement for shared rights to the beneficial use of return flows discharged by the City of Austin. According to the settlement agreement, the two parties will seek regulatory approval to effectuate the strategy of joint return flow benefit. The settlement contemplates that the return flows will be managed between the two parties to first help satisfy environmental flow needs before Austin conducts indirect reuse. If Austin has an indirect reuse project in operation that is consistent with the terms and conditions of the Settlement Agreement, LCRA will not call on return flow passage unless environmental needs and Austin's indirect reuse needs are met.

At this time, the City of Austin has not developed plans for implementing an indirect reuse project; therefore, the model did not include a City of Austin indirect reuse component. Future Region K plans are expected to include assumptions related to indirect reuse by the City of Austin. Consistent with the 2007 settlement agreement language regarding the shared rights to the beneficial use of return flows and because Austin has not proposed a specific indirect reuse project for this plan, return flows were modeled for downstream water right availability. First, return flows were allocated towards meeting environmental flow requirements (instream flow and bay and estuary freshwater inflow requirements) of LCRA's Water Management Plan, as contained in the Region K Cutoff model. Thereafter, the return flows were made available for use by downstream water rights according to the doctrine of prior appropriation.

In this plan, after meeting the LCRA WMP environmental flow requirements in the Region K Cutoff model, the projected remaining return flows were made available to meet all downstream demands, including environmental, municipal, irrigation, and industrial (including steam electric) water needs, in accordance with the prior appropriation doctrine. The partitioning of Austin's municipal return flows between environmental flow requirements and water rights is indicated by *Table 4.25*. It should be noted that the partitioning of return flows shown in *Table 4.25* is dependent on the modeling assumptions used in the Region K Cutoff model and is presented here only as a illustration of concept. Environmental flow requirements will likely change in the future based on the latest scientific studies and actual water right utilization levels throughout the basin. The settlement agreement contemplates a framework for joint management between the two parties so that environmental flow requirements, as based on the best available science at the time, will be satisfied with Austin's return flows prior to beneficial use by either party's water rights.

**Table 4.25 Example of Austin Municipal Return Flow Partitioning**

| | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Total Projected Austin Municipal Return Flow Discharged to Stream After Direct Reuse by Austin, ac-ft/yr | 98,638 | 99,792 | 105,750 | 116,775 | 124,632 | 132,660 |
| Average Return Flow Used to Satisfy Environmental Flows During Drought of Record, ac-ft/yr | 51,341 | 51,562 | 54,843 | 61,035 | 64,012 | 66,789 |
| Average Return Flow Available for Any Water Right by Priority Order During Drought of Record, ac-ft/yr | 47,296 | 48,230 | 50,907 | 55,739 | 60,619 | 65,871 |
| *Total* | *98,637* | *99,792* | *105,750* | *116,775* | *124,631* | *132,660* |
| Average Return Flow Used to Satisfy Environmental Flows for All Years in Period of Record, ac-ft/yr | 38,346 | 37,094 | 38,952 | 43,286 | 45,616 | 47,662 |
| Average Return Flow Available for Any Water Right by Priority Order for All Years in Period of Record, ac-ft/yr | 60,291 | 62,698 | 66,798 | 73,489 | 79,015 | 84,998 |
| *Total* | *98,637* | *99,792* | *105,750* | *116,775* | *124,631* | *132,660* |

*Modeling for Table 4.25 uses the Region K Cutoff assumption, the 1999 LCRA Water Management Plan environmental flow requirements for Lakes Travis and Buchanan, and assumes all water rights are exercised according to their fully authorized amounts. City of Austin municipal return flows are added to the model according to the decadal projection of discharge to the river as given by Table 4.26.*

As indicated in *Table 4.26*, the presence of these return flows reduces the calculated shortages identified in Chapter 4 which were the result of the conservative modeling assumptions used in Chapter 3.

The quantity of return flows is projected to increase over the 50-year planning period due to increased water demands in the Austin area even though the quantity of water reused during this period will increase as well, as shown in *Table 4.37*. However, beyond 2060, the COA projects that it will significantly increase its reuse of treated effluent to nearly 100 percent through direct and indirect reuse with the indirect reuse being implemented only in accordance with the 2007 settlement agreement. As return flows discharged by Austin diminish in the future due to enhanced reclamation of water, other sources may need to be dedicated or developed to meet needs that may currently be met by return flows discharged by Austin.

**Table 4.26 Estimated Continued Benefits of Projected City of Austin Return Flows in the 2011 Region K Plan**

| COA Return Flows | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected COA Effluent minus reuse | 98,638 | 99,792 | 105,750 | 116,775 | 124,632 | 132,660 |
| Estimated Benefits to Major ROR Water Rights [1] | | | | | | |
| Highland Lakes [1] | 26,535 | 26,685 | 26,822 | 29,067 | 28,384 | 29,542 |
| COA [1] | 27,188 | 24,954 | 25,692 | 33,549 | 33,263 | 39,528 |
| STP [1] | 1,088 | 998 | 1,028 | 1,118 | 1,109 | 1,129 |
| Garwood [2] | 848 | 779 | 802 | 872 | 865 | 881 |
| Gulf Coast [2] | 3,263 | 2,995 | 3,083 | 3,355 | 3,326 | 3,388 |
| Lakeside [2] | 2,175 | 1,996 | 2,055 | 2,237 | 2,218 | 2,259 |
| Pierce Ranch [2] | 4,601 | 4,223 | 4,348 | 4,731 | 4,691 | 4,778 |
| Irrigation [3] | 18,665 | 19,687 | 22,900 | 27,781 | 30,382 | 33,838 |
| | | | | | | |
| Estimated Benefit to Matagorda Bay | 14,276 | 17,474 | 19,020 | 14,066 | 20,394 | 17,317 |

Note: Estimates derived from 2006 Region K Plan RJ Brandes Company preliminary modeling using updated demands.
[1] The benefits for each major water right were computed by adjusting the estimated benefits from the modeling work completed in the 2006 Region K Plan for return flow amounts projected in the 2011 Region K Plan. The benefits represent the estimated increase in firm supply available to each water right due to the addition of the City of Austin return flows in the model.
[2] These values represent the gains due to return flows in the portions of the water rights used for non-irrigation purposes.
[3] This value represents the gains due to return flows in the portion of the Irrigation ROR water rights that are used for irrigation purposes.

*Opinion of Probable Costs*

There are no capital costs associated with the diversion of this water because the diversions are done under existing water rights permits with existing infrastructure.

*Issues and Considerations*

Issues related to ownership of treated wastewater effluent are discussed in Sections 4.15 and Chapter 8 (Section 8.2).

### *4.5.1.2 Downstream Return Flows*

In addition to the COA, return flows for the City of Pflugerville and Aqua Water Supply Corporation were also taken into consideration. This plan assumed projected levels of effluent to be discharged by the City of Pflugerville and Aqua Water Supply Corporation of 60 percent of the total projected demand for raw water in 2060, or about 12,500 ac-ft/yr. *Table 4.27* shows the estimated benefits of these return flows to the major water rights holders in the region.

**Table 4.27 Estimated Benefits of Projected Pflugerville and Aqua WSC Return Flows**

| Return Flows | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Projected Effluent | | | | 1,250 | 5,000 | 9,375 | 12,500 |
| Estimated Benefits to Major ROR Water Rights [1] | | | | | | | |
| Highland Lakes [1] | | | | 300 | 1,200 | 2,250 | 3,000 |
| COA [1] | | | | 238 | 950 | 1,781 | 2,375 |
| STP [1] | | | | 11 | 45 | 84 | 113 |
| Garwood [2] | | | | 10 | 40 | 75 | 100 |
| Gulf Coast [2] | | | | 169 | 675 | 1,266 | 1,688 |
| Lakeside [2] | | | | 106 | 425 | 797 | 1,063 |
| Pierce Ranch [2] | | | | 100 | 400 | 750 | 1,000 |
| Irrigation [3] | | | | 213 | 850 | 1,594 | 2,125 |
| | | | | | | | |
| Estimated Benefit to Matagorda Bay | | | | 104 | 415 | 778 | 1,038 |

Note: Estimates derived from 2006 Region K Plan RJ Brandes Company preliminary modeling using updated demands.
[1] The values for each major water right represent the estimated increase in firm supply available to each water right due to the addition of the Pflugerville and Aqua WSC return flows in the river.
[2] These values represent the gains due to return flows in the portions of the water rights used for non-irrigation purposes.
[3] This value represents the gains due to return flows in the portion of the Irrigation ROR water rights that are used for irrigation purposes.

*Opinion of Probable Costs*

There are no capital costs associated with the diversion of this water because the diversions are done under existing water rights permits with existing infrastructure.

*Issues and Considerations*

Issues related to ownership of treated wastewater effluent are discussed in Sections 4.15 and Chapter 8 (Section 8.2).

## 4.6 WHOLESALE WATER PROVIDER MANAGEMENT STRATEGIES

There are two Wholesale Water Providers, as defined by the State planning process in Region K, LCRA and the COA. The COA is also a water customer of LCRA, and together they supply a large portion of Region K's water needs for multiple beneficial purposes.

### 4.6.1 LCRA Water Management Strategies

LCRA holds water rights to over 2.1 million ac-ft of water in the Colorado River Basin. Combined, these water rights authorize every legal purpose of use, and also provide for protection of certain environmental flow needs. The LCRA is directed by the Texas Legislature to be the steward of this water in serving as the regional water supplier. The LCRA supplies water for municipal, irrigation, manufacturing, steam electric, mining, and other water uses. The LCRA currently supplies water to entities in Bastrop, Burnet, Colorado, Fayette, Hays, Lampasas (Region G), Llano, Matagorda, San Saba, Travis, Wharton, and Williamson (including the portion of Williamson in Region G) Counties.

*Table 4.28* below provides a summary of all of the recommended strategies related to the LCRA as a wholesale water provider. The sections following the tables discuss the strategies in more detail.

**Table 4.28 Summary of LCRA Water Management Strategies (ac-ft/yr)**

| LCRA Strategies | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Available Interruptible Water for Irrigation | 255,493 | 196,568 | 137,643 | 78,718 | 19,793 | 0 |
| Amendment to Irrigation for Municipal and Industrial | 43,000 | 47,000 | 55,000 | 65,000 | 65,000 | 106,600 |
| LCRA Contract Amendments | 3,708 | 5,265 | 6,165 | 8,503 | 10,955 | 12,911 |
| LCRA New Water Sale Contracts | 300 | 35,864 | 37,082 | 59,722 | 60,477 | 70,210 |
| LCRA Commitment Reductions [1] | | 15,000 | 17,000 | | | |
| LCRA-SAWS Water Project [2] | | 201,950 | 201,950 | 201,950 | 201,950 | 201,950 |
| Unappropriated Flows and Off-Channel Storage | | | | | | 47,000 |
| Enhanced Municipal and Industrial Conservation | | | 2,000 | 10,000 | 20,000 | 20,000 |
| Aquifer Storage and Recovery | | | | 10,000 | 10,000 | 10,000 |
| Reuse by Highland Lakes Communities | | 500 | 2,000 | 5,000 | 5,000 | 5,000 |

[1] Reduction in LCRA Commitments is due to improved efficiency in Ferguson and COA reuse. The use of this strategy is based on calculated surpluses shown in the 2011 Region K Water Plan only and does not assume that any legal changes to existing commitments would occur as a result of this strategy.

[2] Strategy components of the LCRA-SAWS Water Project for Region K include On-Farm Conservation, Irrigation District Conveyance Improvements, Development of New Rice Varieties, and Conjunctive Use of Groundwater. Please see Section 4.9 for detailed discussion of these various components.

### *4.6.1.1 General LCRA Strategy - LCRA System Operation Approach*

The State has directed LCRA to optimize and conserve available water to meet the existing and future water needs of the region. To meet existing water needs in the basin, LCRA has traditionally used its water rights together as a system. To date, LCRA has largely done this through its Water Management Plan (discussed below) and thus, its efforts have been focused on the management of Lakes Buchanan and Travis to meet firm municipal and industrial customer demands while continuing to provide interruptible supplies to downstream irrigators and provide both firm and interruptible supplies to meet environmental flow needs.[3]

To meet increased and changing water needs over time, LCRA plans to continue to employ a system approach. Future amendments to LCRA's WMP will be required. As firm demands change over time, the amount of interruptible water supply that will be available from the Lakes to help meet irrigation, environmental, recreational, and other water needs will require adjustment. Further, LCRA's ROR rights that are currently used primarily to meet irrigation needs will be needed to meet increased municipal and industrial needs. LCRA has sought and will continue to seek amendment of all of these other existing

[3] For a general description of the LCRA Water Management Plan (WMP), see Section 3.2.1.1.2.1.

water rights to allow for the diversion and use of water for multiple beneficial purposes in other locations as needed to supplement the firm water supply available from the Lakes. Future irrigation water shortages that result from use of these ROR rights to meet other municipal and industrial demands will be largely addressed through continued availability of interruptible water, enhanced water conservation, development of groundwater, and other water management strategies described in this section. Throughout the basin, LCRA will continue to pursue aggressive water conservation measures and other water use efficiencies to continue to meet new and increasing water needs within LCRA's water service area.

*Issues and Considerations*

The use of a system approach allows LCRA to maximize the various amounts of water available. It also allows interruptible flows to contribute to instream flow needs in all of the river segments prior to the main rice growing areas in the Lower Basin, and allows greater flexibility to meet all needs, including instream flow and bay and estuary needs not only in quantity but also in timing of the flow needs. The system approach that LCRA plans to continue to employ, involves the use of a number of specific strategies tied to major projects such as the LSWP[4] and HB 1437 conservation savings, which are examined in greater detail in succeeding sections, with an analysis of the environmental consequences of each.

### *4.6.1.2 Amendments to Water Management Plan*

To meet increased firm customer demands, LCRA will seek to amend its Water Management Plan to adjust the triggers at which it curtails the availability of interruptible water supply from Lakes Buchanan and Travis to meet irrigation, environmental and other needs. Both pending and potential revisions to the WMP are considered in this regional plan without waiver of arguments in potential or pending litigation.

4.6.1.2.1. Environmental Flow Assumptions for WMP Revisions

For purposes of environmental flow commitments, this plan reflects conditions specified in the 1999 WMP, as well as certain aspects of the proposed WMP now pending before the Texas Commission on Environmental Quality (TCEQ).

For the simulation of 2010 conditions, all of the key environmental flow elements of the current (1999) WMP are represented in the modeling, including critical instream flow and bay and estuary freshwater inflow criteria engaged all of the time, target instream flow criteria engaged when the system storage is greater than 1,100,000 ac-ft, and target freshwater inflow criteria engaged when the system storage is greater than 1,700,000 ac-ft,, with the maximum environmental flow caps implemented as stipulated in the WMP.

For the simulation of 2060 conditions, the critical instream flow and bay and estuary freshwater inflow criteria are engaged all of the time, and the additional environmental flow criteria are modified to reflect the draft 2003 WMP so that the target instream flow criteria are engaged when the system storage is greater than 1,400,000 ac-ft, and the target bay and estuary freshwater inflow criteria are engaged only when the system storage is above 1,700,000 ac-ft, which is about 93 percent of the year-2060 system

[4] The LSWP project is the subject of litigation. For a description of the status of the project *see* p. 4-34.

conservation storage capacity (1,832,000 ac-ft). Intermediate freshwater inflow criteria are engaged when system storage is less than 1,700,000 ac-ft and greater than 1,100,000 ac-ft.

*Issues and Considerations*

The current (1999) WMP commits 15,950 acre feet of firm water for instream and bay and estuary flows. The pending amendment (2003) to the WMP will allocate an additional 17,490 acre feet of firm water for a total commitment of 33,440 acre feet. This water will provide some additional benefit to those two areas. However, the main issue of growth in municipal, manufacturing and steam electric demand has a potential to reduce the amount of interruptible supply available for providing over and above the minimum amounts currently included in the LCRA Water Management Plan. LCRA's ability to continue to provide interruptible surface water supplies to the lower counties for rice production does provide benefit to instream flows as these interruptible flows make their way through the river system up to the point of diversion. There is also an element of irrigation return flows during July which provides needed instream flows as well as bay and estuary flows during a historically dry time of year.

4.6.1.2.2. Interruptible Water Supply for Irrigation for WMP Revisions

The LCRA supplies water to four major irrigation operations within the three rice-producing counties. These operations include the Lakeside, Gulf Coast, and Garwood Irrigation Divisions, which are owned and operated by LCRA and the Pierce Ranch. LCRA supplies water to these four irrigation operations from its four ROR water rights to the extent that flows in the river are available, based on each water right's priority date, and up to the limits of each right. However, often in the height of the irrigation season, flows available in the Colorado River are insufficient to supply all of the needs of the four operations.

Pursuant to LCRA's Water Management Plan for Lakes Buchanan and Travis, LCRA has been able to provide water stored in these lakes to the rice irrigators on an interruptible basis during periods of low flow when ROR rights are insufficient to meet demands. Under LCRA's water rights, LCRA is permitted to develop contractual commitments with water users whose demands do not have to be met 100 percent of the time. LCRA's Water Management Plan allows such demands for interruptible stored water to be met to the extent water is available each year after firm demands are satisfied. The portion of the Combined Firm Yield of Lakes Buchanan and Travis that is not yet committed and the water that is committed but not yet being used determines the interruptible stored water that is available each year. The water that is captured and stored during flood events also adds to the amount of interruptible stored water that is available. Under the 1999 Water Management Plan, interruptible water is gradually curtailed when storage levels in the two lakes on January 1 are less than 52 percent. The curtailment is approximately a 4 percent reduction in available interruptible supply for each 100,000 ac-ft decrease in combined storage. All interruptible supply is cut off when the combined storage is less than 325,000 ac-ft on January 1 or after certain specific criteria have been met and the LCRA Board has declared a drought worse than a drought of record.

LCRA does not expect its firm customers to fully utilize their commitments for some time. Therefore, continued implementation of the LCRA Water Management Plan will provide interruptible water to rice irrigators when sufficient water is available in the Highland Lakes System.

Over time, as the current firm contracts draw fully on their commitments and the remainder of the Combined Firm Yield is contracted for, there will be less interruptible stored water available on an annual basis and the allocation of that available interruptible supply among the irrigation operations will likely be modified.[5] For this plan, assumed revisions to the WMP curtailment triggers for interruptible water from the Highland Lakes have been incorporated that affect the availability of interruptible supply to meet irrigation demands within the four irrigation operations. For example, in 2060, it has been assumed that interruptible irrigation supplies would be curtailed proportional to the system storage in Lakes Buchanan and Travis beginning when the storage falls below the full conservation capacity, with no interruptible water available when the system storage is below 325,000 ac-ft. The water availability analyses needed to estimate what the future triggers should be for this plan based on incorporating regional water planning demand projections for LCRA's existing customers, updated estimates for future irrigation water needs in LCRA's lower basin irrigation operations, and assumed levels of water conservation discussed elsewhere in this plan.

As discussed above, this plan includes an analysis of the amount of interruptible water expected to be available during each decade of the planning period using a modified version of the Region K Cutoff Model to include projected municipal and industrial demands, while also including projected return flows discharged by the COA over the planning period. *Table 4.29* presents the results of this analysis. The amount of interruptible stored water available to irrigators from Lakes Buchanan and Travis is estimated to decrease from approximately 255,493 ac-ft/yr in 2010 to 0 ac-ft/yr in 2060 due to increased firm demands in the basin.

**Table 4.29 Available Interruptible LCRA Water Supply for Irrigation**

| Decade | Available [1] Interruptible Water Supply (ac-ft/yr) |
|---|---|
| 2010 | 255,493 |
| 2020 [2] | 196,568 |
| 2030 [2] | 137,643 |
| 2040 [2] | 78,718 |
| 2050 | 19,793 |
| 2060 | 0 |

[1] Annual supply of interruptible stored water available during the critical drought year having the minimum run-of-river supply for the LCRA irrigation water rights (1956).
[2] Simulations were conducted for only 2010, 2050, and 2060. Information for other decades was interpolated from the 2010 and 2050 results.

As the table indicates, the availability of interruptible water supply is expected to decrease significantly in the future as the demands for firm water increase.

*Opinion of Probable Costs*

Capital expenditures for water supply purposes would not be required to implement this alternative since diversions would be made under existing water rights. The cost of raw water for the Lakeside and Gulf Coast irrigation operations under this alternative currently ranges from $5.93 per ac-ft. LCRA also charges additional cost for distribution and delivery of this water.

*Issues and Considerations*

[5] When LCRA purchased both the Garwood Irrigation Company and Pierce Ranch water rights, it made certain commitments to provide interruptible stored water based upon specific requirements in the purchase agreements. This affects the manner in which LCRA allocates available interruptible water supply among the four irrigation operations.

The availability of interruptible supply is a function of the actual demand for firm water supply from LCRA's Lakes Buchanan and Travis and is determined on an annual basis. Therefore, actual availability of this supply from year to year can vary greatly, largely as a function of drought conditions, lake levels, inflows into the lakes, and demands for firm water.

*Environmental and Other Impacts*

As noted above, the increasing municipal, manufacturing and steam electric demands have reduced the amount of interruptible water that is available for the four downstream irrigation operations, which has the potential to reduce the flows in the lower basin.

*Impacts to Agriculture*

Although the management strategies proposed include the amendment of existing water rights to allow uses other than agriculture, the plan is structured to provide the water that agriculture needs according to the forecast demands. Since that is the case, impacts to agriculture are expected to be low, with the possible exception of the increased cost of pumping groundwater for those irrigators using groundwater if permanent drawdowns occur from additional groundwater pumpage for irrigation. The issue of the extent and length of time that drawdowns will occur is still being investigated.

#### *4.6.1.3 Amendments to ROR Rights*

Significant amendments to LCRA's ROR irrigation rights are included as a strategy in this plan without waiver of arguments in any pending litigation or contested case hearing. These amendments are proposed to meet increased municipal and industrial demand within the Lower Colorado River Basin and are also a necessary component of the LSWP (discussed below). LCRA owns 503,750 ac-ft of water per year of water rights on the Lower Colorado River authorized for irrigation use in the Lakeside, Gulf Coast, and Pierce Ranch Irrigation Divisions. Projected total irrigation demand for water in 2060 within these three operations is expected to be approximately 250,000 ac-ft/yr, which reflects some moderate level of conservation as projected by TWDB. The future demand, with implementation of advanced agricultural conservation measures as part of the LSWP, is approximately 55,000 ac-ft/yr less than the projected level of demand for these three operations. Analysis conducted to date shows that to meet the 2060 demand, about 150,000 to 200,000 ac-ft of water per year from LCRA's water rights would be used for irrigation, along with advanced conservation, limited groundwater development for LSWP, and some interruptible supply from Lakes Buchanan and Travis.

Another existing water right owned by LCRA is the former Garwood Irrigation Company water right, which authorizes the diversion of up to 133,000 ac-ft of water per year from the Colorado River for irrigation, municipal, and industrial uses. Water demands in the Garwood operation are estimated to be approximately 80,000 ac-ft of water per year based on TWDB projections. With extensive conservation measures and improved farming practices implemented, the projected future demand in 2060 for irrigation water within this operation is expected to be on the order of 55,000 ac-ft of water per year.

Significant potential exists to optimize system operations and make additional water supplies from these water rights available to meet future water demands. Portions of these ROR irrigation water rights that would no longer be needed for irrigation because of conservation and other factors resulting in reduced irrigation demands are proposed for use as part of a system operation employing off-channel storage, potential new water rights associated with LCRA's permit application for the remaining unappropriated water in the Lower Colorado River Basin, and backup from the Highland Lakes to develop water supplies that would help meet in-basin future needs as well as needs in the San Antonio region and Williamson County. LCRA is also proposing to use some portion of these ROR rights to meet other municipal and industrial demands in the basin. Storage of these water rights in either the Highland Lakes or in the off-channel reservoirs to be constructed as part of the LSWP is projected to increase the firm supply available from these rights on the order of 100,000 ac-ft/yr and is proposed as a strategy to meet in-basin needs by 2060. Moreover, portions of these water rights not used to meet in-basin demands are proposed for storage in off-channel reservoirs for delivery to SAWS as part of the LSWP.

For example, LCRA is proposing to use part of its Gulf Coast and Garwood Irrigation Divisions' water rights as early as 2010 to meet municipal and industrial shortages. LCRA already has a pending application to amend its Garwood water right for such purposes. LCRA is proposing to use the balance of the authorized diversions under the Garwood right (about 75,000 ac-ft/yr) to meet other needs within the Colorado River Basin such as the COA's projected 2060 demand beyond its authorized water rights, the Fayette Power Plant backup demand for LCRA, and other municipal and industrial demands downstream or in the vicinity of Lake Travis. The amendments of specific irrigation water rights contemplated at this time are provided in *Table 4.30*. These water rights were selected for amendment largely for illustrative purposes, recognizing that LCRA intends to amend any and all of its irrigation water rights to meet future and changing water needs.

**Table 4.30 Amendment to Irrigation Water Rights for Municipal and Industrial Needs**

| Irrigation District | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Garwood | (28,000) | (32,000) | (40,000) | (40,000) | (40,000) | (74,600) |
| Pierce Ranch | (15,000) | (15,000) | (15,000) | (15,000) | (15,000) | (15,000) |
| Lakeside | | | | | | (7,000) |
| Gulf Coast | | | | (10,000) | (10,000) | (10,000) |

Note: Estimates derived from RJ Brandes Company preliminary modeling.

*Opinion of Probable Costs*

Capital expenditures for water supply purposes would not be required to implement this alternative. It is anticipated that diversions of these rights for other purposes will be done at locations already authorized for diversion under other water rights held by LCRA using existing infrastructure. The average cost of providing raw water under this alternative is currently $138 per ac-ft, and is estimated to increase on average about 3 percent per year over the next five years, or up to $160/ac-ft.

*Issues and Considerations*

Conversion of irrigation rights to serve municipal, manufacturing, and steam electric needs may not have a significant impact on downstream instream and bay and estuary flows as long as water is provided from other sources to meet the downstream irrigation needs. In addition, use of this water for municipal needs could result in a greater volume of return flows, which if returned to the river in the Austin and surrounding area locations, would provide for instream flow needs as well. In addition, the flows from such activities are more constant than the flows required for irrigation, all of which are needed during the spring, summer, and early fall. Return flows from municipal supplies are expected to be provided year round. One exception to this is the periods of time where groundwater is used for irrigation in the lower three counties. Under this situation, the irrigation rights are not supplied by water in the Colorado and flows could be less during the months of water use by rice irrigation.

*Impacts to Agriculture*

As noted above, minimal impacts to agriculture are anticipated as long as alternative supplies or strategies are provided. Agricultural users of groundwater may see increased cost of production of groundwater as a result of additional drawdown related to LSWP[6].

#### *4.6.1.4 LCRA Contract Amendments*

LCRA has wholesale contracts or Board reservations of raw water that are attributed to numerous water user groups. LCRA has indicated that it expects to continue providing water to these entities throughout the 50-year planning period and expects to meet these customers' projected increased demands for water through amendments to existing contracts to increase contract quantities. For purposes of this plan, water supplied to these customers is designated as largely coming from Lakes Buchanan and Travis. However, as discussed in more detail elsewhere in this chapter, LCRA operates its water rights as a system. To the extent that these customers have obtained contracts or amendments to contracts since 1999, their current LCRA contract expressly recognizes that water may be provided under the contract from any source available to LCRA, including supply from Lakes Buchanan and Travis, LCRA's ROR rights, groundwater, or other sources that might come under LCRA's control. To the extent that existing customer contracts do not contain this language, LCRA contracting rules require any customers seeking contract renewals or amendments to existing contracts to convert to a new form of contract that contains this language.

Capital expenditures for water supply purposes were not assumed to be required to implement this alternative. The average cost of providing raw water under this alternative is currently $138 per ac-ft and is estimated to increase on average about 3 percent per year. As a result, it was assumed that the preferred strategy for these contractual users would be to amend the contracts with LCRA, as appropriate, to meet their needs through the 50-year planning period. *Table 4.31* contains a summary of the WUGs for which this alternative applies and the amount of water planned for in the contract amendment (where increased amounts of water are needed).

In addition, commitment reductions on LCRA contracted supplies by LCRA and City of Austin steam-electric facilities in Llano County and Travis County are potentially feasible for the 2020 and 2030 decades, based on the current demand projections included in this plan. These potential reductions of 15,000 ac-ft/yr in 2020 and 17,000 ac-ft/yr in 2030 could be made available to meet additional municipal needs for those decades only. Reduction in LCRA Commitments is due to improved efficiency in Ferguson and COA reuse. The use of this strategy is based on calculated surpluses shown in the 2011 Region K Water Plan only and does not assume that any legal changes to existing commitments would occur as a result of this strategy.

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[6] The LSWP project is the subject of litigation. For a description of the status of the project *see* p. 4-34.

**Table 4.31 LCRA Contract Amendments**

| WUG | County | Contract Amendments (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Steam Electric Power | Bastrop | | | | 1,280 | 2,780 | 2,780 |
| Cottonwood Shores | Burnet | 26 | 198 | 386 | 601 | 840 | 1,130 |
| Granite Shoals | Burnet | | | | | 14 | 95 |
| Kingsland WSC | Burnet | 10 | 11 | 12 | 13 | 14 | 17 |
| Marble Falls | Burnet | | | 56 | 304 | 275 | 248 |
| Meadow Lakes | Burnet | 241 | 382 | 506 | 593 | 593 | 593 |
| Dripping Springs | Hays | 493 | 1,073 | 1,321 | 1,690 | 2,133 | 2,482 |
| Dripping Spring WSC | Hays | | | | 17 | 213 | 366 |
| Kingsland WSC | Llano | 240 | 240 | 240 | 240 | 240 | 240 |
| Barton Creek West WSC* | Travis | 16 | | | | | |
| Bee Cave Village* | Travis | 830 | 925 | 989 | 1,015 | 990 | 958 |
| Briarcliff Village | Travis | | | | 21 | 47 | 74 |
| Jonestown | Travis | 129 | 233 | 329 | 416 | 481 | 554 |
| Lakeway | Travis | 1,285 | 1,675 | 1,934 | 2,041 | 2,041 | 2,041 |
| Pflugerville | Travis | | | | | 3 | 995 |
| River Place on Lake Austin | Travis | 438 | 528 | 392 | 268 | 156 | 55 |
| Travis County WCID #18 | Travis | | | | 4 | 135 | 283 |
| TOTAL | | 3,708 | 5,265 | 6,165 | 8,503 | 10,955 | 12,911 |

*LCRA Contract Amendment strategy for these WUGs includes purchase of water from West Travis County Regional Water System, which is an LCRA water utility system.

*Opinion of Probable Costs*

Capital expenditures for water supply purposes were not assumed to be required to implement this alternative. The average cost of providing raw water under this alternative is currently $138 per ac-ft and is estimated to increase on average about 3 percent per year.

*Issues and Considerations*

Expansion of existing contracts to meet increasing municipal, manufacturing, and steam electric demands will provide for the needs of a growing population, but will reduce the amount of interruptible water available for irrigation and environmental flows. As customers use more and more of their allocation, the available interruptible supply from Lakes Buchanan and Travis will shrink and less water will be available. The system operations approach will maximize the use of the remaining interruptible supplies both for irrigation and environmental needs.

*Environmental Impacts*

Environmental impacts to instream flows and freshwater inflows to Matagorda Bay were analyzed for the expansion of LCRA contracts, including amendments to existing contracts (this section) and new water sale contracts (*Section 4.6.1.5*). Models were run for the 2010 and 2060 scenarios. There were no resulting impacts from the 2010 contract amendments and sales. The 2060 scenario negative impacts to freshwater inflows to Matagorda Bay were less than five percent, while the instream flow impacts were generally positive (increased flows) due to the expected 30,000 ac-ft authorized diversion for steam-electric in Matagorda County that would be met by storage release. Discussion of the methodology behind the impact analysis is in *Section 4.17*. Tabular results of the impact analysis are in *Appendix 4G*.

*Impacts to Agriculture*

The increasing municipal and manufacturing needs for water would have had a significant impact on agriculture as the available supply of interruptible water gradually diminishes over time. However, the strategies, if implemented, do contain sufficient water such that any impact on agriculture should be low.

#### *4.6.1.5 LCRA New Water Sale Contracts*

Region K has identified shortages within LCRA's service area that are not currently covered by a water sale contract from LCRA but for which LCRA may be willing and able to provide raw water. In particular, many of these include rural communities in the upper portion of the LCRWPA and current customers of the COA whose contract has or is expected to expire during the planning period. The City's current policy is that much of the raw water currently being supplied by the City to wholesale customers may need to be provided by LCRA in the future. The COA will plan to continue to treat and transport this water. As new customers, contracts for water supplied to these customers will come from any source available to LCRA, including supply from Lakes Buchanan and Travis, LCRA's ROR rights, groundwater, or other sources that might come under LCRA's control. The cities of Goldthwaite and Brady hold water rights, but they do not provide firm water during the drought-of-record. For this reason, it is suggested that the City of Goldthwaite negotiate a contract with LCRA to purchase water, which would provide a more reliable supply during times of drought. A new planned steam-electric demand in Matagorda County expects to purchase water from LCRA as well. *Table 4.32* summarizes the new LCRA contracts over the planning horizon.

**Table 4.32 New LCRA Contracts**

| WUG | County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|
| Elgin | Bastrop | | | | | | 3,000 |
| Steam Electric Power | Fayette | | | | 20,975 | 20,975 | 26,885 |
| Steam Electric Power | Matagorda | | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Goldthwaite | Mills | 300 | 300 | 300 | 300 | 300 | 300 |
| Creedmoor-Maha WSC | Travis | | 431 | 548 | 632 | 715 | 807 |
| Manor | Travis | | 705 | 780 | 900 | 1,030 | 1,160 |
| Manville WSC | Travis | | | 831 | 2,184 | 2,584 | 3,034 |
| Rollingwood | Travis | | 373 | 373 | 373 | 373 | 373 |
| West Lake Hills | Travis | | 1,833 | 2,049 | 2,178 | 2,320 | 2,471 |
| Windermere Utility Company | Travis | | 2,222 | 2,201 | 2,180 | 2,180 | 2,180 |
| **TOTAL** | | **300** | **35,864** | **37,082** | **59,722** | **60,477** | **70,210** |

*Opinion of Probable Costs*

With the exception of Elgin, capital expenditures for water supply purposes were not assumed to be required to implement this strategy. The average cost of providing raw water under this strategy is currently $138 per ac-ft and is estimated to increase on average about 3 percent per year. Because Elgin is currently on groundwater, they would require infrastructure to treat surface water. The assumed infrastructure is a surface water treatment plant, pump stations, and a transmission pipeline. Capital costs were calculated to be approximately $17.5 million, with total project costs equaling $23.5 million, and an annual per acre-foot cost of $1,142. More details are available in *Appendix 4B*.

*Issues and Considerations*

Much of the water that would be dedicated to new LCRA contracts in Travis County is already being supplied from the Highland Lakes system. The only change will be that LCRA will be supplying them with raw water instead of the City of Austin. Austin will continue to treat and transport the water to these entities. As a result, the environmental impact will likely be negligible since switching to LCRA allows LCRA to provide service from any one of their sources of water which increases flexibility and allows greater utilization of existing sources LCRA's release of water from the Highland Lakes benefit the instream flows in the Colorado River on the way to the customers. See *Section 4.6.1.4* for more discussion on environmental impacts.

*Impacts on Agriculture*

Large new contracts that would need to utilize supplies from Lakes Buchanan and Travis or other LCRA firm water supplies may decrease the amount of water available for agriculture.

#### *4.6.1.6 Advanced Conservation to Meet Demand for Irrigation*

LCRA has two projects that contemplate the implementation of advanced conservation to extend the available water supplies to the four irrigation operations. These projects include those necessary to implement HB 1437 (see Sections 4.8.6 and 4.9.5 herein for a summary of HB 1437) and the LSWP[7] (refer to Section 4.9). Generally, these strategies include a variety of on-farm conservation measures, in-division irrigation improvements, and development of a new rice variety to reduce water consumption. Water conservation potential under the LSWP is estimated to be up to 118,000 ac-ft/yr and under HB 1437, 25,000 ac-ft/yr or more by 2060.

These strategies are more fully described in Sections 4.9 and 4.15 of this chapter.

#### *4.6.1.7 Groundwater Development to Meet Irrigation Shortages During Drought*

The development and use of groundwater in the Lower Colorado River Basin is also being proposed as a means for meeting some of the demand for irrigation water. The use of this groundwater will reduce dependence of these irrigation operations on the Highland Lakes for backup supplies of surface water during dry periods, thus allowing more water to be retained in storage in the Highland Lakes or used to meet future needs.

[7] The project is the subject of litigation. For a description of the status of the project *see* p. 4-34.

Recent information regarding the status of the LSWP groundwater studies and this strategy are more fully described in Sections 4.9.3 and 4.15 of this chapter.

#### *4.6.1.8 Application for Unappropriated Flows and Off-Channel Storage*

LCRA has pending an application to appropriate remaining flows in the lower part of the Colorado River Basin for storage in off-channel reservoirs. Subject to potential or pending litigation and the discussion in Section 4.15 of this chapter, LCRA intends to capture these flows and use them in conjunction with other water supplies available to it as part of a system operation. This water may ultimately be used to meet demands within the Colorado River Basin or to meet requirement of the LSWP. Water available under this permit will depend on the conditions imposed on the permit for purposes of protecting environmental flows. As a very conservative measure, this analysis included an assumption that target instream flow and freshwater inflow requirements would be imposed on this junior water right before diversions would occur.

The environmental impacts of this strategy on the Colorado River and Matagorda Bay were evaluated in Phase I of this round of planning. Due to the stringent environmental requirements that need to be met prior to excess flows being diverted for off-channel storage, limited impacts to instream flows and freshwater inflows to Matagorda Bay are expected during lower-flow conditions. Negative impacts of less than five percent occur during high-flow periods. The results of this analysis can be found in *Appendix 4F*, as well as in the Region K Phase I Task 2 Study Report. Discussion of the methodology behind the impact analysis is in *Section 4.17*. An alternative form of this strategy is discussed in Section 4.15, with results in *Appendix 4G*.

#### *4.6.1.9 LCRA-SAWS Water Project (LSWP)*[8]

The 2002 State Water Plan included a proposal to temporarily transfer up to 150,000 ac-ft/yr of water from the Lower Colorado River Basin to the Region L water planning area. The objective of this proposal was and is to satisfy long-term water shortages in both Region K and Region L. In 2001, the Region K planning group also considered and passed a resolution that set out a nine-point policy to be considered by the regional planning group in evaluating the proposed inter-basin transfer of this water to Region L. That policy is included in this plan under Section 8.2.1.

In 2002, LCRA entered into an agreement with the San Antonio Water System (SAWS) to effectuate this proposal. This project is now referred to as the LCRA-SAWS Water Project (LSWP). Prior to finalizing the agreement with SAWS, specific legislation was enacted that imposes several restrictions and requirements on the LSWP (Texas Special District Code 8503 (30). Specifically, the LCRA Board must find that the contract:

1. Protects and benefits the Lower Colorado River watershed and the authority's water service area, including municipal, industrial, agricultural, recreational, and environmental interests
2. Is consistent with regional water plans filed with the Texas Water Development Board on or before January 5, 2001
3. Ensures that the beneficial inflows remaining after any water diversions will be adequate to maintain the ecological health and productivity of the Matagorda Bay system

[8] The project is the subject of litigation. For a description of the status of the project *see* p. 4-34.

4. Provides for in-stream flows no less protective than those included in the authority's WMP for the Lower Colorado River Basin, as approved by the commission
5. Ensures that, before any water is delivered under the contract, the municipality has prepared a drought contingency plan and has developed and implemented a water conservation plan that will result in the highest practicable levels of water conservation and efficiency achievable within the jurisdiction of the municipality
6. Provides for a broad public and scientific review process designed to ensure that all information that can be practicably developed is considered in establishing beneficial inflow and instream flow provisions
7. Benefits stored water levels in the authority's existing reservoirs

These and additional requirements contained in the legislation and final agreement between LCRA and SAWS mirror many of those contained in the nine-point policy of the 2001 Plan. For example, the transfer is temporary; it benefits both regions by substantially reducing projected water shortages in Region K and in Region L; the system operation necessary for the project maximizes use of inflows available below Austin; and the goal is to design a project that has minimal detrimental environmental, social, economic and cultural impacts and provides benefits to lake recreation over what would occur without the LSWP.

*Opinion of Probable Costs*

The total estimated capital cost for the LSWP is $2,159,600,000. Per the Definitive Agreement between LCRA and SAWS, SAWS is responsible for LSWP capital costs. The costs are paid primarily through water use fees and surcharges over the life of the project. Region K is not responsible for the capital costs associated with the LSWP.

*Issues and Considerations*

The project is being developed in two phases, study and implementation. The study phase is intended to determine whether a project can be designed to meet these legislative requirements, and the policies adopted by the Region K Planning Group for inter-basin transfers. At the conclusion of the study period, a determination will be made whether to proceed with the project. This project uses an innovative approach to meeting the demands of two basins by enhancing LCRA's ability to optimize the use of its water rights, in combination with aggressive conservation and development of limited groundwater for in-basin uses. Many of the strategies identified in this plan are also component projects of the LSWP. As such, there is a significant environmental component that must be satisfied prior to any projects from LSWP going forward.

The project is currently in litigation. Feasibility studies as of early 2009 indicated that water cannot be made available for SAWS while meeting all requirements of the LCRA Act and of the Definitive Agreement between LCRA and SAWS (including quantity and duration terms). At the request of SAWS made on January 14, 2009, LCRA has taken steps to reduce ongoing study expenses during 2009. While work was done to finalize studies which were close to completion, all other work, including all permitting work, has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications. On August 24, 2009, SAWS filed a lawsuit concerning the project in Travis County District Court.

As to status of particular studies:

Environmental Studies

- *Colorado River and Off-channel Storage Facility Water Quality:* In early 2009, the study team updated the Diel Dissolved Oxygen (DO) model memo; performed analysis of the lower boundary condition for future scenarios; and revised the structural equation modeling (SEM) memo. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Colorado River Flow Relationships to Aquatic Habitat and State Threatened Species: Blue Sucker:* During early 2009, this study finalized a memorandum on temperature tolerances of freshwater fish in the lower Colorado River as part of the climate change work. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Matagorda Bay Health Evaluation:* In early 2009, the team finalized the long-term monitoring recommendations; bio-stats report; bay health impact and alternatives assessment approach memorandum; and sea level change document. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.

Groundwater Studies

- *Groundwater for Agriculture:* During early 2009, the team finalized the groundwater model report. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.

Conservation Studies

- *Agricultural Conservation in Key Irrigation Divisions and Rice Research:* During early 2009, the agricultural conservation team members completed final drafts on the potential effect of irrigation return flows on flows in the San Bernard River and Sandy Creek report and climate change analysis report. The rice varietal research continued throughout 2009. An application to the Texas Seed Certification Program and Plant Board for approval of a variety under the Texas Seed Certification Program and for the Plant Variety / Germplasm Disclosure Form and Breeder / Contributor Data Sheet for the Office of Technology Commercialization of the Texas A&M System was submitted. All other work, besides the rice varietal research, has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.

Engineering Studies

- *Surface Water Availability Assessment:* In early 2009, the surface water availability team incorporated project requirements into the water availability model under 2050 and 2060 conditions to determine the firm water delivery available to SAWS. These results showed that water cannot be made available for SAWS while meeting all requirements of the LCRA Act and the Definitive Agreement between LCRA and SAWS (including quantity and duration terms).
- *Facility Siting, Design, and Affected Environment:* During early 2009, the facility siting team finalized the dam breach analysis impacts memo, uncertainty analysis memo, and geotechnical investigations memo. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.

The following additional activities are ongoing.

- *Permitting Processes Required for Implementation:* During 2009, all permitting work was postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Communications and Public and Stakeholder Involvement:* In 2009, the project team maintained a public Web site and posted project work products as they were completed. In February 2009, three project update meetings were held in El Campo and Burnet. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Science Review Panel:* During 2009, the science review panel reviewed work products submitted in late 2008 and early 2009. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Social and Economic Studies:* During early 2009, the socioeconomic team finalized the Farm Income Maximization Model (FIMM) report. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Waterfowl and Wildlife:* During early 2009, the team members updated the Waterfowl Energy Availability Model (WEAM) with model validation data in preparation for further alternatives analysis. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.
- *Uncertainty and Climate Change:* During early 2009, the uncertainty team members submitted the Phase I Comprehensive Uncertainty Report. All other work has been postponed at SAWS' request pending evaluation of the latest feasibility studies and their implications.

*Impacts to Agriculture*

The proposed project would have a significant beneficial impact on agriculture to the extent that funds will be provided for conservation improvements that could not be afforded by most farmers. Implementation and long term success of conservation measures will require some adaptation by farmers, but many of the more successful farmers have already implemented these measures to try to stay competitive.

For more information about how this proposed project relates to irrigation water management strategies refer to *Section 4.9*.

*Environmental Impacts*

As part of the regional water planning process, this strategy was evaluated by the LCRWPG for its environmental impacts in the same way other strategies in the plan were. The results of the planning group's impact analysis showed that impacts to instream flows and freshwater inflows were both positive and negative, depending on the season (month(s) of year) and the location point on the river of the analysis. This is a complicated strategy with multiple components including streamflow diversions and agricultural conservation that would reduce irrigation demands during certain parts of the year. The freshwater inflows to Matagorda Bay are impacted negatively by less than five percent, and the number of times the threshold level of flow (15,000 ac-ft/month) is met increases slightly. The impacts on instream flows vary widely, although the subsistence-level flows are less impacted by the strategy, with negative impacts of 10 percent or less. Discussion of the methodology behind the impact analysis is in *Section 4.17*. Tabular results of the impact analysis are in Appendix 4G. When this strategy is included as part of the comprehensive strategy model, the comprehensive impact is much less negative, due to the City of Austin return flows (see Chapter 7).

#### *4.6.1.10 Enhanced Municipal and Industrial Conservation*

*Sections 4.6.1.10, 4.6.1.11,* and *4.6.1.12* are water management strategies that LCRA is considering that were developed as part of their Water Supply Resource Plan. This water would either decrease demand or provide additional firm yield to LCRA as a wholesale water provider. The descriptions of the strategies are from the *Water Supply Resource Plan: Water Supply Option Analysis*, prepared by CH2M Hill for LCRA, in July 2009.

This water management strategy assumes water savings beyond the Conservation and Additional Conservation strategies discussed in *Section 4.8.1*. This strategy includes industrial conservation as well as municipal, the minimum values of 120 gpcd was used (rather than 140 gpcd which is used in *Section 4.8.1*), and the percent reduction of projected per capita use is approximately one-half percent per year for forty years,

As a wholesale water provider, any conservation program implemented would rely on, and require coordination with, water user groups within the LCRA's service area, as well as other stakeholders. It is anticipated that the LCRA's role in an enhanced conservation program would be primarily to provide education, enforce regulations, or fund incentives for its firm water customers (e.g. wholesale customers, utilities, and industrial and power customers).

LCRA recently completed its 2009 Water Conservation Plan that addresses water conservation practices for its firm water customers (municipal, industrial, power generation and recreational). These efforts include five-year and ten-year implementation plans that will guide effective water conservation throughout communities in LCRA's rapidly growing service area. More details on the 2009 Water Conservation Plan can be found online at:
http://www.lcra.org/library/media/public/docs/savewater/2009_LCRA_Water_Conservation.pdf.

Potential conservation measures include education, regulations and rebates and other incentives for water efficiency. These measures focus on the municipal, commercial and industrial sectors. Because landscape irrigation represents the largest water use in the residential and commercial sectors, several of the measures are geared toward irrigation water use reduction, e.g., rain and freeze sensors, irrigation standards, and no-waste ordinances.

Leak detection, typically associated with a municipal water system audit, is a useful tool in eliminating water loss and a specific effort LCRA might consider as part of an enhanced conservation program. LCRA could encourage customers to use the leak detection and audit assistance programs offered by the Texas Water Development Board. In addition, LCRA could develop a conservation loan, grant or rebate program to encourage leak detection and repair within the planning area. In this program, customers would receive loans, grants, rebates or other incentives to implement leak detection and repair programs.

Alternately, LCRA could assist their customers with system leak detection programs themselves by providing staff to conduct the audits and/or aid in leak repair.

*Table 4.33* below shows the expected additional water savings from the enhanced municipal and industrial conservation strategy.

**Table 4.33 Additional Water Savings from Enhanced Conservation (ac-ft/yr)**

| Decade | Water Savings (ac-ft/yr) |
|---|---|
| 2010 | 0 |
| 2020 | 0 |
| 2030 | 2,000 |
| 2040 | 10,000 |
| 2050 | 20,000 |
| 2060 | 20,000 |

The cost for this strategy was developed as part of the *Water Supply Resource Plan: Water Supply Option Analysis* for LCRA. The cost was determined to be a maximum of $400 per ac-ft. The cost per volume of water is expected to vary over implementation, and LCRA anticipates a range between $300 and $400 per ac-ft. The most cost effective conservation measures would be expected to be implemented first, and thus the cost per volume saved would expect to increase over time.

*Environmental Impact*

Conservation does not require additional infrastructure which has the potential to require environmental mitigation or other measures to address impacts.

Conservation has other potential impacts for WUGs that are served by groundwater. Communities that are served by surface water will divert less water from streams, meaning more water will remain in channels for downstream uses. However, groundwater communities contribute to streamflow by discharging treated groundwater into streams (typically 60 percent of water supplied is discharged following treatment.) Conservation measures implemented by these WUGs may lead to an overall decrease in streamflow, which is derived from groundwater sources. However, streamflow would not be expected to be decreased if the conservation is in the irrigation usage sector.

### *4.6.1.11 Aquifer Storage and Recovery (ASR)*

This strategy utilizes surface water that is diverted from the Colorado River and treated at a surface water treatment facility. The treated water would either be delivered to meet existing demands, or diverted to aquifer storage for later recovery and use. A firm yield of 10,000 ac-ft/yr was determined for this strategy, beginning in 2040, which assumes the water is diverted during periods of high flow. For the analysis for the Region K Plan, it is assumed that the diversion point would be located in Bastrop County with the ASR wells located in the Carrizo-Wilcox, but implementation of this strategy could occur at a more downstream diversion point as well.

*Costs*

The assumptions for determining costs of the strategy include: 2 miles of transmission pipeline to convey the raw water from the diversion point to a 20 mgd traditional lime softening water treatment plant, a high service pump station to feed the treated water through a 20-mile 36-inch pipeline to the ASR wellfield for storage, twelve (12) 16-inch diameter wells spaced one-mile apart and completed to a depth of 650 feet that store at a rate of 850 gpm and recover at a rate of 1,000 gpm,

An annual unit cost of $3,802.48/ac-ft was determined. Total project costs are $270,627,490, with $168,711,000 of that being capital costs.

*Environmental Impact*

The diversion of surface water could reduce instream flows downstream, which in turn, could negatively impact water quality during certain months of the year when instream flows are already lower. This could potentially impact both agricultural and environmental uses. The assumed junior nature of this water right creates a strategy that has limited impacts to instream flows and freshwater inflows to Matagorda Bay. Discussion of the methodology behind the impact analysis is in *Section 4.17*. Tabular results of the impact analysis are in *Appendix 4G*.

### *4.6.1.12 Reuse by Highland Lakes Communities*

Wastewater reuse, beneficial use of wastewater treatment plant effluent, was studied as a potential source of water supply for this analysis. Effluent is domestic or municipal wastewater that has been treated to a quality suitable for a particular beneficial use. Direct beneficial uses of effluent include landscape, agricultural or commercial irrigation, industrial cooling and process water, and, potentially after additional treatment, drinking water. Only non-potable uses were considered in this water supply option.

The volume of water available for reuse was determined by taking the water demands of the communities in three counties surrounding the Highland Lakes (Burnet, County, Llano County, and Travis County), assuming a conservative 40 percent of the demand would be returned as wastewater. Of that volume available, LCRA estimated 25 percent would be used for direct reuse purposes by 2020 and 50 percent would be used for direct reuse purposes by 2030 and through the planning period. In this option, each individual wastewater utility would treat its water to a level appropriate for irrigation or process water use, as defined by Title 30 of the Texas Administrative Code, Chapter 210, Subchapters A, B, C, and D.

At this time, LCRA is currently in discussions with communities in the Highland Lakes area to determine their specific needs and level of interest in reuse. Many communities are interested due to the TCEQ policy that does not allow wastewater effluent discharge to the Highland Lakes. At this point in the study, the reuse strategy is being recommended as a supply strategy for LCRA rather than an individual strategy for various WUGs. In future planning cycles, the strategy will likely be recommended for specific WUGs rather than for LCRA because the WUGs themselves will be the ones implementing the strategy. For now, it can be assumed that any reuse by communities in the Highland Lakes will reduce the demand required from LCRA. *Table 4.34* below identifies the amount of reuse the strategy can supply.

**Table 4.34 Reuse Strategy as a Supply for LCRA (ac-ft/yr)**

| Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Reuse by Highland Lakes Communities | 0 | 500 | 2,000 | 5,000 | 5,000 | 5,000 |

*Costs*

Costs will vary depending on the size of the community, the amount of effluent that can be reused, and the length of pipeline needed to transport the effluent to its destination. It is assumed that no additional wastewater treatment would be required of a utility, and no additional storage or land for disposal would be required (i.e., the relevant utility would address storage facilities and land for disposal purposes). The project team also assumed that the reclaimed water user would bear the cost of the distribution system once the water was delivered. A representative pipeline would be made of High Density Polyethylene (HDPE), would require one pump station facility, and would span approximately 10 miles. For perspective, generally, less than 0.1 mgd would require a 2-inch diameter pipe; 5 mgd would require an 18-inch diameter pipe. The assumptions used in developing the costs are appropriate for the type of topography and soil encountered in the Highland Lakes area.

An example cost of a pipeline used to transport 1 mgd of effluent 10 miles to a customer was determined in the LCRA Water Supply Resource Plan. Note that some utilities already have this type of infrastructure in place, particularly those that are located in the Lake Travis watershed. The costs are shown in *Table 4.35* below. More detailed cost information can be found in the *Water Supply Resource Plan: Water Supply Option Analysis*, prepared by CH2M Hill for LCRA, in July 2009.

**Table 4.35 Example Cost for Reuse Strategy (Transport 1 MGD of Effluent 10 Miles)**

| Strategy | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|
| Reuse | $3,566,000 | $5,751,000 | $610,500 | $550.00 |

*Environmental Impact*

Limited environmental impacts are expected during construction of the reuse pipeline system. No impacts should occur to instream flows or bay and estuary inflows since the majority of the communities that would incorporate this strategy are not currently allowed to discharge their effluent to the Highland Lakes.

### *4.6.1.13 Description of the Impact of the Management Strategies on Navigation*

The overall impact on navigation in Region K is negligible in the area of the Colorado River and Matagorda Bay that is tidally influenced. This is the area where the most shipping occurs and navigation will be least affected in this zone. Once beyond the tidally influenced areas, the overall impact of the management strategies will be to reduce the amount of currently available interruptible water supplies as the current WUGs increase in demand over time through growth in population. However, the current LCRA Water Management Plan calls for a minimum release of approximately 16,000 acre feet annually through 2010, and then increasing to approximately 33,000 acre feet annually after 2010. However, these amounts may change as the results of the LSWP studies and mitigation strategies are better known. In addition, inflows originating downstream of the Highland Lakes would add to these release amounts. The 16,000 ac-ft/yr release translates to a rate of approximately 22 cubic feet per second. Navigation on the Colorado upstream of the tidally influenced areas is primarily for pleasure craft, and the impact of the mandated releases under the LCRA Management Plan plus other downstream flows may provide sufficient water for navigation purposes. Based in terms of a high, medium, or low impact, the estimated impact to navigation will be low.

### 4.6.2 COA Water Management Strategies

The COA provides water for municipal, manufacturing, and steam electric water uses. COA's existing service area covers portions of Travis, Williamson, and Hays Counties.

The COA water management strategies include water conservation, direct reuse, and purchasing water from LCRA. The total amounts for each strategy are summarized below in *Table 4.36*.

**Table 4.36 COA Water Management Strategies (ac-ft/yr)**

| COA Strategies | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Conservation | 11,030 | 18,795 | 24,036 | 25,385 | 30,401 | 36,370 |
| Direct Reuse (Municipal and Manufacturing) | 5,143 | 13,620 | 22,077 | 30,268 | 36,218 | 40,468 |
| Direct Reuse (Steam Electric) Travis | 2,315 | 3,315 | 7,315 | 8,315 | 12,315 | 13,315 |
| Purchase Water from LCRA (Steam Electric) | 0 | 0 | 0 | 20,975 | 20,975 | 26,895 |
| **TOTAL** | 18,487 | 35,730 | 53,428 | 84,943 | 99,909 | 117,047 |

#### *4.6.2.1 Water Conservation*

The COA began an aggressive water conservation campaign in the mid 1980s in response to rapid growth and a series of particularly dry years. COA has achieved significant reductions in both per capita consumption and peak day to average day demand ratio. For the per capita use calculations, the COA used year 1998 as their base year instead of year 2000, since the COA had mandatory water conservation measures in place during year 2000.

The adopted LCRWPG projections for municipal, manufacturing, and wholesale water commitments for the COA and its wholesale customers are projected to increase from approximately 198,290 ac-ft/yr in the year 2010 to approximately 384,103 ac-ft/yr in 2060. Projections for water demands in succeeding decades assume the continuation and expansion of the City's conservation programs. These programs represent a roughly 9 percent savings in 2060 over the demands with no per capita reduction. With conservation and reuse an overall per capita reduction of roughly 11 percent is projected.

In 1990, the City's conservation program evolved from primarily reacting to high summertime demands to a comprehensive program with the goals of reducing both per capita consumption and peak day demand. To achieve these broader goals, the City has implemented and anticipates continuing water conservation programs in a number of areas including:

- Public education and outreach including school programs
- Rebate and incentive programs
- Local ordinances that increase water efficiency by customers
- Support of legislation that increases water efficiency in plumbing products and appliances at both the State and Federal level,

- Increased water efficiency in utility operations
- Conservation-oriented rate structures

In 2006, Austin City Council set a water conservation goal of reducing peak day water use by 1% per year for 10-years. The Council created a Water Conservation Task Force with a goal drafting a policy document for Council consideration consisting of strategies and implementation plans for new water conservation initiatives to meet this goal. In 2007, the Austin City Council approved the final policy recommendations aimed at meeting this goal, including enhanced water use management (2-day per week water limits). Through its various water conservation programs, the COA has made significant advances toward reducing the per capita consumption of water in its service area. The COA states that it is committed to continuing to seek ways to reduce its per capita demands as a Best Management Practice for its utility and to reduce overall capital costs for new construction to meet increasing demands. Through on-going efforts including continued conservation planning and comprehensive Water Resources Planning Study effort, COA is in the process of analyzing its current water conservation programs, goals, and per capita demands. For example, the Austin City Council recently adopted a resolution endorsing a goal of reducing total per capita per day water production to an average of 140 gpcd by 2020 and to increase Austin's customers' understanding of their water use and educate them on ways to use water more efficiently. The city council directed city staff to develop a 10-year water conservation action plan to achieve this goal. Plan development is currently underway. Austin Water Utility is expected to present the plan for adoption to the Austin city council in December of 2010. Future plan updates will reflect changes as additional COA water conservation program information becomes available. The range of conservation program costs is from $60 to $830 per acre foot, depending on the program.

*Environmental and Other Impacts*

Water conservation holds several advantages over alternative strategies in the fact that implementation of conservation practices does not require any additional water system infrastructure and does not require the movement of water between locations. In the event that, over time, water conservation causes changes to wastewater concentrations, treatment processes may need to be adjusted to maintain permitted discharge parameters. In addition, water conservation generally does not result in adverse impacts to environmental flows or other environmental considerations.

*Impacts to Agriculture*

No adverse impacts to agriculture are anticipated as a result of this strategy.

#### *4.6.2.2 Water Reclamation Initiative (Direct Reuse)*

This COA reclaimed water program includes the continued development of water distribution systems to provide reclaimed water to meet non-potable water demands within the City's service area. The City has established its Central Reclaimed Water System from the Walnut Creek Wastewater Treatment Plant (WWTP) and its South system from the South Austin Regional WWTP. These systems are expected to have a planning horizon capacity of approximately 40,000 ac-ft/yr. Austin has also evaluated the feasibility of developing reclaimed water facilities in other areas of the City. The City projects that it will need to develop the use of reclaimed water to the maximum extent possible, up to, if necessary, 100 percent reuse of its effluent to meet future needs. As the level of authorized reclaimed water use in the COA increases, the amount of flow it returns to the Colorado River may decrease accordingly.

Development of reclaimed water facilities necessary to provide for the projected 2060 direct municipal reuse (non-potable) demands of approximately 40,400 ac-ft/yr is anticipated to require a capital expenditure of $227 million. The unit cost of reclaimed water is expected to be $851 per ac-ft.

In addition to the water conservation measures the COA has implemented to reduce water demands, the COA is pursuing the development of reclaimed water as an additional supply of water to meet non-potable demands in the area. The COA has indicated that it will develop and use reclaimed water as the primary strategy to meet the projected needs in 2060, and likely beyond. To meet the total projected water demands, the Water Reclamation Initiative would need to supply up to 40,400 ac-ft/yr for direct municipal non-potable purposes by the year 2060 plus approximately 13,300 ac-ft/yr of COA direct non-potable use for steam electric needs in Travis County. The approximate total amount of this direct reuse supply in Travis County is 53,700 ac-ft/yr.

The City is currently using reclaimed water from its existing reclaimed system to irrigate several golf courses and meet other non-potable needs. The City estimates this use to be approximately 6,100 ac-ft/yr. In order to expand the availability and use of reclaimed water, the COA has completed a series of planning activities, including the publication of the 1998 Water Reclamation Initiative (WRI) Planning Document, and completion of the north and south system master plans. In addition, COA completed a Title XVI federal cost-share program feasibility study in conjunction with the Federal Bureau of Reclamation (FBR).

The City anticipates that the use of reclaimed water will increase steadily from the current level of 6,100 ac-ft/yr. The COA will continue to pursue implementation of its WRI and anticipates that additional capacity will be available in the future as the needs increase over the planning horizon. *Table 4.37* shows the projected capacity increases for the three main categories of reuse for each decade of the planning period. Note: WRI system master plans have been developed to a system capacity level of approximately 30,000 ac-ft/yr. Additional non-potable water demand and system infrastructure will be required to increase the direct reuse system capacity to achieve the increased volumes included in this plan.

**Table 4.37 Anticipated Reclaimed Water Capacity (Direct Reuse)**

| Decade | Direct Reuse - Municipal and Manufacturing (ac-ft/yr) | Direct Reuse – Steam-Electric Travis County (ac-ft/yr) |
|---|---|---|
| 2010 | 5,143 | 2,315 |
| 2020 | 13,620 | 3,315 |
| 2030 | 22,077 | 7,315 |
| 2040 | 30,268 | 8,315 |
| 2050 | 36,218 | 12,315 |
| 2060 | 40,468 | 13,315 |

Note: Anticipated capacity information provided by COA.

Through its current comprehensive Water Resources Planning Study, COA is in the process of evaluating its water reuse program and options. Future plan updates will reflect changes as additional Austin water reclamation program information becomes available.

*Projected Reduction of Return Flows*

The COA recognizes that the water demand projections contained in the Lower Colorado Regional Water Plan are only projections. Actual water demands may increase faster or slower than projected. The City will monitor the growth of its water demands and adjust its reclaimed water program, as well as its other water conservation programs, accordingly. As a result, the City has indicated that it may increase the use of reclaimed water at a faster rate than projected in this plan. The City believes that the increased use of reclaimed water will provide, in addition to the benefit of conserving sources of raw water, a monetary benefit to the COA through decreased raw water costs and delayed capital expenditures. As return flows discharged by Austin diminish in the future due to increasing reclamation of water, other sources may need to be dedicated or developed to meet needs that may currently be met by return flows discharged by Austin.

Any decrease in municipal return flows will likely be gradual. However, the City projects that it will increase its use of reclaimed water to the maximum extent feasible to meet demands above 325,000 ac-ft/yr, whether those demands occur before or after 2060.

*Opinion of Probable Costs*

In addition to water conservation, the use of reclaimed water has been identified as a significant source of water to meet the COA's projected demand deficits in 2060. The City has completed planning studies for a Reclaimed Water System to serve potential customers in the City. The system will provide a portion of the water supply required to meet the COA's identified needs. Planning efforts for additional water reclamation options are in progress, including a comprehensive Water Resources Planning Study.

*Table 4.38* presents the probable cost for the central and south systems. As previously indicated, the direct reuse non-potable system for municipal purposes will need to have a capacity of approximately 40,500 ac-ft/yr. Direct reuse for steam-electric purposes in Travis County is projected to be approximately 13,300 ac-ft/yr. In September 2008 numbers, the probable cost for Austin to meet all of its planning horizon identified direct reuse needs through the use of reclaimed water (53,700 ac-ft/yr) is approximately $429,195,000. This would result in a total annual cost (including operations and maintenance [O&M]) of approximately $46 million per yr. The opinion of probable unit cost of reclaimed water is $851 per ac-ft, or approximately $2.61 per 1,000 gallons.

**Table 4.38 COA Reclaimed Water (Direct Reuse for Municipal, Manufacturing, and Steam-Electric) Opinion of Probable Unit Costs**

| Phase | Cost Opinion |
|---|---|
| **Capital Costs** | |
| Plant Pump Station, Storage, and Misc. Improvements [1] | $38,141,473 |
| Transmission System [1] | $217,175,767 |
| System Pumping and Storage [1] | $46,933,270 |
| **Total Capital Costs** | **$302,250,510** |
| | |
| Engineering, Contingencies and Legal Services (35%) | $105,787,679 |
| Land Acquisition and Survey (5%) | $15,112,526 |
| Environmental and Architectural Studies, Mitigation, and Permitting (2%) | $6,045,010 |
| **Total Project Costs** | **$429,195,724** |
| | |
| **Annual Costs** | |
| Debt Service (6 percent for 20 years) | $37,419,239 |
| Operation and Maintenance [2] | $8,347,255 |
| **Total Annual Costs** | **$45,766,494** |
| | |
| **Available Project Yield (ac-ft/yr)** | **53,783** |
| **Unit Cost of Water ($/ac-ft)** | **$851** |
| **Unit Cost of Water ($/1000 gallons)** | **$ 2.61** |

[1] Cost taken from draft U.S. FBR Feasibility Study of COA's Reclaimed Water System (July 2005). Values were increased proportionally to the amount of yield as compared to the amount in the study and converted to September 2008 using the ENR Construction Cost Index.

[2] O&M Cost taken from draft U.S. FBR Feasibility Study of COA's Reclaimed Water System (July 2005). O&M costs were adjusted to September 2008 dollars using the U.S. Department of Labor's Consumer Price Index

Capital costs for this strategy were updated to September 2008 dollars using the *Engineering News-Record* (ENR) Construction Cost Index (CCI). Land acquisition, environmental study, and O&M costs were adjusted to September 2008 dollars using the U.S. Department of Labor's Consumer Price Index.

*Environmental and Other Impacts*

The water quality impacts from direct reuse of reclaimed water is regulated by the TCEQ through 30 TAC Chapter 210. Reclaimed water projects authorized under these regulations are presumed to be protective of human health and the environment. The potential impacts generated through the construction of the proposed pipelines and pump stations will need to be addressed in the preliminary engineering studies to be conducted for these projects.

The use of reclaimed water presents an alternative for providing water for non-potable uses without the development of new water supplies for the City of Austin for the planning period. The costs and environmental impacts of expanding the City's current reuse system will have to be determined as more specific information, such as the locations of customers to be served, is identified. The extent of pipeline and other transmission facilities will have to be determined before specific environmental impacts can be estimated. However, the majority of the facilities needed will most likely be placed in existing easements and, therefore, minimize the impact upon natural resources.

*Table 4.39* shows the expected return flows from the COA, less the expected amount of reuse. Over the planning period, return flow amounts are projected to increase. The environmental impact analysis for this strategy compared the impact of return flows less the amount of reuse to the impact of no return flows for 2010 and 2060 scenarios. As would be expected, the impacts to instream flows and freshwater inflows to Matagorda Bay showed mainly flow increases. Discussion of the general methodology of the impact analysis is in *Section 4.17*. Tabular results of the impact analysis are presented in *Appendix 4G*.

*Impacts to Agriculture*

Impact to agriculture is low based on the projected return flow amounts over the planning period.

**Table 4.39 Projected COA Effluent Minus Reuse by Decade***

| COA Return Flows | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected COA Effluent minus reuse | 98,638 | 99,792 | 105,750 | 116,775 | 124,632 | 132,660 |

*Based on data provided by COA.

As allowed by state law and as contemplated by the City of Austin and LCRA 2007 Settlement Agreement, the City intends to use reclaimed water to the maximum extent feasible to meet demands above 325,000 ac-ft/yr, whether those demands occur before or after 2060. As a result, although current projections do not indicate that the City will need to reuse all of its effluent during this planning cycle, this strategy could result in the City potentially reusing all of its effluent to meet growing demands and, ultimately, the City could have zero return flow to the Colorado River from its wastewater treatment plants (WWTP).

## 4.7 REGIONAL WATER MANAGEMENT STRATEGIES

There are several water management strategies that apply to multiple WUG categories. These strategies are discussed in the regional water management section of the report. For strategies specific to a category of water use, (Municipal, Irrigation, Livestock, Manufacturing, Mining, and Steam Electric Power) refer to later sections of the report.

For municipal WUGs with shortages water conservation was considered before these regional strategies, please refer to Section 4.8.1.

### 4.7.1 Expansion of Current Groundwater Supplies

This group of strategies includes WUGs with existing groundwater sources that will be seeking to expand the amount of groundwater they produce from that source or sources to meet their increasing needs.

#### *4.7.1.1 Carrizo-Wilcox Aquifer*

This alternative would involve pumping additional groundwater from the Carrizo-Wilcox aquifer, either using the WUG's existing wells or drilling additional wells. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water.

*Table 4.40* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage. It should be noted that Elgin in Bastrop County will pump 1 ac-ft/yr in 2050 and 3 ac-ft/yr in 2060 to supply the portion of Elgin located in Travis County. The county needs for Elgin are separated in the table below but will essentially both be pumped from the Carrizo-Wilcox aquifer.

**Table 4.40 Carrizo-Wilcox Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Aqua WSC | Bastrop | Colorado | | | 602 | 3,709 | 6,109 | 7,850 |
| Bastrop County WCID #2 | Bastrop | Colorado | | | | | | 144 |
| County-Other | Bastrop | Colorado | | 663 | 1,879 | 3,037 | 2,922 | 3,700 |
| Elgin | Bastrop | Colorado | | 525 | 1,136 | 2,033 | 2,734 | 400 |
| Polonia WSC | Bastrop | Colorado | | 2 | 7 | 16 | 23 | 30 |
| Smithville | Bastrop | Colorado | 49 | 311 | 526 | 946 | 1,115 | 733 |
| Manufacturing | Bastrop | Colorado | | 7 | 17 | 25 | 32 | 44 |
| Mining | Bastrop | Colorado | 4,293 | 4,297 | 4,298 | | | |
| Elgin* | Travis | Colorado | | | | | 1 | 3 |
| **County Total for Colorado River Basin** | | | **4,342** | **5,805** | **8,465** | **9,766** | **12,936** | **12,904** |
| Manufacturing | Bastrop | Guadalupe | 8 | 10 | 11 | 13 | 14 | 16 |
| **County Total for Guadalupe River Basin** | | | **8** | **10** | **11** | **13** | **14** | **16** |

*This portion of Elgin in Travis County will be supplied from wells in Bastrop County

This strategy was applied to the following WUGs in Bastrop County: Aqua WSC, Bastrop County WCID #2, County-Other, Elgin, Polonia WSC, Smithville, Manufacturing, and Mining. Elgin falls into both Bastrop and Travis Counties. It was assumed that the portion of the WUG in Travis County would also receive water in 2050 and 2060 from the Carrizo-Wilcox aquifer.

*Opinion of Probable Costs*

*Table 4.41* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be two potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation) and installation of a one-half-mile long transmission pipe(s) to tie the additional well(s) to the distribution system. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Carrizo-Wilcox aquifer, the values used were 1.5 mgd, 500 ft, 16 in, and 200 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 feet per second (ft/s) velocity. The smallest assumed diameter was 6 inches.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

**Table 4.41 Carrizo-Wilcox Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Aqua WSC | Bastrop | Colorado | $6,248,640 | $9,069,004 | $4,254,054 | $541.92 |
| Bastrop County WCID #2 | Bastrop | Colorado | | | $5,386 | $37.41 |
| County-Other | Bastrop | Colorado | $4,280,640 | $6,189,196 | $1,410,336 | $381.17 |
| Elgin | Bastrop | Colorado | $2,082,880 | $3,023,001 | $700,216 | $256.11 |
| Polonia WSC | Bastrop | Colorado | | | $1,122 | $37.41 |
| Smithville | Bastrop | Colorado | $1,041,440 | $1,511,501 | $235,904 | $211.57 |
| Manufacturing | Bastrop | Colorado | | | $1,646 | $37.41 |
| Mining | Bastrop | Colorado | $3,219,360 | $4,670,504 | $1,393,011 | $324.11 |
| Elgin | Travis | Colorado | | | $112 | $37.41 |
| Manufacturing | Bastrop | Guadalupe | | | $598 | $37.41 |

For the purposes of developing costs for this strategy, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy, was assumed to acquire the additional groundwater through additional pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures.

The above rule was utilized for all WUGs other than Livestock WUGs, whose capital costs were generated assuming one well per ac-ft/yr needed, with no transmission line costs. Each well for Livestock WUGs was estimated to cost $9,860, fully installed and operational. In addition, no additional project costs were added in for Livestock WUGs and a 5-year term of debt was utilized when annualizing the capital costs. A listing of assumptions and/or methodology is provided in *Appendix 4B*.

*Environmental Impacts*

The environmental impacts of expanded groundwater use will vary depending upon site characteristics. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent, and the disturbance from pipeline construction is temporary. Availability numbers were developed by the Lost Pines Groundwater Conservation District for this aquifer in Bastrop County, and they attempt to limit the groundwater use to the amount that can be replenished on an annual basis. If this is the case, then the impact on the environment should be low.

*Impacts to Agriculture*

There are currently no irrigation WUGs with supplies of irrigation water or livestock water from the Carrizo-Wilcox Aquifer in Region K. This is not a source of choice, probably because of the depth of the aquifer. In addition, the terrain in Bastrop County is often not conducive to irrigated agriculture. Therefore, the impact on agriculture is low.

#### *4.7.1.2 Ellenburger-San Saba Aquifer*

This alternative would involve pumping additional groundwater from the Ellenburger-San Saba aquifer, either using the WUG's existing wells or drilling additional wells. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water.

*Table 4.42* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.42 Ellenburger-San Saba Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Bertram | Burnet | Colorado (to Brazos) | | | | | | 24 |
| County-Other | Burnet | Colorado | | | | 418 | 804 | 1,179 |
| Mining | Burnet | Colorado | 681 | 756 | 788 | 811 | 829 | 873 |
| **County Total for Colorado River Basin** | | | **681** | **756** | **788** | **1,229** | **1,633** | **2,076** |

This strategy was applied to the following WUGs in Burnet County: Bertram, County-Other, and Mining.

*Opinion of Probable Costs*

*Table 4.43* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For the purposes of developing costs for this strategy within the Ellenburger-San Saba aquifer, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy was assumed to acquire the additional groundwater through added pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures. All WUGs utilizing this strategy in this aquifer fit into this category. Note that annual energy costs were based on the assumed pumping distance, which was taken to be 200 ft plus 5 ft for every 1,000 ft of transmission pipe, as well as $0.09 per kWh. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

**Table 4.43 Ellenburger-San Saba Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Bertram | Burnet | Colorado (to Brazos) | | | $898 | $37.41 |
| County-Other | Burnet | Colorado | $8,367,840 | $12,249,979 | $2,308,805 | $1,958.27 |
| Mining | Burnet | Colorado | $6,114,960 | $8,951,908 | $1,483,219 | $1,698.99 |

*Environmental Impact*

The environmental impacts of expanded groundwater use from the Ellenburger-San Saba Aquifer will vary depending upon site characteristics but are not expected to be significant. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent and the disturbance from pipeline construction is temporary. No Ellenburger-San Saba Aquifer use is expected to surpass the current, sustainable yield of the aquifer as determined in Chapter 3.. However, there is no current model of the Ellenberger San Saba, so it is not possible to determine the potential impacts on spring flows. As a result, long term impacts upon groundwater resources and spring flows are unknown. Additionally, the treated return flows from the City of Llano may introduce additional return flows that contribute to in-stream habitat.

*Impacts to Agriculture*

The Ellenburger-San Saba is a source of water supply for agricultural interests in Burnet, Blanco, Gillespie and Llano Counties. The additional drafting of this aquifer has the potential to draw down the static and pumping water levels and increase the cost of production for agricultural users. This represents a medium to high impact.

### *4.7.1.3 Gulf Coast Aquifer*

This alternative would involve pumping additional groundwater from the Gulf Coast aquifer, either using the WUG's existing wells or drilling additional wells. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water.

*Table 4.44* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.44 Gulf Coast Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Mining | Colorado | Brazos-Colorado | 19 | 22 | 23 | 24 | 25 | 26 |
| **County Total for Brazos-Colorado River Basin** | | | **19** | **22** | **23** | **24** | **25** | **26** |
| Livestock | Colorado | Colorado | 14 | 14 | 14 | 14 | 14 | 14 |
| Mining | Colorado | Colorado | 3,626 | 3,626 | 2,803 | 1,650 | 214 | 373 |
| **County Total for Colorado River Basin** | | | **3,640** | **3,640** | **2,817** | **1,664** | **228** | **387** |
| County-Other | Colorado | Lavaca | 105 | 109 | 106 | 97 | 93 | 90 |
| Livestock | Colorado | Lavaca | 11 | 11 | 11 | 11 | 11 | 11 |
| Mining | Colorado | Lavaca (to Colorado) | 555 | 30 | | | | |
| Mining | Colorado | Lavaca | 100 | 132 | 151 | 168 | 184 | 199 |
| **County Total for Lavaca River Basin** | | | **771** | **282** | **268** | **276** | **288** | **300** |
| Mining | Fayette | Brazos | | 4 | 22 | 28 | 29 | 29 |
| **County Total for Brazos River Basin** | | | | **4** | **22** | **28** | **29** | **29** |
| Fayette WSC | Fayette | Colorado | | 236 | 428 | 428 | 428 | 428 |
| **County Total for Colorado River Basin** | | | | **236** | **428** | **428** | **428** | **428** |
| County-Other | Fayette | Lavaca | | | | 32 | 25 | 16 |
| Fayette WSC | Fayette | Lavaca | | 21 | 45 | 63 | 86 | 116 |
| Manufacturing | Fayette | Lavaca | | | | 2 | 20 | 43 |
| **County Total for Lavaca River Basin** | | | | **21** | **45** | **97** | **131** | **175** |
| Livestock | Matagorda | Colorado-Lavaca | 56 | 56 | 56 | 56 | 56 | 56 |
| **County Total for Colorado-Lavaca River Basin** | | | **56** | **56** | **56** | **56** | **56** | **56** |
| Manufacturing | Wharton | Colorado-Lavaca | | | | | | 8 |
| **County Total for Colorado-Lavaca River Basin** | | | | | | | | **8** |

This strategy was applied to County-Other, Livestock, and Mining in Colorado County; County-Other, Fayette WSC, Manufacturing, and Mining in Fayette County; Livestock in Matagorda County; and Manufacturing in Wharton County. Supply for Mining in Colorado and in the Colorado River Basin was obtained by pumping water from the Colorado River Basin, the Brazos-Colorado River Basin, and the Lavaca River Basin. There was not enough available groundwater from just one basin to meet the entire shortage for this WUG.

*Opinion of Probable Costs*

*Table 4.45* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be two potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation) and installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Gulf Coast aquifer, the values used were 0.5 mgd, 500 ft, 8 in, and 200 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

**Table 4.45 Gulf Coast Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Mining | Colorado | Brazos-Colorado | | | $228 | $8.77 |
| Livestock | Colorado | Colorado | $138,040 | $146,322 | $45,615 | $3,258.22 |
| Mining | Colorado | Colorado | | | $31,809 | $8.77 |
| County-Other | Colorado | Lavaca | | | $4,077 | $37.41 |
| Livestock | Colorado | Lavaca | $108,460 | $114,968 | $34,682 | $3,152.95 |
| Mining | Colorado | Lavaca | | | $1,746 | $8.77 |
| Mining | Colorado | Lavaca (to Colorado) | | | $4,869 | $8.77 |
| Mining | Fayette | Brazos | | | $1,085 | $37.41 |
| Fayette WSC | Fayette | Colorado | $676,480 | $989,243 | $130,712 | $305.40 |
| County-Other | Fayette | Lavaca | | | $1,197 | $37.41 |
| Fayette WSC | Fayette | Lavaca | | | $4,339 | $37.41 |
| Manufacturing | Fayette | Lavaca | | | $1,608 | $37.41 |
| Livestock | Matagorda | Colorado-Lavaca | $552,160 | $585,290 | $264,991 | $4,731.98 |
| Manufacturing | Wharton | Colorado-Lavaca | | | $299 | $37.41 |

For the purposes of developing costs for this strategy, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy was assumed to acquire the additional groundwater through additional pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures. The use of increased annual energy cost only also applied to the Mining-Colorado County WUGs because these mines are located over the Recharge Zone of the Gulf Coast Aquifer, and the mines typically extend into the groundwater with their excavations. Therefore, no well costs are assumed for these WUGs and a pumping lift distance of only 50 feet was used in the energy calculation.

In addition, the above rule did not apply to Livestock WUGs, whose capital costs were generated assuming one well per ac-ft/yr needed, with no transmission line costs. Each well for Livestock WUGs was estimated to cost $9,860, fully installed and operational. In addition, no additional project costs were added in for Livestock WUGs and a 5-year term of debt was utilized when annualizing the capital costs. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

*Environmental Impact*

The environmental impacts of expanded groundwater use will vary depending upon site characteristics but are not expected to be significant. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent and the disturbance from pipeline construction is temporary. No Gulf Coast aquifer use is expected to surpass the current, sustainable yield of the aquifers as determined in Chapter 3. However, personal observation of springs in the area by Bob Pickens has occurred. Based on his observations, it is not possible to tell whether the springs noted are from perched water tables from years of higher precipitation or springs from the Gulf Coast Aquifer. In any event, the Gulf Coast Aquifer formally had springs identified, but the known springs from the past have not flowed for many years. It appears based on the information above that impacts on the environment from this strategy are likely minimal under current conditions. However the impact on springflows is unknown at this time.

*Impacts to Agriculture*

The amounts of water proposed in this strategy are based on initial studies of the aquifer as a part of the LSWP. The additional drawdown from these strategies may be of concern and could have an impact on agricultural operations that rely on groundwater depending on actual final well siting decisions and pumping scenarios. . The LSWP studies still need to provide further definition of the extent and timing of additional drawdown, if any.

### *4.7.1.4 Hickory Aquifer*

This alternative would involve pumping additional groundwater, either using their existing wells or drilling additional wells. The WUGs were assumed to pump this additional water from their current supply. *Table 4.46* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.46 Hickory Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Livestock | Llano | Colorado | 62 | 62 | 62 | 62 | 62 | 62 |

This strategy was applied to Livestock in Llano County.

*Opinion of Probable Costs*

*Table 4.47* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

The Livestock WUG capital costs were generated assuming one well per ac-ft/yr needed, with no transmission line costs. Each well for Livestock WUGs was estimated to cost $9,860, fully installed and operational. In addition, no additional project costs were added in for Livestock WUGs and a 5-year term of debt was utilized when annualizing the capital costs. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

**Table 4.47 Hickory Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Livestock | Llano | Colorado | $611,320 | $647,999 | $306,436 | $4,942.52 |

*Environmental Impact*

The sustainable yield of the Hickory aquifer has been provided by analysis of drawdown and pumping records, in the absence of a current model of the aquifer. The impacts from well construction and pipeline construction are limited to the disturbance during construction, and should not be a major environmental factor. The intent is to use no more from the aquifer than is returned to it on an annual basis. This aquifer has limited springs, but in the absence of a model, it is not possible to determine whether or not these springs would be negatively impacted.

*Impacts to Agriculture*

The Hickory aquifer is used for both livestock watering and irrigation in Burnet, Gillespie, Llano, and San Saba Counties. The amounts used for these activities are far in excess of the amounts proposed in this strategy, and livestock needs will be served from this strategy as well. As a result, anticipated impact on agriculture is low.

### *4.7.1.5 Queen City Aquifer*

This alternative would involve pumping additional groundwater, either using their existing wells or drilling additional wells. The WUGs were assumed to pump this additional water from their current supply. *Table 4.48* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.48 Queen City Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Irrigation | Bastrop | Brazos | 40 | 40 | 40 | 31 | 24 | 17 |
| Irrigation | Bastrop | Colorado | 58 | | | | | |

This strategy was applied to Irrigation in Bastrop County.

*Opinion of Probable Costs*

*Table 4.49* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For the purposes of developing costs for this strategy within the Queen City aquifer, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy was assumed to acquire the additional groundwater through additional pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures. All WUGs utilizing this strategy in this aquifer fit into this category. Note that annual energy costs were based on the assumed pumping distance, which was taken to be 200 ft plus 5 ft for every 1,000 ft of transmission pipe, as well as $0.09 per kWh. A listing of assumptions and/or methodology is provided in *Appendix 4B*.

**Table 4.49 Queen City Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Irrigation | Bastrop | Brazos | | | $794 | $19.86 |
| Irrigation | Bastrop | Colorado | | | $1,152 | $19.86 |

*Environmental Impact*

The model of the Queen City aquifer had not been released at the time the water supply determinations were made, so the estimate of supply came from previous determinations of water levels and pumpage. The impact on the environment from construction of wells and pipelines is expected to be low, with most of the impact occurring during the construction process itself. It was not possible to determine whether there would be any major impacts to any potential springs from this aquifer.

*Impacts to Agriculture*

This strategy provides water to meet an agricultural need so this will have a positive impact on agriculture. In addition, the amounts provided are small so the additional demand is unlikely to cause significant additional drawdown to impact other agricultural producers although it is not possible to determine that for certain.

### *4.7.1.6 Sparta Aquifer*

This alternative would involve pumping additional groundwater, either using their existing wells or drilling additional wells. The WUGs were assumed to pump this additional water from their current supply. *Table 4.50* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.50 Sparta Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| County-Other | Fayette | Colorado | 123 | 120 | 19 | | | |
| Irrigation | Fayette | Lavaca | 20 | 18 | 16 | 14 | 12 | 10 |
| Manufacturing | Fayette | Lavaca | 45 | 70 | 94 | 115 | 117 | 119 |

This strategy was applied to the following WUGs in Fayette County: County-Other, Irrigation, and Manufacturing.

*Opinion of Probable Costs*

*Table 4.51* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For the purposes of developing costs for this strategy within the Sparta aquifer, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy was assumed to acquire the additional groundwater through added pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures. All WUGs utilizing this strategy in this aquifer fit into this category. Note that annual energy costs were based on the assumed pumping distance, which was taken to be 200 ft plus 5 ft for every 1,000 ft of transmission pipe, as well as $0.09 per kWh. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

**Table 4.51 Sparta Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| County-Other | Fayette | Colorado | | | $4,601 | $37.41 |
| Irrigation | Fayette | Lavaca | | | $748 | $37.41 |
| Manufacturing | Fayette | Lavaca | | | $4,451 | $37.41 |

*Environmental Impact*

The model of the Sparta Aquifer had not been released at the time the water supply determinations were made, so the estimate of supply came from previous determinations of water levels and pumpage. The impact on the environment from construction of wells and pipelines is expected to be low, with most of the impact occurring during the construction process itself. It was not possible to determine whether there would be any major impacts to any potential springs from this aquifer.

*Impacts to Agriculture*

Sparta water is used extensively for agricultural purposes in Fayette County. One of the purposes of this strategy is to provide for an irrigation need, which will have a positive impact on agriculture. The increase in demand is small in comparison to amounts already produced, and it is unlikely to have more than a low impact on agriculture.

#### *4.7.1.7 Trinity Aquifer*

This alternative would involve pumping additional groundwater, either using their existing wells or drilling additional wells. The WUGs were assumed to pump this additional water from their current supply. *Table 4.52* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUGs individual shortage.

**Table 4.52 Trinity Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| County-Other | Burnet | Colorado | | | 480 | 480 | 541 | 541 |
| Livestock | Burnet | Brazos | 23 | 23 | 23 | 23 | 23 | 23 |
| Mining | Burnet | Brazos | 7 | 10 | 12 | 22 | 24 | 25 |
| County-Other | Mills | Brazos | | | | | 1 | 9 |
| County-Other | Mills | Colorado | | | | | 40 | 52 |
| Goldthwaite * | Mills | Brazos | 7 | 7 | 6 | 6 | 5 | 2 |
| Goldthwaite * | Mills | Brazos (to Colorado) | 102 | 109 | | | | |
| Goldthwaite * | Mills | Colorado | | 7 | 226 | 226 | 320 | 283 |
| Irrigation | Mills | Brazos | 180 | 173 | 184 | 177 | 193 | 186 |
| Irrigation | Mills | Colorado | 109 | 102 | 57 | 3 | | |

*Note: The City of Goldthwaite is located in two river basins (Brazos and Colorado) and has needs in both. One proposed strategy to meet their needs is to pump additional Trinity aquifer groundwater. This strategy would be used for all of Goldthwaite (both river basins) and will only have one cost associated with it, but it shows as three pieces due to the river basin split and the availability limitations of the Trinity aquifer in Mills County. Refer to *Appendix 4C* for further discussion of this strategy.

This strategy was applied to County-Other, Livestock, and Mining in Burnet County; and County-Other, Goldthwaite, and Irrigation in Mills County.

*Opinion of Probable Costs*

*Table 4.53* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be two potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation) and installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Trinity aquifer, the values used were 0.2 mgd (0.04 mgd for Goldthwaite), 500 ft, 8 in, and 200 ft (350 ft in Burnet County), respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

**Table 4.53 Trinity Aquifer Expansion Cost**

<table>
<tr><th>WUG Name</th><th>County</th><th>River Basin</th><th>Total Capital Cost</th><th>Total Project Cost</th><th>Largest Annual Cost</th><th>Unit Cost ($/ac-ft)</th></tr>
<tr><td>County-Other</td><td>Burnet</td><td>Colorado</td><td>$2,029,440</td><td>$2,967,729</td><td>$499,632</td><td>$923.53</td></tr>
<tr><td>Livestock</td><td>Burnet</td><td>Brazos</td><td>$226,780</td><td>$226,780</td><td>$92,894</td><td>$4,038.88</td></tr>
<tr><td>Mining</td><td>Burnet</td><td>Brazos</td><td></td><td></td><td>$1,593</td><td>$63.72</td></tr>
<tr><td>County-Other</td><td>Mills</td><td>Brazos</td><td></td><td></td><td>$337</td><td>$37.41</td></tr>
<tr><td>County-Other</td><td>Mills</td><td>Colorado</td><td></td><td></td><td>$1,945</td><td>$37.41</td></tr>
<tr><td>Goldthwaite *</td><td>Mills</td><td>Colorado</td><td>$1,352,960</td><td>$1,903,826</td><td>$239,228</td><td>$736.09</td></tr>
<tr><td>Goldthwaite *</td><td>Mills</td><td>Brazos (to Colorado)</td><td rowspan="2" colspan="4">(See WUG above)</td></tr>
<tr><td>Goldthwaite *</td><td>Mills</td><td>Brazos</td></tr>
<tr><td>Irrigation</td><td>Mills</td><td>Brazos</td><td></td><td></td><td>$7,219</td><td>$37.41</td></tr>
<tr><td>Irrigation</td><td>Mills</td><td>Colorado</td><td></td><td></td><td>$4,077</td><td>$37.41</td></tr>
</table>

*Note: The City of Goldthwaite is located in two river basins (Brazos and Colorado) and has needs in both. One proposed strategy to meet their needs is to pump additional Trinity aquifer groundwater. This strategy would be used for all of Goldthwaite (both river basins) and will only have one cost associated with it, but it shows as three pieces due to the river basin split and the availability limitations of the Trinity aquifer in Mills County. Refer to *Appendix 4C* for further discussion of this strategy.

For the purposes of developing costs for this strategy, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy was assumed to acquire the additional groundwater through additional pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures.

The above rule was utilized for all WUGs other than Livestock WUGs, whose capital costs were generated assuming one well per ac-ft/yr needed, with no transmission line costs. Each well for Livestock WUGs was estimated to cost $9,860, fully installed and operational. In addition, no additional project costs were added in for Livestock WUGs and a 5-year term of debt was utilized when annualizing the capital costs. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

*Environmental Impact*

The Trinity aquifer was modeled to allow the use of water from the aquifer until the simulated drought of record springflow with no pumpage from the aquifer was still equal to 90 percent of the observed springflow during the drought of record. In the absence of definitive studies, it is hoped that this amount of spring flow will be sufficient to maintain any threatened or endangered populations, but it is not known for sure if that is the case. The impacts of construction of wells and pipelines, if properly managed, are expected to produce low impact to the environment, and primarily during the construction period itself.

*Impacts to Agriculture*

This strategy provides small amounts of water for livestock in Burnet County and for irrigation in Mills County, all of which will have a positive impact on agriculture. Increased drawdown from the municipal demands to be served from the aquifer will likely have a low negative impact on agriculture.

### *4.7.1.8 Yegua-Jackson Aquifer*

This alternative would involve pumping additional groundwater, either using their existing wells or drilling additional wells. The WUGs were assumed to pump this additional water from their current supply. *Table 4.54* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.54 Yegua-Jackson Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Schulenburg | Fayette | Lavaca | | | | | | 9 |

*Opinion of Probable Costs*

*Table 4.55* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For the purposes of developing costs for this strategy within the Yegua-Jackson aquifer, any WUG generating a maximum supply, in a single decade, of less than 1/4 mgd (approximately 280 ac-ft/yr) from the strategy was assumed to acquire the additional groundwater through added pumping of existing wells. For these WUGs, only the increased annual energy cost was factored into the unit cost for the strategy, with no capital expenditures. The WUG utilizing this strategy in this aquifer fit into this category. Note that annual energy costs were based on the assumed pumping distance, which was taken to be 200 ft plus 5 ft for every 1,000 ft of transmission pipe, as well as $0.09 per kWh. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

**Table 4.55 Yegua-Jackson Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Schulenburg | Fayette | Lavaca | | | $337 | $37.41 |

*Environmental Impact*

The model of the Yegua-Jackson Aquifer had not been released at the time the water supply determinations were made, so the estimate of supply came from permit data provided by the Fayette County Groundwater Conservation District. No construction is required for this strategy, so no impact on the environment from construction of wells and pipelines is expected. It was not possible to determine whether there would be any major impacts to any potential springs from this aquifer.

*Impacts to Agriculture*

This small increase in supply should have little to no impact on agriculture. There are additional aquifers in Fayette County that supply water for irrigation needs.

### *4.7.1.9 Other Aquifer*

Other Aquifer refers to alluvial groundwater supplies that have not been identified, named, or studied. The most likely source of these Other Aquifer supplies in Region K is the Colorado River alluvium and related terrace deposits.

This alternative would involve pumping additional groundwater either using their existing wells or drilling additional wells. The WUGs were assumed to pump this additional water from their current supply. *Table 4.56* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

Alluvial water may legally constitute state water for which a water right from the State must be obtained if it is determined to be the 'underflow' of a state watercourse. If a direct hydrologic connection exists between the surface water in the stream and the alluvial water, then pumping from the alluvium will diminish the streamflow proportionally.

**Table 4.56 Other Aquifer Expansions**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Bastrop | Bastrop | Colorado | | 416 | 777 | 1,366 | 2,017 | 2,814 |

This strategy was applied to the City of Bastrop in Bastrop County.

*Opinion of Probable Costs*

*Table 4.57* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be two potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation) and installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For Aquifer Other, the values used were 0.75 mgd, 100 ft, 10 in, and 20 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

**Table 4.57 Other Aquifer Expansion Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Bastrop | Bastrop | Colorado | $1,721,920 | $2,548,868 | $333,193 | $118.41 |

*Environmental Impacts*

Impacts of additional pumping from the Other Aquifer category are more difficult to pinpoint. There is no model to use to determine the potential drawdown impacts from this strategy, and there is also no means to determine the impact on streamflows if this water is withdrawn. The impact of the construction of wells and pipelines is expected to be low provided that sufficient care is taken to avoid wetland issues in site selection and construction. Construction impacts should be limited primarily to the construction period. Impacts would be expected to be low unless there is a noticeable reduction in streamflows as a result of this strategy.

*Impacts to Agriculture*

No agricultural WUGs in Bastrop County use Other Aquifer as a source. As a result, no impact to agriculture is anticipated, although potential impacts on downstream water rights that supply water to irrigation could occur if streamflows of the Colorado River are being intercepted by the alluvium formation.

### 4.7.2 Development of New Groundwater Supplies

This group of strategies includes those WUGs that are obtaining groundwater from groundwater sources which they have not tapped previously.

#### *4.7.2.1 Carrizo-Wilcox Aquifer*

This alternative would involve developing a new well field to pump water from the Carrizo-Wilcox aquifer in the Guadalupe River Basin, with most of the water being provided to County-Other users in the Colorado River Basin. This strategy assumes that one or more new developments would be located fairly close to the Guadalupe River Basin. A new well field will consist of acquisition of a site, new wells, 5 miles of distribution line, one-half mile of transmission line, new pump stations, and will assume that the WUG has the available storage capacity to store this additional water. *Table 4.58* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.58 Carrizo-Wilcox Aquifer Development**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| County-Other | Bastrop | Guadalupe (to Colorado) | | | | | 975 | 1,230 |
| County-Other | Bastrop | Guadalupe | | | | | | 16 |
| Buda | Hays | Colorado (from Region L) | | 1,687 | 1,687 | 1,687 | 1,687 | 1,687 |

This strategy was applied to the following WUGs in Bastrop County: County-Other in the Guadalupe River Basin and the Colorado River Basin. This strategy is also applied to the City of Buda in Hays County as part of the Hays-Caldwell Public Utility Agency's development of the Carrizo-Wilcos aquifer in Caldwell and Gonzalez Counties (Region L) for transport to multiple municipal WUGs in Hays County located in both Region L and Region K.

*Opinion of Probable Costs*

*Table 4.59* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy for the WUGs in Bastrop County, there were assumed to be four potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a one- mile- long transmission pipe(s) to tie the additional well(s) to the distribution system, a 10-mile distribution pipe, and a pump station. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Carrizo-Wilcox aquifer, the values used were 1.5 mgd, 500 ft, 16 in, and 200 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum *total* flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well and 5 acres for the pump station, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

The costs for the City of Buda were determined through discussions with City of Buda personnel who explained that the project costs for City of Buda would be a percentage of the total project costs that is equal to the percentage of total water that City of Buda would receive from the project.

**Table 4.59 Carrizo-Wilcox Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| County-Other | Bastrop | Guadalupe (to Colorado) | $5,434,871 | $7,932,044 | $881,392 | $707.38 |
| County-Other | Bastrop | Guadalupe | | | $11,318 | $707.38 |
| Buda | Hays | Colorado (from Region L) | $6,807,200 | $10,905,253 | $1,300,027 | $770.61 |

A listing of assumptions and/or methodology is provided in *Appendix 4B.*

*Environmental Impacts*

The impacts to the environment from the additional yield being sought from the Carrizo-Wilcox aquifer area expected to be low. Impacts from construction of wells and pipelines should be limited primarily to the construction period as long as care is taken to avoid environmentally sensitive areas and provide proper restoration to the surface when complete.

*Impacts to Agriculture*

There are currently no irrigation WUGs with supplies of irrigation water or livestock water from the Carrizo-Wilcox Aquifer in Region K. This is not a source of choice, probably because of the depth of the aquifer. In addition, the terrain in Bastrop County is often not conducive to irrigated agriculture. Therefore, the impact on agriculture is low.

### *4.7.2.2 Edwards-BFZ Aquifer (Brackish Groundwater Desalination)*

This strategy would involve developing a new well field over the Saline Zone of the Edwards-BFZ Aquifer in eastern Travis County to pump saline groundwater and desalinate the water on-site prior to connecting to an existing distribution system that would distribute the water to customers in southern Travis and northern Hays County. The system includes a well field, pump station, well collection lines, distribution lines, a water treatment plant, and a brine disposal system.

Barton Springs/Edwards Aquifer Conservation District (BS/EACD) is currently working with Texas Disposal Systems (TDS) and other partners to evaluate well field locations, water quality, and buffer zone distances to prevent any impact to the freshwater zone of the aquifer. The partnership is also exploring options for using Refuse Derived Fuels (RDFs) and for reusing brine waste, rather than disposing of it.

*Table 4.60* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed.

**Table 4.60 Edwards-BFZ Aquifer Development (Brackish Groundwater Desalination)**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Buda | Hays | Colorado | | | | | | 500 |
| Cimarron Park Water Company | Hays | Colorado | | | 250 | 350 | 500 | 600 |
| County-Other | Hays | Colorado | | 250 | 2,500 | 2,500 | 5,000 | 6,000 |

This strategy was applied to the following WUGs in Hays County: Buda, Cimarron Park Water Company, and County-Other.

*Opinion of Probable Costs*

*Table 4.61* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be six potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a 1 mile well collection line(s), a 1 mile distribution pipe, a pump station, a water treatment plant, and a brine disposal system. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Edwards-BFZ aquifer, the values used were 1 mgd, 1,000 ft, 12 in, and 300 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a TWDB groundwater desalination formula (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum *total* flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 5 acres per well, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

**Table 4.61 Edwards-BFZ Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Buda | Hays | Colorado | $1,391,124 | $1,949,445 | $489,334 | $978.67 |
| Cimarron Park Water Company | Hays | Colorado | $1,669,349 | $2,339,334 | $587,200 | $978.67 |
| County-Other | Hays | Colorado | $16,693,491 | $23,393,343 | $5,872,020 | $978.67 |

### *4.7.2.3 Ellenburger-San Saba Aquifer*

This alternative would involve developing a new well field to pump water from the Ellenburger-San Saba aquifer. A new well field will consist of acquisition of a site, new wells, five (5) miles of distribution line, one-half mile of transmission line, new pump stations, and assumes that the WUG has the available storage capacity to store this additional water. *Table 4.62* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.62 Ellenburger-San Saba Aquifer Development**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| County-Other | Blanco | Guadalupe | | | | | 41 | 64 |
| Llano | Llano | Colorado | 478 | 478 | 478 | 478 | 478 | 478 |

Additional information on this strategy for the City of Llano is available in *Appendix 4C.*

*Opinion of Probable Costs*

*Table 4.63* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be four potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system, a 5-mile distribution pipe, and a pump station. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Ellenburger-San Saba aquifer, the values used were 0.1 mgd, 600 ft, 6 in, and 200 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum total flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well and 5 acres for the pump station, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon. A listing of assumptions and/or methodology is provided in *Appendix 4B*.

**Table 4.63 Ellenburger-San Saba Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| County-Other | Blanco | Guadalupe | $1,977,110 | $2,868,976 | $276,304 | $4,317.25 |
| Llano | Llano | Colorado | $3,624,413 | $5,411,080 | $736,897 | $1,541.63 |

*Environmental Impacts*

The additional pumpage from the Ellenburger-San Saba aquifer is within the sustainable yield of the aquifer for all decades. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. There is some potential beneficial impact to streamflows from the increased return flow from Llano.

*Impacts to Agriculture*

The amount of additional pumping from the Ellenburger-San Saba aquifer may result in additional drawdown that will have a low negative impact on agricultural producers from increased cost to produce water.

### *4.7.2.4 Hickory Aquifer*

This strategy would involve developing a new well field to pump water from the Hickory aquifer. A new well field will consist of acquisition of a site, new wells, five (5) miles of distribution line, one-half mile of transmission line, new pump stations, and assumes that the WUG has the available storage capacity to store this additional water. *Table 4.64* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed. Additional groundwater was only allocated to meet the WUG's individual shortage.

**Table 4.64 Hickory Aquifer Development**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Llano | Llano | Colorado | 512 | 488 | 406 | 331 | 261 | 196 |

Additional information on this strategy for the City of Llano is available in *Appendix 4C*.

*Opinion of Probable Costs*

*Table 4.65* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be four potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system, a 5-mile distribution pipe, and a pump station. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Hickory aquifer, the values used were 0.2 mgd, 1,000 ft, 6 in, and 300 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum total flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well and 5 acres for the pump station, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon. A listing of assumptions and/or methodology is provided in *Appendix 4B*.

**Table 4.65 Hickory Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Llano | Llano | Colorado | $4,697,200.00 | $6,908,443 | $876,077 | $1,711.09 |

*Environmental Impacts*

The additional pumpage from the Hickory aquifer is within the sustainable yield of the aquifer for all decades. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. There is some potential beneficial impact to streamflows from the increased return flow from Llano.

*Impacts to Agriculture*

The location of this proposed strategy currently has no irrigation wells, so no impact to agriculture is expected.

### *4.7.2.5 Queen City Aquifer*

This strategy would involve developing a new well to pump water from the Queen City aquifer. A new well field will consist of acquisition of a site, new wells, 5 miles of distribution line, one-half mile of transmission line, new pump stations, and assumes that the WUG has the available storage capacity to store this additional water. *Table 4.66* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed.

**Table 4.66 Queen City Aquifer Development**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Smithville | Bastrop | Colorado | | | | | | 580 |

*Opinion of Probable Costs*

*Table 4.67* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be four potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system, an 8-mile distribution pipe, and a pump station. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Queen City aquifer, the values used were 0.75 mgd, 500 ft, 16 in, and 200 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum total flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well and 5 acres for the pump station, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon. A listing of assumptions and/or methodology is provided in *Appendix 4B*

**Table 4.67 Queen City Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Smithville | Bastrop | Colorado | $4,190,135 | $6,132,554 | $627,800 | $1,082.41 |

*Environmental Impacts*

The additional pumpage from the Queen City aquifer is within the sustainable yield of the aquifer for all decades. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas.

*Impacts to Agriculture*

Although within the sustainable yield of the aquifer, additional drawdown of the Queen City aquifer by the City of Smithville may impact agricultural users of the Queen City aquifer by increasing their energy costs required to pump the groundwater.

### *4.7.2.6 Trinity Aquifer*

This alternative would involve developing a new well to pump water from the Trinity aquifer. A new well field will consist of acquisition of a site, new wells, 5 miles of distribution line, one-half mile of transmission line, new pump stations, and assumes that the WUG has the available storage capacity to store this additional water. *Table 4.68* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed. Additional groundwater was only allocated to meet each WUG's individual shortage.

**Table 4.68 Trinity Aquifer Development**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Manufacturing | Hays | Colorado | | | 75 | 200 | 301 | 400 |

*Opinion of Probable Costs*

*Table 4.69* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be four potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system, a 5-mile distribution pipe, and a pump station. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Trinity aquifer, the values used were 0.2 mgd, 1200 ft, 8 in, and 200 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum total flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well and 5 acres for the pump station, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon. A listing of assumptions and/or methodology is provided in *Appendix 4B*.

**Table 4.69 Trinity Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Manufacturing | Hays | Colorado | $4,084,198 | $6,000,820 | $662,608 | $1,656.52 |

*Environmental Impacts*

As noted during the section on expansion of groundwater, this aquifer was modeled to maintain 90 percent of springflow with no pumping during the critical period of the drought of record. If that level is sufficiently protective of local species, then environmental impacts are expected to be low. Impacts from construction of well sites and pipelines are also expected to be low, and confined primarily to the construction period.

*Impacts to Agriculture*

As noted above, the aquifer was modeled to maintain 90 percent of springflow with no pumping. As a result, potential drawdown is limited and impacts to agriculture are low.

### *4.7.2.7 Other Aquifer*

Other Aquifer refers to alluvial groundwater supplies that have not been identified, named, or studied. The most likely source of these Other Aquifer supplies in Region K is the Colorado River alluvium and related terrace deposits.

This alternative would involve developing a new well to pump water from the Other Aquifer in the Colorado and Lavaca River Basins. A new well field will consist of acquisition of a site, new wells, 5 miles of distribution line, one-half mile of transmission line, new pump stations, and assumes that the WUG has the available storage capacity to store this additional water. *Table 4.70* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed. Additional groundwater was only allocated to meet each WUG's individual shortage.

Alluvial water may legally constitute state water for which a water right from the State must be obtained if it is determined to be the 'underflow' of a state watercourse. If a direct hydrologic connection exists between the surface water in the stream and the alluvial water, then pumping from the alluvium will diminish the streamflow proportionally.

**Table 4.70 Other Aquifer Development**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Mining | Colorado | Colorado | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 |
| Fayette WSC | Fayette | Colorado | | | 79 | 291 | 548 | 889 |
| Livestock | Fayette | Colorado (to Brazos) | 22 | 22 | 22 | 22 | 22 | 22 |

This strategy was applied to Mining in Colorado County and Fayette WSC and Livestock in Fayette County.

*Opinion of Probable Costs*

*Table 4.71* presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be four potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a one-half-mile-long transmission pipe(s) to tie the additional well(s) to the distribution system, a 5 mile distribution pipe, and a pump station. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized and the approximate location of the WUG. For the Other Aquifer, the values used were 0.75 mgd, 100 ft, 10 in, and 20 ft, respectively. These assumptions were based on familiarity with similar projects and project locations, as well as the characteristics of nearby existing wells. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a unit cost of $41 per in-ft (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was six inches. Distribution pipe was sized to handle the maximum *total* flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 1 acre per well and 5 acres for the pump station, at $5,000 per acre), and

Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized cost, O&M and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

**Table 4.71 Other Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Mining | Colorado | Colorado | | | $37,449 | $8.77 |
| Fayette WSC | Fayette | Colorado | $2,887,868 | $4,260,602 | $436,506 | $491.01 |
| Livestock | Fayette | Colorado (to Brazos) | $216,920 | $229,935 | $62,958 | $2,861.71 |

Because the Mining-Colorado WUG is located over the Recharge Zone of the Gulf Coast aquifer, and the mines typically extend into the groundwater with their excavations, no well costs were assumed for this WUG and a pumping lift distance of only 50 feet was used in the energy calculation. No capital costs were assumed for the Mining WUG.

The methodology also deviated for the Livestock WUGs, whose capital costs were generated assuming one well per ac-ft/yr needed, with no transmission or distribution line costs and no pump station costs. Each well for Livestock WUGs was estimated to cost $9,860, fully installed and operational. In addition, no additional project costs were added in for Livestock WUGs and a 5-year term of debt was utilized when annualizing the capital costs. A listing of assumptions and/or methodology is provided in *Appendix 4B.*

*Environmental Impacts*

The potential environmental impacts from this strategy are related to whether or not there is a direct impact to streamflow. Other Aquifer in this plan primarily refers to alluvial sands in the vicinity of the Colorado River. The probability of making a significant change in river flow from the withdrawal of this relatively small amount is low and the impacts are likely low as well. Impacts from construction of well sites and pipelines are also expected to be low and confined primarily to the construction period.

*Impacts to Agriculture*

As noted previously, there are no known agricultural users of Other Aquifer water and impacts would be low to none.

### 4.7.3 Transfer/Allocate Water From WUGs with Surplus

Significant shortages as well as ample surpluses appear for several WUGs within the Region K planning area. This strategy evaluates the idea of the WUGs with a surplus transferring their water to WUGs with shortages as long as they were in the same vicinity.

*Analysis*

The WUG in *Table 4.72* utilizes the transfer strategy in which water is transferred either within the same WUG but in a different county or within the same WUG but from a different river basin. There are no costs associated with this strategy.

**Table 4.72 Transfer Water Strategy**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Goforth WSC | Travis | Colorado | 11 | 21 | 30 | 37 | 43 | 48 |
| **TOTAL** | | | **11** | **21** | **30** | **37** | **43** | **48** |

The WUGs in *Table 4.73* have water allocated to them from another WUG (usually the County-Other WUG) within the same county. These County-Other supplies that are being reallocated using this strategy were estimated in the 2001 Plan. The water demands have changed and the number of WUGs included in County-Other has changed since the last plan; therefore, this strategy involves adjusting the 2001 supply allocation estimates to better represent the current plan conditions. There are no costs associated with this strategy.

Cimarron Park Water Company in Hays County will have available groundwater allocated to it by County-Other in 2010 and 2020.

The Irrigation WUG in Mills County can help meet its need in 2010 by being allocated surplus Trinity aquifer water from County-Other.

**Table 4.73 Allocate Water Strategy**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Cimarron Park Water Company | Hays | Colorado | 17 | 110 | | | | |
| Irrigation | Mills | Colorado | 50 | | | | | |
| **TOTAL** | | | **67** | **110** | **0** | **0** | **0** | **0** |

*Impacts to Agriculture*

Allocations to Irrigation would have a positive, though small, impact on agriculture.

### 4.7.4 Temporary Drought Period Use of Aquifers

The following WUGs (*Table 4.74*) utilize the temporary aquifer additional use strategy in which additional groundwater is pumped to meet the projected shortage during the DOR.

For Irrigation in Bastrop County, which already has wells in the Queen City aquifer, the strategy is to pump additional groundwater in the early years to alleviate the drought shortage.

For Manufacturing in Matagorda County, which already has wells in the Gulf Coast aquifer, the strategy is to pump additional groundwater in 2060 to alleviate the drought shortage.

**Table 4.74 Temporary Drought Period Use of Aquifers**

| WUG Name | County | River Basin | Aquifer | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Irrigation | Bastrop | Brazos | Queen City | 21 | 10 | 0 | 0 | 0 | 0 |
| Manufacturing | Matagorda | Colorado | Gulf Coast | 0 | 0 | 0 | 0 | 0 | 47 |
| **TOTAL** | | | | **21** | **10** | **0** | **0** | **0** | **47** |

*Opinion of Probable Costs*

The costs associated with this strategy involve the additional energy cost that will be incurred during the temporary additional use of the aquifer. This cost assumes that the pumping distance required would be approximately 200 feet plus an additional 5 feet for every 1,000 feet of transmission line the pumped water would need to pass through (one-half-mile used). The energy calculation uses the value of $0.09/kWh, and is also based on the assumption that the wire to water efficiency in the pumps and motors is 75 percent. The anticipated costs for the WUGs listed above are summarized in *Table 4.75* below.

**Table 4.75 Temporary Drought Period Use of Aquifers Additional Pumping Costs**

| WUG Name | County | River Basin | Aquifer | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|
| Irrigation | Bastrop | Brazos | Queen City | | | $417 | $19.86 |
| Manufacturing | Matagorda | Colorado | Gulf Coast | | | $1,758 | $37.41 |

*Issues and Considerations*

The additional drought period use of the Queen City Aquifer that is proposed will only occur during occurrence of the drought of record, and it will result in a limited additional drawdown of the water table. This additional drawdown will increase the cost of each unit of water produced as a result of the increased pumping lift. During years of more normal rainfall, the aquifer will recharge, and the irrigation demand will be decreased as a result of more rain falling on the crops. During this time period, the aquifer will recover over time and the water levels will return to normal. In addition, the demand decreases over time, so that by 2030, there is no longer an overdraft on the aquifer and the amounts produced are within the sustainable yield. In addition, the nature of agricultural irrigation is that water is produced during a fairly narrow window of time and the aquifer recovers until the next growing season. These conditions tend to further mitigate the additional drawdown that will be produced by the temporary additional use. However in areas of the aquifer where the transmissivities are lower, the local impacts and drawdowns will be correspondingly greater.

There are no known impacts to streamflows from water leaving the Queen City as springflow, so there should be no negative impacts on downstream flows as a result of this strategy.

The additional drought period use of the Gulf Coast aquifer for manufacturing in Matagorda County does not start until 2060. Therefore, impacts during this planning period will be negligible. In addition, the amount is a small fraction of the water produced from the Gulf Coast aquifer, so only minor and localized additional drawdowns would be anticipated to result from this strategy.

The Gulf Coast aquifer is close to the Gulf of Mexico at this location and there are no known springs which would contribute to instream flows or bay and estuary flows from the aquifer. As a result, there would be no negative impact on streamflows from the production of this additional amount of water, and there could be a minor positive impact if there are return flows from this location.

In addition to the additional use issues noted above, there is also a strategy for temporary drought period use of the Gulf Coast Aquifer in Matagorda and Wharton Counties as a part of the overall LSWP. Each of the components of LSWP is addressed separately in Section 4.9. This additional use is part of a strategy of conjunctive use of groundwater and surface water that will minimize the impacts of the additional pumping. The use of surface water when it is available is assured because of its lesser cost to pump into the system. As a result, surface water will be used whenever it is available, significant amounts of groundwater will be used only when surface water is not available, and the aquifer will recover. There is currently some question as to whether the aquifer levels will recover fully in terms of drawdown. The LSWP has a significant portion of its study dedicated to the development of a groundwater availability model that builds upon the current version to make it more site-specific in the lower counties of Region K. This study will provide more definitive data on the long-term impacts to the aquifer and will be incorporated into any deliberations or revisions to the plan.

*Environmental Impacts*

Impacts from the construction of wells and pipelines associated with this strategy are expected to be low and to be confined primarily to the construction period. The potential amounts of additional use are relatively small and limited in extent of time that they will occur.

*Impacts to Agricultural Resources*

This strategy provides water for agricultural use, which has a positive impact, but at the same time may result in increased costs of water production for some users based on greater pumping lifts from increased drawdown. Further studies are underway to better determine these impacts with more localized groundwater models for the Gulf Coast aquifer, which has the largest amount of irrigation usage and the greatest potential impact.

### 4.7.5 Drought Management

With the reduced rainfall that occurred during 2008 and 2009, causing severe, and even exceptional, states of drought in certain parts of Texas, drought management as a water management strategy was looked at more closely by several of the regional water planning groups, including the LCRWPG.

Drought Management is different from conservation in that conservation tends to look at the long-term, and takes more permanent steps to reduce a community's GPCD slowly over time. Actions such as replacing old water fixtures with new low-flow fixtures, providing public education to the community about native vegetation that requires less water, and performing audits on waterlines to check for leaks are examples of conservation measures that over time can reduce the amount of water that a community needs. Drought management, on the other hand, attempts to reduce a community's GPCD by a larger amount over a shorter period of time. Both drought management and conservation can be important and effective in their own ways.

The GPCD numbers used in this plan are an annual average. The actual amount of water used is generally higher in the summer and lower in the winter, mainly due to outdoor watering in the warmer months. By restricting outdoor watering during the warmer months as a way of managing drought, the annual average GPCD for a community can be significantly lowered, depending on the level of restriction and the effort to provide the appropriate information to the public. Tiered water rates, which charge higher $/1000 gallon rates once a customer uses more than a specified amount, have also been found to be effective in reducing water use.

Many WUGs implemented water use restrictions during the summer of 2009. The Edwards-BFZ aquifer in Hays County and Travis County that is permitted by the BS/EACD reached Critical Drought Stage, which requires users to reduce water use by 30 percent. The City of Austin restricted outdoor watering to one day per week. Both types of restrictions were effective in reducing water use. The City of Austin showed that municipal WUGs that currently have their demands met (no shortage/need) can still be proactive by implementing drought management during times of reduced rainfall.

For this planning cycle, drought management is not recommended for every WUG, but a table is provided in *Appendix 4D* that shows the amount of water in acre-feet that each municipal WUG could save by implementing both five percent and ten percent water use restrictions, as a suggestion. For some of the WUGs that have drought management recommended as a strategy, the percent of water use reduction is as high as 30 percent, because that is the amount they have to reduce by during a critical drought. For those without existing regulations, water use reductions ranged between five and ten percent. *Table 4.76* below shows the WUGs that would utilize this strategy along with the implementation decade and the amount of water saved.

**Table 4.76 Drought Management**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Aqua WSC | Bastrop | Colorado | | | | | | 898 |
| Elgin | Bastrop | Colorado | | | | | | 265 |
| Smithville | Bastrop | Colorado | | | | | | 288 |
| Cimarron Park Water Company | Hays | Colorado | 109 | 109 | 109 | 109 | 109 | 109 |
| Mountain City | Hays | Colorado | 39 | 39 | 39 | 39 | 39 | 39 |
| Manufacturing | Hays | Colorado | 257 | 257 | 257 | 257 | 257 | 257 |
| Goldthwaite | Mills | Colorado | 56 | 56 | 56 | 56 | 56 | 56 |
| **TOTAL** | | | 461 | 461 | 461 | 461 | 461 | 1,912 |

*Opinion of Probable Costs*

The costs associated with this strategy are related mainly to public outreach and enforcement. Depending on the number of customers who need to be informed of the water use restrictions, and the methods chosen to reach the customers, along with the level of enforcement, the annual costs can vary. In some cases, increased water rates and fines can recover the expenses of public outreach. The East Bay Municipal Utility District (EBMUD) in California provided an example for costs by hiring a public outreach consultant with the goal of saving a certain amount of water. The contract was for $1.75 million with a goal of saving 36,000 ac-ft of water. This works out to a unit cost of $50/ac-ft. (*See www.ebmud.com, Meeting Action Summary 06/10/08 #9a for more information.*)

*Environmental Impact*

In many cases, reducing groundwater use during a drought allows for more springflow to provide water downstream. Reducing surface water use allows more water to remain in the streams, rivers, and lakes.

## 4.8 MUNICIPAL WATER MANAGEMENT STRATEGIES

Region K has 282 WUGs and 132 are Municipal. The municipal WUGs include cities, water utilities, and County-Other (rural/unincorporated areas of municipal water use aggregated on a county basis). *Table 4.77* shows the water needs for all of the Municipal WUGs in Region K and the number of WUGs with water deficits for each decade.

**Table 4.77 Municipal Water Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Municipal | (6,894) | (19,640) | (29,753) | (44,719) | (88,591) | (136,233) |
| No. of WUGs | 21 | 34 | 41 | 46 | 54 | 56 |

Several strategies were identified to meet the municipal shortages including conservation and contract renewals; conservation was the first strategy considered for municipal WUGs with needs. For several municipal WUGs with shortages, the following regional management strategies were selected:

- Expansion of Current Groundwater Supplies
- Development of New Groundwater Supplies
- Transfer/Allocate Water From WUGs with Surplus
- Drought Management

These regional strategies are explained in detail in *Section 4.7* of this report.

In addition to these strategies, several municipal WUGs with shortages purchase water from the LCRA or the COA. Amendment of these contracts or new contracts are also identified as a strategy to meet shortages. These strategies are explained in *Sections 4.6.1.4* and *4.6.1.5*.

Part of the LSWP feasibility study will also determine how water shortages for rural communities in the upper portion of the LCRWPA can be better met.

In addition to the strategies identified above, additional municipal strategies have been identified to meet specific WUG needs. The following sections provide a description, analysis, and cost breakdown for these municipal strategies.

### 4.8.1 Water Conservation

Reduction of municipal water demand through conservation was a focal point of the 2006 round of Regional Water Planning in Texas and continues to be a focal point for the 2011 round. The water demands approved by TWDB and the individual Regional Water Planning Groups (RWPGs) have already been adjusted to incorporate the effects of the 1991 State Water Saving Performance Standards for Plumbing Fixtures Act. In addition, RWPGs are required to consider further water conservation measures in their plan or explain reasons for not recommending conservation.

The LCRWPA currently anticipates 58 municipal WUGs with shortages in the year 2060. Twenty-six of these WUGs have per capita water demands in excess of the 140 gallons per capita per day (gpcd) limit proposed by the Water Conservation Implementation Task Force (WCITF) and may be able to reduce their shortages through conservation practices.

A methodology was developed to determine the anticipated municipal water conservation savings for the WUGs within the LCRWPA. First, WUGs were required to meet the following criteria to be chosen for conservation measures:

- Be a municipal WUG.
- Develop a shortage at some point from 2010 through 2060; WUGs without shortages were not considered.
- Have a year 2010 per capita water usage of greater than 140 gpcd indicating a potential for savings through conservation.

Per capita water demands were determined from the measured or projected population and water demands for each WUG during each decade. The potential reduced per capita demand for the year 2020 was determined from the 2010 per capita demand and from the previous decade ($D_{i-1}$) for each subsequent decade ($D_i$) in the following manner:

$$D_i = D_{i-1}(0.99)^{10} \qquad (1)$$

This method follows the recommendation of a 1 percent per year reduction in per capita water demand in order to reach the target demand of 140 gpcd proposed by WCITF. Conservation was applied immediately in 2010 regardless of the beginning year of a WUG shortage so that conservation could be implemented early enough to have significant effects on demand by the time the shortage was realized.

After conservation was applied, several WUGs had very low per capita water usage which did not seem attainable; therefore, a lower limit of 140 gpcd was set. This was done so that conservation was only recommended to reach reasonable levels. For WUGs that were anticipated to reach a per capita usage below 140 gpcd without conservation in later decades, the lower demands approved by the Regional Planning Board and TWDB were carried forward.

The new per capita usage for each decade was then used along with the WUG population to determine the new water demands for each decade. These values were subtracted from the original water demands to determine the amount of water conserved in each decade.

This strategy was evaluated using the criteria above for the following WUGs shown in *Table 4.78*:

**Table 4.78 Municipal Water Conservation Savings (ac-ft/yr)**

| WUG | County | River Basin | Amount Conserved (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Bastrop | Bastrop | Colorado | 146 | 396 | 755 | 1,224 | 1,438 | 1,728 |
| Elgin | Bastrop | Colorado | 91 | 79 | 40 | 0 | 0 | 0 |
| Smithville | Bastrop | Colorado | 25 | 0 | 0 | 0 | 0 | 0 |
| Bertram | Burnet | Brazos | 22 | 54 | 80 | 91 | 96 | 106 |
| Marble Falls | Burnet | Colorado | 199 | 510 | 920 | 1,415 | 1,879 | 2,405 |
| Meadowlakes | Burnet | Colorado | 77 | 194 | 351 | 537 | 710 | 897 |
| Schulenberg | Fayette | Lavaca | 43 | 104 | 157 | 159 | 167 | 184 |
| Cimarron Park Water Company | Hays | Colorado | 24 | 17 | 13 | 9 | 5 | 7 |
| Dripping Springs | Hays | Colorado | 81 | 277 | 470 | 549 | 661 | 748 |
| Mountain City | Hays | Colorado | 2 | 0 | 0 | 0 | 0 | 0 |
| County-Other | Llano | Colorado | 873 | 1,150 | 1,408 | 1,568 | 1,724 | 1,890 |
| Lake LBJ MUD | Llano | Colorado | 135 | 290 | 420 | 541 | 666 | 777 |
| Llano | Llano | Colorado | 100 | 205 | 299 | 383 | 468 | 558 |
| Goldthwaite | Mills | Brazos | 1 | 2 | 3 | 3 | 3 | 3 |
| Goldthwaite | Mills | Colorado | 46 | 98 | 144 | 184 | 220 | 256 |
| Richland SUD | San Saba | Colorado | 13 | 22 | 19 | 15 | 14 | 15 |
| Austin [1] | Travis | Colorado | 11,030 | 18,795 | 24,036 | 25,385 | 30,401 | 36,370 |
| Barton Creek West WSC | Travis | Colorado | 37 | 68 | 97 | 123 | 147 | 163 |
| Bee Cave Village | Travis | Colorado | 106 | 247 | 417 | 600 | 778 | 965 |
| Briarcliff Village | Travis | Colorado | 16 | 39 | 61 | 66 | 70 | 75 |
| Lakeway | Travis | Colorado | 396 | 938 | 1,579 | 2,297 | 3,017 | 3,765 |
| Manor | Travis | Colorado | 102 | 235 | 393 | 490 | 522 | 557 |
| Pflugerville | Travis | Colorado | 541 | 748 | 810 | 844 | 915 | 986 |
| River Place on Lake Austin | Travis | Colorado | 132 | 295 | 431 | 549 | 661 | 762 |
| Rollingwood | Travis | Colorado | 31 | 60 | 85 | 109 | 132 | 143 |
| Round Rock | Travis | Colorado | 32 | 93 | 179 | 243 | 277 | 312 |
| West Lake Hills | Travis | Colorado | 139 | 303 | 495 | 677 | 870 | 1,074 |
| West Travis County Regional WS | Travis | Colorado | 17 | 9 | 0 | 0 | 0 | 0 |
| Wharton | Wharton | Colorado | 41 | 29 | 18 | 8 | 4 | 4 |
| **TOTAL** | | | **14,498** | **25,257** | **33,680** | **38,069** | **45,845** | **54,750** |

[1] The amount of savings from Conservation for the City of Austin was provided by the City of Austin and was not determined using the methodology presented in this section. Please refer to Section 4.6.2.1

*Opinion of Probable Cost*

The conservation cost estimates were developed using information from the TWDB GDS Associates Inc. Study; *Quantifying the Effectiveness of Various Water Conservation Techniques in Texas*, May 2003.

The study divided each RWPG into urban, suburban, and rural areas. The urban areas in Region K are comprised of the City of Austin and the City of Round Rock. The suburban areas are Travis, Hays, Bastrop, and Williamson Counties; and all of the other counties are considered rural.

For the cost estimates, the conservation savings were divided into plumbing fixture savings and irrigation savings. The plumbing fixture savings include toilet retrofits, showerhead and aerator replacements, and clothes washer rebates. The irrigation savings include irrigation audits. The total conservation savings calculated for each WUG was proportioned between plumbing fixture savings and irrigation savings using an average of the estimated savings per measure in the study. Then the savings costs for plumbing fixture savings and irrigation savings were calculated using the cost per acre foot estimates in the study. These unit costs were only applied to the incremental savings; therefore, the savings that occur the year before will not have a cost the next year, only the additional savings have a cost associated with them.

The table below contains the percent of plumbing savings versus irrigation savings and the cost per ac-ft for the three categories (urban, suburban, and rural).

**Table 4.79 Municipal Water Conservation Savings Unit Costs**

| Conservation Savings | Percent of Total Savings | Cost per Acre-Foot |
|---|---|---|
| **Urban** | | |
| Plumbing Fixture Savings | 32% | $481.60 |
| Irrigation Savings | 68% | $515.89 |
| **Suburban** | | |
| Plumbing Fixture Savings | 31% | $564.82 |
| Irrigation Savings | 69% | $540.94 |
| **Rural** | | |
| Plumbing Fixture Savings | 30% | $704.65 |
| Irrigation Savings | 70% | $543.28 |

It should be noted that much of the information on costs and anticipated savings for conservation measures is based on TWDB Report 362 – *Water Conservation Best Management Practices Guide*, prepared for the TWDB by GDS Associates. This publication is an excellent reference work for WUGs seeking information for starting or expanding their conservation programs.

*Environmental Impact*

As mentioned with the strategy for City of Austin conservation, conservation does not require additional infrastructure which has the potential to require environmental mitigation or other measures to address impacts.

Conservation has other potential impacts for WUGs that are served by groundwater. Communities that are served by surface water will divert less water from streams, meaning more water will remain in channels for downstream uses. However, groundwater communities contribute to streamflow by discharging treated groundwater into streams (typically 60 percent of water supplied is discharged following treatment.) Conservation measures implemented by these WUGs may lead to an overall decrease in streamflow, which is derived from groundwater sources. However, streamflow would not be expected to be decreased if the conservation is in the irrigation usage sector.

#### *4.8.1.1 Additional Conservation*

An additional conservation scenario for increasing water conservation was proposed and analyzed in the same manner as the original conservation figures developed above. This scenario involved applying a 0.25 percent savings annually to all municipal WUGs with shortages and a per capita demand between 100 and 140 gpcd.

This scenario could be performed in conjunction with conservation practices already recommended in the section above. Additional conservation would be applied until the per capita water demand reached 100 and 140 gpcd, respectively. No conservation would be applied below these respective levels. *Table 4.80* shows the additional amount of water conserved by implementing this scenario. This strategy is recommended for two WUGs in Bastrop County that could attain relatively large amounts of water savings using this strategy.

**Table 4.80 Anticipated Reduction From Additional Municipal Conservation (ac-ft/yr)**

| WUG | County | Basin | Amount Conserved (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Aqua WSC | Bastrop | Colorado | 0 | 0 | 0 | 122 | 396 | 908 |
| County-Other | Bastrop | Colorado | 0 | 0 | 0 | 400 | 631 | 936 |
| **TOTAL** | | | **0** | **0** | **0** | **522** | **1,027** | **1,844** |

For many of the other municipal WUGs, anticipated reductions in demand from this scenario are considerably less than the expected savings from the conservation strategy recommended in Section 4.8.1, so it is not recommended for them at this time.

*Opinion of Probable Cost*

The costs were calculated using the same methodology for both the municipal conservation and additional municipal conservation strategies. Refer to Section 4.8.1 for a breakdown of the costs for this strategy.

*Environmental Impact*

The environmental impacts for this strategy are discussed in Section 4.8.1.

*Impacts to Agricultural Resources*

No impacts to agriculture are anticipated as a result of municipal conservation.

### 4.8.2 Recharge Edwards-BFZ With Onion Creek Recharge Structure for Hays County

In previous rounds, more analysis of this strategy was recommended due to various study findings that placed less confidence on the determined firm yields from the Onion Creek Recharge Structure. During this round of planning, discussions with the City of Austin (COA) and the Barton Springs / Edwards Aquifer Conservation District (BS/EACD) took place as part of the Phase I studies (Task 3 – Evaluation of High Growth Areas), and opinion letters on the strategy were received by both entities.

In general, it is the opinion of the BS/EACD that the Onion Creek recharge structure strategy is not feasible and would not be effective. The basis for this is three different viewpoints consisting of infrastructure and land-use compatibility, use of water resources, and relative recharge effectiveness. The District has some suggestions for alternative recharge enhancement strategies to consider. These include a number of smaller-scale recharge enhancement structures and facilities on Onion Creek and adjacent recharge streams.

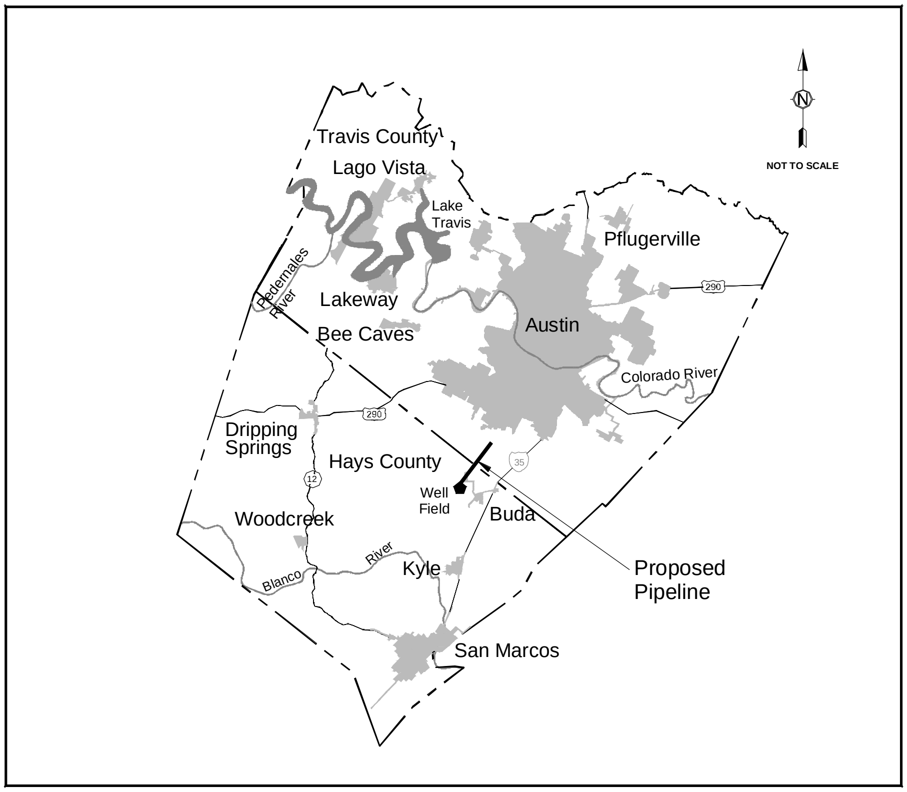
The City of Austin also believes that the proposed in-channel reservoirs are ineffective and cause additional concerns, and offers discussion of four alternative projects as replacements for the in-channel reservoirs. These projects include expanding the CenTex quarry, based on current data; protection of riparian corridors along major Colorado River tributaries; protection and maintenance of existing individual in-channel recharge features; and purchasing conservation zones in the contribution zone of Onion Creek. In addition, the City of Austin staff feels that there is an underestimate in the current Region K plan of the long-term benefits of recharge enhancement, and that additional analysis should be done to assess the volume of water available and the aquifer residence time of water resulting from recharge enhancement. These opinion letters were provided in the Phase I Task 3 Study Report (Evaluation of High Growth Areas Study).

During Phase II of this round of planning, further discussions with BS/EACD were held regarding the strategies to attempt to confirm a reliable firm water value. The discussions that took place resulted in the understanding that the Onion Creek Recharge Structure had become more of a water quality tool that may have some positive impact on springflow, although no numbers are currently available. BS/EACD indicated that they would not increase existing permit amounts or issue new permits if the recharge structure increased recharge to the aquifer. This indication led to the realization that this particular strategy would not create additional firm yield for Hays County-Other, and therefore, it is no longer being recommended as a strategy.

### 4.8.3 Obtain Surface Water From the COA for Hays County

This alternative would involve the construction of transmission facilities to transport water from the COA's distribution system into Northern Hays County. Water provided by the COA would be specifically designated for the Spillar Ranch and Pfluger Ranch developments (located in Hays County-Other). A schematic layout of this alternative is presented on *Figure 4.3*.

**Figure 4.3: Obtain Surface Water From the COA**




The improvements necessary to move water from the COA to the proposed developments would involve a looped 16-inch transmission main. These facilities would have the capacity to provide approximately 1,100 ac-ft/yr to the proposed developments.

*Opinion of Probable Cost*

The probable costs for this alternative are presented in *Table 4.81*. The costs presented include the transmission main from the COA and are based on information provided by City staff.

**Table 4.81 COA Waterline Opinion of Probable Cost**

| Phase | Cost Opinion |
|---|---|
| | |
| **Total Project Costs [1]** | **$2,987,000** |
| | |
| **Annual Costs** | |
| Debt Service (6% for 30 years) | $217,000 |
| Operation and Maintenance | $24,400 |
| Purchase of Treated Water from COA [2] | $1,144,000 |
| **Total Annual Costs** | **$1,385,400** |
| | |
| **Unit Cost of Water ($/ac-ft)** | **$1,259** |
| **Unit Cost of Water ($/1000 gallons)** | **$3.87** |

[1] Opinion of probable costs update provided through COA staff 7/5/05 and updated to September 2008 dollars.
[2] The purchase of treated wholesale water from COA is assumed to be an average cost of $3.20 per 1,000 gallons.

Capital costs for this strategy were updated to September 2008 dollars using the *Engineering News-Record* (ENR) Construction Cost Index (CCI). O&M costs were adjusted to September 2008 dollars using the U.S. Department of Labor's Consumer Price Index.

*Environmental Impact*

This strategy would convey treated water from the COA system to customers in Hays County. There may be issues concerning the mixing of treated surface water with groundwater in the Hays County distribution systems. Environmental aspects of the proposed pipe alignment would have to be considered. An assessment of the potential environmental impacts of this project has not been completed and would have to be performed before implementing this alternative. Beyond the short-term impact associated with typical construction costs, it is anticipated that implementation of this project would have the positive benefit of limiting the demand on the Barton Springs segment of the Edwards aquifer.

*Impacts to Agricultural Resources*

This strategy does not take water from rural areas and should have no impact on agriculture.

### 4.8.4 Construct Goldthwaite Channel Dam in Mills County

A strategy involving the construction of a new channel dam below the City's existing diversion structure was identified, however, according to the Region K Cutoff Model this strategy would not provide a firm supply of water during the drought-of-record due to the junior status of the reservoir compared to the other water rights in the river.

A strategy to meet water shortages in this eventuality would be to contract with LCRA for water that would be counted against the firm yield of the Highland Lakes.

*Analysis*

For this strategy, a channel dam below the City's existing diversion structure would be constructed on the Colorado River. This low dam structure would be located approximately 300 feet downstream of the City's existing structure. The channel dam would be approximately 10 feet in height and the construction of this structure would provide a source of water for the City's diversion pumps, allowing the City to continue providing service for a longer period without flow in the river. The water impounded behind this dam would provide a consistent source of water from which to pump, as well as an additional 400 ac-ft/yr; modeling showed that this supply would not be a firm supply during the drought-of-record. The City would consider entering into a partnership with the Fox Crossing Water District, LCRA, or private landowners to construct the channel dam. The actual size and location of this structure should be determined by engineering studies, this report only contains estimated values.

*Opinion of Probable Cost*

The opinion of probable project costs is presented in *Table 4.82.*

**Table 4.82 New Goldthwaite Channel Dam Opinion of Probable Cost**

| Phase | Cost Opinion |
|---|---|
| **Capital Costs [1]** | |
| Reservoir Construction | $1,841,800 |
| **Total Capital Costs** | **$1,841,800** |
| | |
| Engineering, Contingencies and Legal Services (35%) | $644,630 |
| Environmental and Archaeological Studies, Mitigation, and Permitting | $566,000 |
| Site Acquisition | $92,000 |
| Interest Accrued During Construction [2] | $376,668 |
| Interest Earned on Unused Principal [2] | ($251,617) |
| **Total Project Costs** | **$3,269,481** |
| | |
| **Annual Costs** | |
| Debt Service (6% for 40 years) | $217,287 |
| Operations and Maintenance | $70,000 |
| Treatment at Existing Plant | $127,500 |
| **Total Annual Costs** | **$414,787** |
| | |
| **Unit Cost of Water ($/ac-ft)** | **NA** |
| **Unit Cost of Water ($/1000 gallons)** | **NA** |

[1] Cost information taken from LCRA report *Cost Estimation and Location of a Channel Dam on the Colorado River Near Goldthwaite, Texas*, May 1998

[2] Interest earned and accrued based on a five (5) year construction period

[3] The adjustment of the firm yield to zero makes it impossible to calculate per unit cost.

Capital costs and additional treatment cost for this strategy were taken from costs developed in the 2001 Region K Plan, and updated to September 2008 dollars using the *Engineering News-Record* (ENR) Construction Cost Index (CCI). Land acquisition, environmental study, and O&M costs were adjusted to September 2008 dollars using the Department of Labor's Consumer Price Index.

*Issues and Considerations*

The following is a summary of the advantages and disadvantages for this alternative:

*Advantages*

- Operation of the City's water system would remain the same

*Disadvantages*

- Construction of the dam would require acquisition of land or the rights to inundate land
- Construction of a channel dam would require a water rights permit amendment
- Construction of a channel dam may have environmental impacts
- Future sedimentation of the reservoir may become an issue
- Implementation of this alternative may take several years (3 to 5)

*Environmental Impact*

No downstream water rights would be affected due to the junior status of the reservoir, and compliance with target bay and estuary inflows would be slightly reduced. Water quality downstream may be beneficially impacted by reduced sediment loading. The environmental impacts of this strategy on the Colorado River and Matagorda Bay were evaluated in Phase I of this round of planning. The results of this analysis can be found in *Appendix 4F*, as well as in the Region K Phase I Task 2 Study Report. Discussion of the methodology behind the impact analysis is in *Section 4.17*.

*Impacts to Agricultural Resources*

No water is diverted from agricultural use and impacts to agriculture should be low to none.

### 4.8.5 HB 1437 (Region G) for Williamson County

In 1999, the 76$^{th}$ Session of the Texas Legislature enacted HB 1437, authorizing LCRA to transfer up to an additional 25,000 ac-ft/year from the Colorado River Basin to new customers within the Brazos River Basin (in Williamson County). This legislation is now codified at Texas Water Code §222.029. HB 1437 represents a water conservation strategy in which improvements are made in farms and in the irrigation districts that reduce agricultural use of surface water. The legislation allows the transfer only if there is "no net loss" to the Colorado River Basin and requires the adverse effects of the transfer to be mitigated. HB 1437 establishes an Agricultural Water Conservation Fund (Ag Fund) to pay for the mitigation, funded through a conservation surcharge set by the LCRA Board and collected from Williamson County customers. To receive funding from the Ag Fund, the mitigation projects must reduce the reliance of irrigated agriculture in the Colorado River Basin on surface water.

LCRA entered into a contract for a 50-year water sale pursuant to HB 1437. The agreement also includes a clause that allows the Brazos River Authority (BRA) to terminate the agreement after 10 years. Water transfers from LCRA to Williamson County are expected to begin in 2012. Projections show that by 2025, the annual volume of water transferred could be as high as 16,000 ac-ft/yr. Currently, this strategy envisions two water conservation projects, implemented in phases that match the demand projections from Williamson County. The proposed plan includes a system of automated check structures and control systems in a LCRA irrigation division (to save approximately 12,000 ac-ft/yr) plus precision land leveling of rice farms (to save approximately 13,500 ac-ft/yr) within the irrigation divisions to generate the necessary water saving.

This Region G strategy affects Round Rock in Region K (this WUG is shared by the regions). Other customers of BRA within Region G that are affected include Round Rock, Georgetown, Liberty Hill, and the Chisholm Trail SUD.

**Table 4.83 HB 1437 Strategy**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Round Rock | Travis | Colorado | 126 | 246 | 349 | 426 | 536 | 645 |

*Opinion of Probable Cost*

The total estimated construction cost to implement these strategies is $23,624,000. Today, the expected HB 1437 customers pay the current LCRA raw water rate of $138 per ac-ft for water diverted and $69.00 per ac-ft for water reserved but not diverted, and a 25 percent surcharge on all fees collected for water. These surcharge funds will be used to fund these strategies. HB 1437 customers in Williamson County will fund most of the implementation of these strategies through payment of the surcharge. Including the surcharge, the two municipal WUGs listed above will pay a unit cost of $172.50/ac-ft.

*Issues and Considerations*

The LCRA Board has approved HB 1437 implementation procedures and policies including the definition of “no net loss” and has approved funding for initial strategies to meet the short term demands for BRA customers in Williamson County. These strategies primarily include agricultural water conservation measures such as precision land leveling for farmland in Colorado, Wharton, and Matagorda counties where rice is grown. A plan to meet the longer term demands is being developed by LCRA with advice from the HB 1437 Agricultural Water Conservation Advisory Committee and updated demand projections from BRA.

*Environmental Impact*

The transfer of water anticipated under HB 1437 would constitute an inter-basin transfer to the Brazos River Basin. With this distinction comes the potential for issues resulting from mixing water supplies from multiple sources. The environmental impacts of this strategy on the Colorado River and Matagorda Bay were evaluated in Phase I of this round of planning. Impacts to the instream flows and freshwater inflows to Matagorda Bay from the modeling analysis are limited due to the interruptible nature of the irrigation water rights. The results of this analysis can be found in *Appendix 4F*, as well as in the Region K Phase I Task 2 Study Report. Discussion of the methodology behind the impact analysis is in *Section 4.17*.

*Impacts to Agriculture*

This strategy will provide money for agricultural conservation and will not take water that agriculture is currently using so the impacts will be low to none.

## 4.9 IRRIGATION WATER MANAGEMENT STRATEGIES

Region K has 282 WUGs and 30 are Irrigation. The existing water supplies available to the irrigators in Region K are not sufficient to meet the projected needs. A shortage would occur in all decades of the planning period should the critical drought be repeated. Using the Region K Cutoff Model with no return flows and assuming full use of the ROR irrigation rights to meet irrigation demands in those operations, the maximum annual shortage is projected to decrease from just under 235,000 ac-ft/yr in 2010 to approximately 136,000 ac-ft/yr in 2060. The calculated shortages are expected to decrease due to projected decreases in the amount of acreage placed in rice production. However, these estimated shortages require an upward adjustment to reflect LCRA's strategy for meeting other municipal and industrial firm demands, which includes amending its existing ROR rights to meet these other demands. *Table 4.84* shows the water needs for all of the Irrigation WUGs in Region K and the number of WUGs with water deficits for each decade, and *Table 4.85* shows the irrigation needs for the rice counties in Region K.

**Table 4.84 Irrigation Water Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Irrigation | (234,738) | (217,011) | (198,717) | (181,070) | (164,084) | (135,822) |
| No. of WUGs | 12 | 11 | 11 | 11 | 10 | 10 |

**Table 4.85 Rice Irrigation Water Needs (ac-ft/yr)**

| County Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Colorado | (49,300) | (42,090) | (35,089) | (28,312) | (21,723) | (15,416) |
| Matagorda | (126,742) | (121,053) | (114,334) | (107,897) | (101,703) | (95,731) |
| Wharton | (58,218) | (53,525) | (48,997) | (44,636) | (40,429) | (24,462) |
| **TOTAL** | **(234,260)** | **(216,668)** | **(198,420)** | **(180,845)** | **(163,855)** | **(135,609)** |

Rice irrigators in Colorado, Wharton, and Matagorda Counties have the largest irrigation needs in Region K. LCRA's strategies to be implemented as part of its sale of water to Williamson County under HB 1437 and those contained within the LSWP are designed to minimize the impacts of these projects to the available water supply for irrigation and otherwise extend the availability of interruptible water supply to meet irrigation demands beyond that which would be expected without the LSWP. The recommended plan to meet the rice irrigation shortage that is reflected in the LSWP is based on recommendations presented by the Irrigation Water Supply Working Group of the LCRWPG for the 2001 Plan. This Working Group included several rice irrigators, representatives from the affected counties, a representative from LCRA, environmental representatives, and representatives interested in the impacts on the Highland Lakes. The recommended plan includes the following components, in priority order. The strategies, which are outlined in detail in this section rely heavily on implementation of the LSWP. *Table 4.86* provides a summary of the water management strategies recommended for rice irrigation.

**Table 4.86 Rice Irrigation Water Management Strategies**

| Rice Irrigation Strategies | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Continued Use of Austin Return Flows[1] | 18,665 | 19,687 | 22,900 | 27,781 | 30,382 | 33,838 |
| Continued Use of Downstream Return Flows [2] | 0 | 0 | 213 | 850 | 1,594 | 2,125 |
| 1999 Water Management Plan-Interruptible Water Supply | 255,493 | 196,568 | 137,643 | 78,718 | 19,793 | 0 |
| | | | | | | |
| On-Farm Conservation [3] | | 34,150 | 34,150 | 34,150 | 34,150 | 34,150 |
| Irrigation Operations Conveyance Improvements [3] | | 65,000 | 65,000 | 65,000 | 65,000 | 65,000 |
| Conjunctive Use of Groundwater [4] | | 62,000 | 62,000 | 62,000 | 62,000 | 62,000 |
| Development of New Rice Varieties [3] | | 40,800 | 40,800 | 40,800 | 40,800 | 40,800 |
| *LSWP Subtotal* | | *201,950* | *201,950* | *201,950* | *201,950* | *201,950* |
| | | | | | | |
| Firm up ROR With Off-Channel Reservoir | | | | | | 47,000 |
| | | | | | | |
| HB 1437 | 4,000 | 4,000 | 4,000 | 4,000 | 14,800 | 25,000 |
| | | | | | | |
| Supply Reduction due to LSWP | | | | | | (71,381) |
| Amendment to Irrigation Rights for Municipal and Industrial Needs | (25,365) | (42,769) | (50,769) | (57,769) | (67,769) | (90,487) |
| **TOTAL** | **252,793** | **379,436** | **315,937** | **255,530** | **200,750** | **148,045** |

Note: Limited simulations were conducted for only 2010, 2050, and 2060. Information for other decades was interpolated from the 2010 and 2050 results.

[1] Amounts reflect the benefit of Austin return flows to the portion of LCRA's downstream run-of-river rights used for irrigation purposes.

[2] The downstream return flows are from Pflugerville and Aqua WSC. Amounts reflect the benefit of return flows to the portion of LCRA's downstream run-of-river rights used for irrigation purposes.

[3] Demand reductions through advanced conservation made available under LSWP were distributed to county-basin irrigation WUGs based on the location of shortages. These estimates continue to be refined as a part of the LSWP studies (see p. 4-35) and it is anticipated that these needs will be addressed by managing all of the components as a LCRA system.

[4] Groundwater supplies made available under LSWP as shown here are estimated for planning and modeling purposes, and were distributed to county-basin irrigation WUGs based on the location of shortages. The modeling conducted for the LSWP strategy was done assuming a long-term average not to exceed 36,000 ac-ft/yr, 62,000 ac-ft/yr as the 10-year rolling average (repeat of the drought of record), and 95,000 ac-ft/yr as the annual maximum limit. These estimates are to be refined as a part of the LSWP studies (see p. 4-35) with development of a site-specific GAM. It is anticipated that these needs will be addressed by managing all of the components as a LCRA system.

For Irrigation WUGs with shortages outside of Colorado, Matagorda, and Wharton Counties, the following regional water management strategies were selected:

- Expansion of Current Groundwater Supplies
- Transfer/Allocate Water From WUGs with Surplus
- Temporary Drought Period Use of Aquifer

These regional strategies are explained in detail in Section 4.7 of this report.

A discussion of the rice irrigation strategies: Continued Use of Austin Return Flows, Water Management Plan-Interruptible Water Supply, Firm up ROR with Off-Channel Reservoir, the Supply Reduction due to LSWP, and the Transfer ROR Supply to Municipal and Industrial are contained in Section 4.6.1.

### 4.9.1 On-Farm Water Conservation

The water needed for irrigation in Colorado, Wharton, and Matagorda Counties is the largest deficit identified within the LCRWPA. On-farm water conservation for irrigation is one of the water management strategies developed under LSWP to address the issue.

*Analysis*

It is anticipated that significant water savings can be achieved through the use of precision land leveling, multiple field inlets, and reduced levee intervals. The estimated amount of water savings from on-farm water conservation from the LSWP 2008 Project Viability Assessment (PVA) is 34,150 ac-ft/yr of water savings in an average scenario which is slightly less than the 37,348 ac-ft/yr that the 2001 Region K Water Plan estimated.

The conservation estimate was based on updated estimates of total rice acreage in each irrigation operation, and the estimates are slightly different from those used in the 2001 Region K Water Plan. The estimate also assumes 50 percent adoption of conservation tillage, 55 percent adoption of land leveling, 10 percent adoption of tailwater recovery, and 70 percent adoption of multiple inlets.

These estimates will continue to be refined throughout the LSWP study period. Recent changes to the conservation estimates are reflected in the table below.

**Table 4.87 On-Farm Conservation Estimates**

| WUG Name | County | River Basin | Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| Irrigation | Colorado | Brazos-Colorado | | 4,715 | 4,715 | 4,715 | 4,715 | 4,715 |
| Irrigation | Colorado | Lavaca | | 9,405 | 9,405 | 9,405 | 9,405 | 9,405 |
| Irrigation | Matagorda | Brazos-Colorado | | 2,848 | 2,848 | 2,848 | 2,848 | 2,848 |
| Irrigation | Matagorda | Colorado | | 502 | 502 | 502 | 502 | 502 |
| Irrigation | Matagorda | Colorado-Lavaca | | 3,617 | 3,617 | 3,617 | 3,617 | 3,617 |
| Irrigation | Wharton | Brazos-Colorado | | 8,803 | 8,803 | 8,803 | 8,803 | 8,803 |
| Irrigation | Wharton | Colorado | | 150 | 150 | 150 | 150 | 150 |
| Irrigation | Wharton | Colorado-Lavaca | | 4,110 | 4,110 | 4,110 | 4,110 | 4,110 |
| **TOTAL** | | | | **34,150** | **34,150** | **34,150** | **34,150** | **34,150** |

Note: Demand reductions through advanced conservation made available under LSWP were distributed to county-basin irrigation WUGs based on the location of shortages. These estimates are to be refined as a part of the ongoing LSWP studies and it is anticipated that these needs will be addressed by managing all of the components as a LCRA system.

Rice utilizes significantly more water than other Texas crops because of the growing environment adopted for rice production. Rice is grown in standing water during most of its vegetative and reproductive stages to minimize competition from plants that cannot tolerate standing water, basically as a weed control measure. The flood culture is not required to grow rice, but is almost universally accepted as the most economical method to control weeds and sustain the rice crop.

Shallow levees are used to separate the individual cuts in a rice field. Maintenance of a uniform shallow water depth allows the levees to maintain greater freeboard or levee height above the water surface. If there is insufficient freeboard, rainfall can cause the levees to overtop and fail with the worst-case result being loss of water from the entire field. Minimizing the flooding depth allows the producer to capture rainwater, replacing an equal amount of water that would normally have been diverted from the river or pumped from wells. The amount of water saved can vary with rainfall during the growing season, but can replace a significant quantity of the water normally diverted from the river and minimize the amount of tail water or rice field runoff water that can carry dissolved fertilizer and potential pollutants downstream.

There are many potential on-farm irrigation improvements, but in general water savings can best be achieved by minimizing flooding depth and improving management of the flushing and flooding operations. The techniques that have the most significant impact in accomplishing these goals include precision or laser land leveling, use of a field lateral with multiple field inlets, reducing the vertical interval or elevation difference between levees, improved management of water control activities, and improved recordkeeping. Individual water conservation measures are discussed in the following sections.

*Opinion of Probable Cost*

The total estimated cost for the LCRA-SAWS Water Project is $2,159,600,000, as developed by the Region L consultant. Per the Definitive Agreement between LCRA and SAWS, SAWS is responsible for LSWP costs. The costs are paid primarily through water use fees and surcharges over the life of the project. Region K is not responsible for the costs associated with the LSWP. *Table 4.88* shows the cost of the various conservation strategies based on September 2008 costs.

**Table 4.88 Estimated Unit Cost of Agricultural Conservation Improvements**

| Improvement | Improvement Cost per Acre |
|---|---|
| **Land Leveling** | **$141.68** |
| **Multiple Inlets** | **$2.83** |
| **Reduced Levee Interval** | **$0.71** |
| **Irrigation Pipeline** | **$233.76** |

*Issues and Considerations*

**Table 4.89 On-Farm Conservation Issues**

| Management Strategy | Environmental Flows | Wildlife Habitat | Cultural Resources | Agricultural Resources | Other Water Resources | Social/Economic |
|---|---|---|---|---|---|---|
| On-Farm Conservation | Reduced irrigation return flows to bay and estuaries. | None anticipated. | None anticipated. | None anticipated. | None anticipated. | Cost exceeds irrigators' ability to pay. |

*Environmental Impact*

On-farm conservation for rice production could influence the instream water balance during dry, summer months in two ways: (1) by reducing the amount of return flows introduced to streams and (2) by reducing the amount of water diverted from streams to irrigate for the second rice crop immediately following harvest of the first. The balance of these two impacts could potentially result in a net gain or loss in dry weather instream flows, depending on the farming practices used. First, the reduced application rates required by conservation would negatively impact return flows to streams, which occur during the summer months when this discharge can provide habitat for species and other ecological services. However, following the harvest of the first rice crop, a certain acreage is flooded again to grow a second crop to be harvested in September and October. Second, conservation could have a positive impact on instream flows by reducing the amount of water diverted to provide for rice irrigation at this time.

The overall balance of return flows and withdrawals for this period was estimated from information that was originally assembled for calculating irrigation water demands in Colorado, Matagorda, and Wharton Counties. The ratios of water used for first and second crops for both groundwater and surface water irrigated fields for each county were used to divide the expected conservation, as estimated by LCRA, between the first and second crops. It was assumed that all water that could be conserved by on-farm practices was water that would otherwise be discharged to streams in return flows. In addition, return flows were assumed to be 4 inches for all fields before conservation. The expected surface water withdrawals after implementing conservation were then used to determine an overall balance for water being returned and diverted during the summer.

*Results*

*Table 4.90* shows the instream water balance resulting from recommended conservation in Colorado, Matagorda, and Wharton Counties. This analysis shows that the reduction in return flows to streams is of a greater magnitude than the reduced diversions for irrigating the second crop resulting from conservation. For instance, in Colorado County, the amount of water reentering the streams from rice fields would be reduced by nearly 5,500 ac-ft after conservation, while conservation would only reduce the diversion of water from streams by just under 4,000 ac-ft. Therefore, although on-farm conservation would result in lower average diversions throughout the year and greater average instream flows, the practice would result in a net reduction in instream flows during the summer when flows are typically at their lowest. This is due to the larger number of acres farmed for the first crop than the second crop and because reduced return flows from both groundwater and surface water irrigated lands are impacted by conservation while instream flows only benefit from reduced surface water diversions.

**Table 4.90 Anticipated On-Farm Conservation for Rice Crops and Summer Instream Flows** [1]

| | | Colorado | Matagorda | Wharton | Notes |
|---|---|---|---|---|---|
| **Summer Return Flows** | Before Conservation | 10,900 | 9,594 | 6,739 | 2 |
| | After Conservation | 5,401 | 4,400 | 1,825 | |
| | Net Change | (5,499) | (5,194) | (4,914) | |
| **Summer Surface Water Diversions** | Before Conservation | 66,459 | 42,502 | 28,102 | 3 |
| | After Conservation | 62,494 | 40,212 | 25,475 | |
| | Net Change | (3,965) | (2,290) | (2,627) | |
| **Net Change in Summer Instream Flows** | | (1,534) | (2,904) | (2,287) | 4 |

[1] These figures were produced following rice irrigation assumptions developed by the planning group for each of the three counties (i.e. application rate, percent of total acreage for second crop, etc.). Current typical return flows were estimated to be approximately 4 in-ac/ac.
[2] Includes return flows related to summer rice harvests for both fields irrigated with groundwater and surface water. Does not include return flows related to flushing associated with planting of the first crop in the spring.
[3] Includes water required for growth of the second crop for surface water irrigated fields only.
[4] Represent the benefits to instream flows resulting from reduced diversions, less the reduction in return flows associated with conservation.

If this strategy were implemented along with the use of new rice varieties, return flows occurring later in the year would be reduced, but there would be no diversions made for a second crop. Therefore, conservation effects would only negatively impact summer instream flows by reducing the volume of return flows. The implementation of off-channel storage recommended in the LSWP potentially offset the impacts of conservation by maintaining streamflow during dry periods for at least a portion of the river, depending upon the location. These reservoirs will receive at least a portion of their supply from stored rights which will provide some replacement streamflow.

### *4.9.1.1 Laser Land Leveling*

In the production of rice, there are many benefits to having fields that are almost level but still have some slope for drainage, typically 0.15 foot or less in elevation change for 100 feet of distance. An almost level field will allow a more uniform shallow water depth across the field, reducing the total amount of water applied to the field. Land grading can give a field this desired condition by using a laser-guided grader.

Precision leveling or land grading can reduce the amount of water used by 25 to 30 percent and increase production by 10 to 15 percent.

Interest in conservation in the rice industry is almost exclusively confined to those rice growers who own their own land. In that case, improvements benefit the landowner and make sense economically, particularly when there is matching grant money available from the Natural Resources Conservation Service. However, in many cases, land is leased on an annual basis for rice production. There is no long-term agreement between the landowner and farmer. This makes it difficult for the farmer to justify a significant capital expenditure, and limits the amount of land where precision leveling is being implemented. The topography and soil type also may limit the amount of land where this practice could be implemented.

#### *4.9.1.2 Use of Multiple Field Inlets*

Another method used by rice producers to conserve water is the utilization of multiple field inlets for applying water to the individual cuts or land sections between levees. The use of multiple inlets allows for many benefits that result in water savings. The water savings is further enhanced when multiple inlets are applied in combination with land leveling. The most significant benefits are the ability to apply water where it is needed and at a shallower depth. Because of the shallow water, rice production is increased while the total water applied is minimized. A side lateral with multiple inlets is often paired with a similar drain, as opposed to draining all water from a field through the lowest cut. This allows the field to drain much quicker, shortening the time to harvest and increasing the potential for production of a ratoon crop.

#### *4.9.1.3 Reduced Levee Intervals*

Another approach to minimizing the water depth is to reduce the typical contour interval between levees from 0.2 feet to 0.15 feet. The cost associated with making this change can be very minimal with only a few additional levees plowed into place at the beginning of the rice growing season. The smaller interval allows average flooding depth to be minimized, which is both more compatible with the current dwarf varieties of rice that are grown and allows more freeboard for capturing rainfall. The levees themselves can also be smaller resulting in not only less rice being grown on the levees because they are narrower, but the yield from rice grown on the levees is less impacted. Smaller levees also result in less wear and tear on equipment that must cross the levees during production and harvest. Reducing the levee interval can save about 0.3 feet per acre irrigated when used in conjunction with precision land leveling and 0.4 feet per acre irrigated when applied without precision leveling.

#### *4.9.1.4 Combining Land Leveling With Multiple Field Inlets*

Several combinations of conservation practices could be evaluated, but the LCRWPG Rice Irrigation Working Group decided that the most common combined approach that would result in the greatest water savings would be the combination of land leveling with the use of multiple inlets. In many cases the farmers that use these two conservation practices may also implement a reduced levee interval, but the cost associated with the additional combination of conservation practices becomes less discernible as does the water savings.

### 4.9.2 Irrigation Operations Conveyance Improvements

The water needed for irrigation in Colorado, Wharton, and Matagorda Counties is the largest deficit identified within the LCRWPA. Irrigation operation conveyance improvement is one of the water management strategies developed under LSWP to address the issue.

*Analysis*

In addition to the water conservation measures implemented on-farm, substantial water can be saved by improving the efficiency of the canal systems that deliver water to the individual irrigator. These improvements would include improving the flow control structures by adding checks structures, automating the operation of the flow control structures, and adding flow regulating reservoirs to balance flows.

The 2008 LSWP PVA estimated 65,000 ac-ft/yr of water savings from improved efficiency of rice irrigation delivery system by the LCRA irrigation divisions in an average scenario. The 2001 Region K Plan estimated an amount of 45,650 ac-ft/yr of water savings from this water management strategy. The improved efficiency of rice irrigation delivery system savings amount adopted for the 2006 Region K Water Plan is 46,184 ac-ft/yr.

The PVA analysis estimates a higher savings amount for this strategy compared to the 2001 Region K water plan because the former takes the water savings by Garwood into account which has been acquired by LCRA since the 2001 Region K Water Plan was developed.

Details of this conservation estimate can be found in a report titled Conservation Strategies in the LCRA Irrigation Divisions – 2007 dated May 23, 2008. Recent changes to the conservation estimates are reflected in the table below.

**Table 4.91 Irrigation District Conveyance Improvement Estimates**

| WUG Name | County | River Basin | Draft Water Management Strategies (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Irrigation | Colorado | Brazos-Colorado | | 8,282 | 8,282 | 8,282 | 8,282 | 8,282 |
| Irrigation | Colorado | Lavaca | | 14,056 | 14,056 | 14,056 | 14,056 | 14,056 |
| Irrigation | Matagorda | Brazos-Colorado | | 6,107 | 6,107 | 6,107 | 6,107 | 6,107 |
| Irrigation | Matagorda | Colorado | | 2,983 | 2,983 | 2,983 | 2,983 | 2,983 |
| Irrigation | Matagorda | Colorado-Lavaca | | 6,160 | 6,160 | 6,160 | 6,160 | 6,160 |
| Irrigation | Wharton | Brazos-Colorado | | 16,303 | 16,303 | 16,303 | 16,303 | 16,303 |
| Irrigation | Wharton | Colorado | | 2,518 | 2,518 | 2,518 | 2,518 | 2,518 |
| Irrigation | Wharton | Colorado-Lavaca | | 8,591 | 8,591 | 8,591 | 8,591 | 8,591 |
| **TOTAL** | | | | **65,000** | **65,000** | **65,000** | **65,000** | **65,000** |

Note: Demand reductions through advanced conservation made available under LSWP were distributed to county-basin irrigation WUGs based on the location of shortages. These estimates are to be refined as a part of the LSWP studies and it is anticipated that these needs will be addressed by managing all of the components as a LCRA system.

*Opinion of Probable Cost*

The total estimated cost for the LCRA-SAWS Water Project is $2,159,600,000, as developed by the Region L consultant. Per the Definitive Agreement between LCRA and SAWS, SAWS is responsible for LSWP costs. The costs are paid primarily through water use fees and surcharges over the life of the project. Region K is not responsible for the costs associated with the LSWP.

*Issues and Considerations*

**Table 4.92 Irrigation District Conveyance Improvement Issues**

| Management Strategy | Environmental Flows | Wildlife Habitat | Cultural Resources | Agricultural Resources | Other Water Resources | Social/Economic |
|---|---|---|---|---|---|---|
| Irrigation Delivery System Improvements | Reduced irrigation return flows to bay and estuaries. | None anticipated. | None anticipated. | None anticipated. | None anticipated. | Cost exceeds irrigators' ability to pay. |

*Environmental Impact*

The improvement of existing irrigation conveyances that provide water to farms will allow for customers to be served with fewer losses in transmission. This will result in a reduced overall demand for water and will reduce the volume of diversions that will have to be dedicated to maintaining flow in canals. This may be environmentally beneficial to instream flows in certain portions of the basin, but transfer of water out of the basin may not be beneficial to bay and estuary freshwater inflows or instream flows in the lower portions of the Colorado River.

### 4.9.3 Conjunctive Use of Groundwater Resources

The water needed for irrigation in Colorado, Wharton, and Matagorda Counties is the largest deficit identified within the LCRWPA. Conjunctive use of groundwater from the Gulf Coast aquifer during drought is one of the water management strategies developed under the LSWP to address the issue.

*Analysis*

This water management strategy would involve the construction of approximately 90-133 wells scattered throughout the Garwood, Gulf Coast, Lakeside, and Pierce Ranch Irrigation Operations. All wells would be completed into either the Evangeline or Chicot Formations. Groundwater would be pumped from these wells into the irrigation canal systems during conditions when surface water availability is not sufficient to meet the demands.

It was anticipated in the 2001 Plan that conjunctive use of groundwater in LCRWPA could generate an average yield of 62,000 ac-ft/yr during a repeat of the drought of record. The 2008 PVA of LSWP confirmed that at least 62,000 ac-ft/yr of groundwater would be available to support agriculture in the Lower Colorado River Basin on average, with an annual maximum of 95,000 ac-ft/yr. For the 2011 Plan, a value of 62,000 ac-ft/yr is shown in the tables by decade as representing the average annual pumping during the 10 year drought of record conditions. An annual maximum year pumpage of 95,000 acre-feet annually was used in the modeling of the conjunctive use system. Estimated yield of water from this strategy by WUG is presented in *Table 4.93*.

**Table 4.93 Development of the Gulf Coast Aquifer Estimated Yield**

| WUG Name | County | River Basin | Draft Water Management Strategies (ac-ft/yr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Irrigation | Colorado | Brazos-Colorado | | | 4,886 | 4,886 | 4,886 | 4,886 | 4,886 |
| Irrigation | Colorado | Lavaca | | | 9,920 | 9,920 | 9,920 | 9,920 | 9,920 |
| Irrigation | Matagorda | Brazos-Colorado | | | 14,437 | 14,437 | 14,437 | 14,437 | 14,437 |
| Irrigation | Matagorda | Colorado | | | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 |
| Irrigation | Matagorda | Colorado-Lavaca | | | 13,553 | 13,553 | 13,553 | 13,553 | 13,553 |
| Irrigation | Wharton | Brazos-Colorado | | | 12,766 | 12,766 | 12,766 | 12,766 | 12,766 |
| Irrigation | Wharton | Colorado | | | 532 | 532 | 532 | 532 | 532 |
| Irrigation | Wharton | Colorado-Lavaca | | | 4,433 | 4,433 | 4,433 | 4,433 | 4,433 |
| **TOTAL** | | | | | **62,000** | **62,000** | **62,000** | **62,000** | **62,000** |

Note: Groundwater supplies made available under LSWP as shown here are estimated to be the average over the DOR, and were distributed to county-basin irrigation WUGs based on the location of shortages. These estimates are to be refined as a part of the LSWP studies and it is anticipated that these needs will be addressed by managing all of the components as a LCRA system.

Groundwater aquifers located within the three rice irrigation counties are a potential source of water for the irrigators. These groundwater resources could be developed in a manner to be used conjunctively with the existing surface water supply. The groundwater wells would only be used to provide water when the surface water available was not sufficient to meet the demands in conjunction with advanced conservation for LSWP and HB 1437. During these conditions, water would be pumped from the ground and released into the irrigation distribution canals.

*Modeling Performed for 2000 Region K Water Planning*

In the 2001 Plan, three alternative scenarios were evaluated to supplement the supply of water to the Lakeside and Gulf Coast Irrigation Divisions with groundwater. The three scenarios included various levels of average groundwater dependence, 25,000 ac-ft/yr, 50,000 ac-ft/yr, and 100,000 ac-ft/yr. It was assumed that the wells would be constructed so that they would be scattered throughout the two irrigation divisions. All of the wells in the Gulf Coast Irrigation Division were assumed to be located within the Chicot Formation of the Gulf Coast aquifer. For the 25,000 ac-ft/yr alternative, all of the wells in the Lakeside Irrigation Division would be in the Evangeline Formation. For the 50,000 and 100,000 ac-ft/yr alternatives, one-third of the wells in the Lakeside Irrigation Division would be in the Chicot Formation, and the remainder would be in the Evangeline Formation.

The three alternatives were modeled using the Gulf Coast aquifer hydrologic model to determine the temporary and long-term impacts of the conjunctive use alternatives. The demand for groundwater was simulated based on results from the LCRA's Response Model for various levels of irrigation demands, which incorporates the following assumptions:

- A full drought cycle was modeled based on the 1941 to 1965 historic rainfall conditions.
- The drought cycle would begin in the year 2026 and continue through 2050.
- If groundwater pumping is required, it would occur during the first six months of the year.
- The modeling cycle was extended by 10 years to evaluate the aquifer recovery after the drought cycle.
- Each well would have a capacity of 2,000 gpm, which equates to an annual capacity of 1,613 ac-ft based on 6 months of operation.
- The number of wells required was based on the peak demand plus 10 percent.
- The projected demands for groundwater from other WUGs were imposed on the model at the same time.

The number of wells required for each of the alternative scenarios is presented in *Table 4.94*.

**Table 4.94 Number of Wells Required for Conjunctive Use**

| Aquifer | 25,000 ac-ft/yr Conjunctive Use | 50,000 ac-ft/yr Conjunctive Use | 100,000 ac-ft/yr Conjunctive Use |
|---|---|---|---|
| **Lakeside District** | | | |
| Evangeline | 16 | 12 | 24 |
| Chicot | 0 | 5 | 11 |
| **Gulf Coast District** | | | |
| Chicot | 17 | 20 | 42 |

The conjunctive use of the groundwater wells will have both short-term and long-term impacts on groundwater levels in the region. The predicted impacts on these two formations are presented in *Table 4.93*.

**Table 4.95 Impact of Conjunctive Use on Aquifer Levels (ft)**

| Formation | No Conjunctive Use | 25,000 ac-ft/yr Conjunctive Use | 50,000 ac-ft/yr Conjunctive Use | 100,000 ac-ft/yr Conjunctive Use |
|---|---|---|---|---|
| **Evangeline Formation** | | | | |
| Maximum Short-Term Drawdown | 30 | 90 | 100 | 190 |
| Maximum Long-Term Drawdown | 30 | 40 | 50 | 60 |
| **Chicot Formation** | | | | |
| Maximum Short-Term Drawdown | 10 | 75 | 90 | 170 |
| Maximum Long-Term Drawdown | 10 | 12 | 12 | 15 |

As the table indicates, the model results show that the Chicot Formation will almost fully recover following the drought cycle. In addition, the maximum temporary aquifer drawdowns in the Chicot Formation are associated with pumpage from the Gulf Coast Division. The temporary drawdowns in the Lakeside Division are smaller. The Evangeline Formation is shown to have much larger temporary drawdowns and does not fully recover following the drought cycle.

This alternative was specifically evaluated for the Lakeside and Gulf Coast Irrigation Divisions. However, it may be possible to obtain similar results through the conjunctive use of groundwater in Pierce Ranch.

*Status of Modeling for the Current Plan Development*

The LSWP Groundwater Team ("GWT") completed a study in 2008 to quantify the predicted impacts of LSWP on groundwater drawdowns in the LCRWPA. As part of the study the GWT developed and calibrated a groundwater model capable of simulating the impacts of the LSWP's pumping activities on drawdown, land subsidence, groundwater availability estimates, and changes in surface water-groundwater interactions. The model was used to evaluate the impact of pumping up to an average of 36,000 ac-ft/yr of additional supply from the Lakeside, Garwood, Gulf Coast, and Pierce Ranch Irrigation Operations in the Lower Colorado River Basin. The model simulations included changes to the LSWP pumping rates and recharge rates based on a Drought of Record (DOR) from 1947 to 1956. For the 10-year DOR period in the simulation with LSWP (Case 2), the average LSWP pumping is 62,000 ac-ft/yr. The simulation is for the years 2000 to 2090 and the DOR was 2056 to 2065.

The primary drawdown metric used in the GWT report was the net drawdown caused by LSWP at 5,579 well locations representing all the permitted and registered wells in Wharton and Matagorda Counties, and the Colorado County wells in the GWT database. Net drawdown was defined as the difference between drawdown with and without LSWP. The 2008 GWT report characterize the regional drawdowns as follows:

- Net drawdown is greatest in 2060 during the time of increased pumping caused by the DOR.
- For the majority of the area in the three counties (Colorado, Wharton, Matagorda), the maximum values for net drawdown range between 2-10 feet within the irrigation operations.
- For 2040, 2060, and 2080 snapshots, the largest net drawdown values consistently occur in two areas: Colorado County near the upper portions of Lakeside and Garwood Irrigation Districts, and in Matagorda County near the middle of the East and West sections of the Gulf Coast Irrigation Division.
- The drawdown values for the five model layers (shallow aquifer system and aquifer outcrop, Beaumont Formation, Lissie Formation, Willis Formation, Upper Goliad Formation, and Lower Goliad Formation) are the smallest for the shallow aquifer.
- Among Colorado, Wharton, and Matagorda Counties, Wharton County has the smallest net drawdown values.

The release of the information contained in this study coincides with activities being performed by Groundwater Management Area 15 (GMA 15) and the groundwater districts in the three counties. At this time there has not been adequate review of the LSWP GWT study by GMA 15 and the groundwater districts to allow incorporation of this information into the GMA process. For this reason the availability of groundwater in Colorado, Matagorda, and Wharton Counties is based on the management plans from the respective groundwater districts.

*Consistency with Plans of Local Groundwater Conservation Districts*

Matagorda and Wharton Counties have existing groundwater conservation districts, each of which have developed groundwater management plans based on the estimation of the sustainable amounts of groundwater that can be produced annually. The addition of the of 95,000 ac-ft/yr annual maximum of groundwater planned for the LSWP to be available during the drought, when added to the existing and proposed groundwater uses of these two counties, will cause the total groundwater demand to exceed the sustainable supplies as defined by the Coastal Bend GCD (Wharton County) and the Coastal Plains GCD (Matagorda County). The amount of additional groundwater to be produced will be produced only during a DOR condition when surface water is not available. Surface water is less expensive to produce and will be chosen over groundwater when it is available. This will allow the aquifer to recover during times of more plentiful surface water. This strategy will require the concurrence of the two GCDs noted above.

*Opinion of Probable Cost*

The total estimated cost for the LSWP is $2,159,600,000, as developed by the Region L consultant. Per the Definitive Agreement between LCRA and SAWS, SAWS is responsible for LSWP costs. The costs are paid primarily through water use fees and surcharges over the life of the project. Region K is not responsible for the costs associated with the LSWP. The portion of these costs related to development of groundwater assumed development of wells that pump the annual maximum amount of groundwater or 95,000 ac-ft/yr.

*Issues and Considerations*

**Table 4.96 Conjunctive Use of Groundwater Issues**

| Management Strategy | Environmental Flows | Wildlife Habitat | Cultural Resources | Agricultural Resources | Other Water Resources | Social/Economic |
|---|---|---|---|---|---|---|
| Conjunctive Groundwater Use | Increased irrigation return flows to bay and estuaries. | None anticipated. | None anticipated. | None anticipated. | Localized drawdowns of aquifer may affect wells. | Cost exceeds irrigators' ability to pay. |

*Environmental Impact*

- Sustained water fowl habitat.
- Decreases in aquifer level; however, no known significant springs in the area are currently flowing so decreased spring flow would not be an issue.

The use of groundwater supplies to augment surface water diversions during dry periods can potentially sustain rice irrigation during a drought of record. This strategy would introduce groundwater to streams through return flows when there would normally be very little streamflow. This could potentially benefit instream flows in certain portions of the basin, though this water would be diverted from the basin before it could make a positive impact on instream flows and bay and estuary freshwater inflows in the lower portions of the river. Maintaining the acreage of planted rice during dry periods would also provide beneficial habitat for waterfowl.

Increased demands on the aquifer caused by this strategy could result in both short term and long term impacts to aquifer levels. Impacts to existing wells may occur from this additional drawdown. No significant springs are known to be fed by the aquifers in the lower counties of the basin, and therefore there would be no impact to wildlife from short-term increased withdrawals from groundwater. If drawdowns become severe enough to impact rice acreage, the reduced acreage would have a negative impact on wildlife habitat and return flows.

*Impacts to Agriculture*

This strategy could have both positive and negative impacts on agriculture. Those producers using surface water will have access to sufficient water to grow crops that would not otherwise have been available. However, those producers using primarily groundwater will probably see increased costs for bringing water to the surface for use. These increases will be small, and additional modeling will be needed to determine whether they occur only during the heavy pumping through the drought of record or if the potential long term drawdowns are still present.

### 4.9.4 Development of New Rice Varieties

The water needed for irrigation in Colorado, Wharton, and Matagorda Counties is the largest deficit identified within the LCRWPA. Development of high yielding/water efficient rice varieties is one of the water management strategies developed under the LSWP to address the water shortage for irrigation.

*Analysis*

Estimates of savings were originally based on the 2004 PVA of LSWP, but ongoing studies have continued to refine the estimates. Results of the 2008 PVA indicate an estimated savings of 40,800 ac-ft/yr based on a 75 percent adoption of the new rice variety.

The table below presents the water that the irrigation WUGs would save by implementing this strategy.

**Table 4.97 Development of New Rice Varieties**

| WUG Name | County | River Basin | Draft Water Management Strategies (ac-ft/yr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| Irrigation | Colorado | Brazos-Colorado | | | 4,548 | 4,548 | 4,548 | 4,548 | 4,548 |
| Irrigation | Colorado | Lavaca | | | 10,181 | 10,181 | 10,181 | 10,181 | 10,181 |
| Irrigation | Matagorda | Brazos-Colorado | | | 3,661 | 3,661 | 3,661 | 3,661 | 3,661 |
| Irrigation | Matagorda | Colorado | | | 486 | 486 | 486 | 486 | 486 |
| Irrigation | Matagorda | Colorado-Lavaca | | | 4,468 | 4,468 | 4,468 | 4,468 | 4,468 |
| Irrigation | Wharton | Brazos-Colorado | | | 13,293 | 13,293 | 13,293 | 13,293 | 13,293 |
| Irrigation | Wharton | Colorado | | | 144 | 144 | 144 | 144 | 144 |
| Irrigation | Wharton | Colorado-Lavaca | | | 4,019 | 4,019 | 4,019 | 4,019 | 4,019 |
| **TOTAL** | | | | | **40,800** | **40,800** | **40,800** | **40,800** | **40,800** |

Note: Demand reductions through advanced conservation made available under LSWP were distributed to county-basin irrigation WUGs based on the location of shortages. These estimates are to be refined as a part of the LSWP studies and it is anticipated that these needs will be addressed by managing all of the components as a LCRA system.

The availability and cost of water for rice irrigation are key factors in the continued economic viability of the rice industry in the region. Reducing the amount of water needed to irrigate the rice fields would provide the producers a financial benefit, while at the same time address the overall water supply shortage within the basin. Agricultural research has been successful in developing new varieties of crops that meet specific requirements. The development of new, high yield-lower water use rice varieties could provide a significant reduction in the water demands.

According to the LSWP report, a study has been conducted by Texas A&M University on the development of a new rice variety. It estimates that this new variety would produce a 24 percent water savings (based on a two-crop system using approximately 3.5 ac-ft/ac of water), take slightly longer to grow, and produce a higher yield. This alternative would eliminate the ratoon crop due to the longer growing season, thus eliminating the income produced by that crop. However, since this variety has a higher yield and would require only one crop, the profits should increase.

*Opinion of Probable Cost*

The total estimated cost for the LSWP is $2,159,600,000, as developed by the Region L consultant. Per the Definitive Agreement between LCRA and SAWS, SAWS is responsible for LSWP costs. The costs are paid primarily through water use fees and surcharges over the life of the project. Region K is not responsible for the costs associated with the LSWP.

*Issues and Considerations*

**Table 4.98 Development of New Rice Varieties Issues**

| Management Strategy | Environmental Flows | Wildlife Habitat | Cultural Resources | Agricultural Resources | Other Water Resources | Social/Economic |
|---|---|---|---|---|---|---|
| Development of New Rice Varieties | Reduced reliance on instream surface water | Potential reduction in migratory geese habitat | None anticipated. | None anticipated. | None anticipated. | Cost exceeds irrigators' ability to pay. |

This alternative is a concern to the waterfowl hunting industry because of their dependency on the second crop. It is unclear as to how this will affect the income of this industry.

*Environmental Impact*

The development of new rice varieties that require less water for production would decrease the demand for surface water resources in the LCRWPA and allow more water to be retained instream for ecological uses in some portions of the basin. However, this water would, ultimately, be diverted to Region L before its beneficial impacts on instream flows and bay and estuary inflows were realized in the lower basin. Use of a rice variety that would increase efficiency by eliminating the need for a second crop may limit habitat for waterfowl later in the year, although the primary migratory waterfowl season occurs later in the year.

*Impacts to Agricultural Resources*

The overall impact on agriculture from the implementation of this strategy should be beneficial. The implementation of a single rice variety that provides the same approximate yield that is now produced from a first and a second crop, will lead to savings in labor and machinery cost in not having to manage and harvest two crops.

### 4.9.5 HB 1437

HB 1437 requires water being transported out of the Colorado River Basin to the Brazos River Basin to be replaced to the extent that there is no net loss of surface water in the Colorado River Basin. One of the methods for replacing that water is through on-farm conservation in the lower three counties. Through the HB 1437 process, farmers within LCRA's irrigation divisions will receive funding of about 80 percent of the total costs, with farmers bearing 20 percent of the cost for implementing laser land leveling for conservation savings. In September 2008 numbers, this is estimated to cost $19,019,500 for the total 25,000 ac-ft of water expected to be saved in the later decades of the planning horizon by such strategy. *Table 4.99* below lists each of the irrigation WUGs in Region K that will utilize this strategy and the corresponding cost estimates for each. The total estimated cost to be paid by Region K farmers was divided among the various irrigation WUGs based on the amount of supply to be provided to that WUG by the strategy.

**Table 4.99 HB 1437 Strategy for Irrigation WUGs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Irrigation | Colorado | Brazos-Colorado | $0 | $0 | $0 | $0 |
| Irrigation | Colorado | Lavaca | $0 | $0 | $0 | $0 |
| Irrigation | Matagorda | Brazos-Colorado | $1,863,134 | $1, 863,134 | $162,437 | $13.31 |
| Irrigation | Matagorda | Colorado | $30,543 | $30,543 | $2,663 | $13.31 |
| Irrigation | Matagorda | Colorado-Lavaca | $1,313,357 | $1,313,357 | $114,504 | $13.31 |
| Irrigation | Wharton | Brazos-Colorado | $549,777 | $549,777 | $47,932 | $13.31 |
| Irrigation | Wharton | Colorado | $30,543 | $30,543 | $2,663 | $13.31 |
| Irrigation | Wharton | Colorado-Lavaca | $30,543 | $30,543 | $2,663 | $13.31 |

*Environmental Impact*

On-farm conservation for rice production could influence the instream water balance during dry, summer months in two ways: (1) by reducing the amount of return flows introduced to streams, and (2) by reducing the amount of water diverted from streams to irrigate for the second rice crop immediately following harvest of the first. The balance of these two impacts could potentially result in a net gain or loss in dry weather instream flows, depending on the farming practices used. First, the reduced application rates required by conservation would negatively impact return flows to streams, which occur during the summer months when this discharge can provide habitat for species and other ecological services. However, following the harvest of the first rice crop, a certain acreage is flooded again to grow a second crop to be harvested in September and October. Second, conservation could have a positive impact on instream flows by reducing the amount of water diverted to provide for rice irrigation at this time.

The overall balance of return flows and withdrawals for this period was estimated from information that was originally assembled for calculating irrigation water demands in Colorado, Matagorda, and Wharton Counties. The ratios of water used for first and second crops for both groundwater and surface water irrigated fields for each county were used to divide the expected conservation, as estimated by LCRA, between the first and second crops. It was assumed that all water that could be conserved by on-farm practices was water that would otherwise be discharged to streams in return flows. In addition, return flows were assumed to be 4 inches for all fields before conservation. The expected surface water withdrawals after implementing conservation were then used to determine an overall balance for water being returned and diverted during the summer.

*Impacts to Agricultural Resources*

The proposed overall strategy replaces water supplies moved to other uses. As long as the alternative supplies are provided and provided in a timely manner, there should be no negative impact on agriculture.

## 4.10 LIVESTOCK WATER MANAGEMENT STRATEGIES

Region K has 282 WUGs, 30 are Livestock. *Table 4.100* shows the water needs for all of the Livestock WUGs in Region K and the number of WUGs with water deficits for each decade.

**Table 4.100 Livestock Water Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Livestock | (188) | (188) | (188) | (188) | (188) | (188) |
| No. of WUGs | 6 | 6 | 6 | 6 | 6 | 6 |

The following regional water management strategies were selected to meet these Livestock needs:

- Expansion of current groundwater supplies
- Development of new groundwater supplies

These regional strategies are explained in detail in Section 4.7 of this report.

## 4.11 MANUFACTURING WATER MANAGEMENT STRATEGIES

Region K has 282 WUGs, 30 are Manufacturing. *Table 4.101* shows the water needs for all of the Manufacturing WUGs in Region K and the number of WUGs with water deficits for each decade.

**Table 4.101 Manufacturing Water Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Manufacturing | (146) | (298) | (452) | (605) | (741) | (934) |
| No. of WUGs | 3 | 4 | 4 | 4 | 4 | 6 |

Several strategies have been identified to meet manufacturing WUG needs. The following regional water management strategies were selected to meet some of these Manufacturing needs:

- Expansion of current groundwater supplies
- Transfer/Allocate water from WUGS with surplus
- Drought Management

These regional strategies are explained in detail in Section 4.7 of this report.

## 4.12 MINING WATER MANAGEMENT STRATEGIES

Region K has 282 WUGs, 30 are Mining. *Table 4.102* shows the water needs for all of the Mining WUGs in Region K and the number of WUGs with water deficits for each decade.

**Table 4.102 Mining Water Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Mining | (13,550) | (13,146) | (12,366) | (6,972) | (5,574) | (5,794) |
| No. of WUGs | 6 | 7 | 7 | 6 | 6 | 6 |

The following regional water management strategies were selected to meet these Mining needs:

- Expansion of current groundwater supplies
- Development of new groundwater supplies

These regional strategies are explained in detail in Section 4.7 of this report.

## 4.13 STEAM ELECTRIC POWER WATER MANAGEMENT STRATEGIES

Region K has 282 WUGs, 30 are Steam Electric Power. *Table 4.103* shows the water needs for all of the Steam Electric Power WUGs in Region K and the number of WUGs with water deficits for each decade.

**Table 4.103 Steam Electric Power Water Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Steam Electric | (193) | (53,005) | (53,175) | (76,430) | (81,930) | (89,042) |
| No. of WUGs | 1 | 1 | 2 | 4 | 4 | 5 |

Several strategies have been identified to meet steam electric power WUG needs. The following regional water management strategy was selected to meet some of these Steam Electric Power needs:

- Expansion of current groundwater supplies

This regional strategy is explained in detail in Section 4.7 of this report.

The following sections provide a description, analysis, and cost breakdown for the other steam electric power strategies.

### 4.13.1 LCRA Steam Electric Water Management Strategies

LCRA has assumed, as part of its strategies discussed in Section 4.6.1, that it will make additional water available to meet shortages in steam electric power water needs from the operation of its system. LCRA intends to use a portion of its Garwood water right to meet its own demand at the Fayette Power Project, although this would require an amendment of the Garwood water right.

### 4.13.2 COA Steam Electric Water Management Strategies

The City of Austin has steam electric power needs in Fayette, Matagorda, and Travis Counties. Austin's portion of the South Texas Nuclear Project (STNP) demand is included in the STNP total steam electric demand in Matagorda County, and is therefore not addressed here. *Table 4.104* shows the steam electric water demands in Fayette and Travis Counties.

**Table 4.104 COA Steam Electric Power Water Demand (ac-ft/yr)**

| County Name | 2010 Demand | 2020 Demand | 2030 Demand | 2040 Demand | 2050 Demand | 2060 Demand |
|---|---|---|---|---|---|---|
| Fayette – Austin's portion | 14,622 | 14,702 | 18,002 | 25,742 | 25,742 | 31,652 |
| Travis | 17,500 | 18,500 | 22,500 | 23,500 | 27,500 | 28,500 |
| **TOTAL** | **32,122** | **33,202** | **40,502** | **49,242** | **53,242** | **60,152** |

To meet Austin's steam electric power needs, Austin has identified three main sources of water. These are COA ROR water rights, LCRA firm water supply contracts (purchase water from LCRA), and direct water reuse. These are summarized in *Table 4.105* showing the steam electric supplies and water management strategies in Fayette and Travis Counties.

**Table 4.105 COA Steam-Electric Supplies and Water Management Strategies (ac-ft/yr)**

| COA Supplies & Strategies | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| ***Supplies*** | | | | | | |
| COA Run of River (Steam Electric - Fayette) | 1,267 | 1,267 | 1,267 | 1,267 | 1,267 | 1,267 |
| LCRA Contract (Steam Electric - Fayette) | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| ***Strategies*** | | | | | | |
| Purchase from LCRA (Steam Electric) Fayette | | | | 20,975 | 20,975 | 26,885 |
| **Fayette Total** | **4,767** | **4,767** | **4,767** | **25,742** | **25,742** | **31,652** |
| ***Supplies*** | | | | | | |
| COA Run of River (Steam Electric - Decker & Lady Bird Lake) | 7,153 | 7,153 | 7,153 | 7,153 | 7,153 | 7,153 |
| LCRA Contract (Steam Electric Decker & Lady Bird Lake) | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 | 15,174 |
| ***Strategies*** | | | | | | |
| Direct Reuse (Steam Electric) Travis | 2,315 | 3,315 | 7,315 | 8,315 | 12,315 | 13,315 |
| **Travis Total** | **24,642** | **25,642** | **29,642** | **30,642** | **34,642** | **35,642** |
| | | | | | | |
| **Total Steam-Electric** | **29,409** | **30,409** | **34,409** | **56,384** | **60,384** | **67,294** |

It is anticipated that there will be additional infrastructure needed. The probable costs associated with the Austin's direct reuse water management strategy for supplying steam electric needs in Travis County are estimated to be approximately $851/ac-ft (see water reclamation cost Section 4.6.2.2, *Table 4.38*). Further, it is anticipated that there will be additional long-term costs associated with Austin's indirect steam electric power water management strategy to meet its projected shortages at the Fayette Power Project over the planning period. It is expected that there will be infrastructure costs associated with increasing the capacity of the pump station, and associated infrastructure, as well as other potential costs. However, it is assumed that these anticipated long-term costs would be essentially the same for all feasible alternatives, and are therefore not quantified here.

### 4.13.3 STP Nuclear Operating Company Water Management Strategies

The STP Nuclear Operating Company (STPNOC)'s water demand is reflected in *Table 2.10*. This demand is based on higher availability of generation capacity, added generating capacity, and blowdown of the reservoir to maintain water quality. This demand during the 50-year planning horizon will be satisfied significantly through (1) the management strategies of continued run-of-the-river diversions of up to 102,000 ac-ft/yr, under Certificate of Adjudication No. 14-5437[9], (2) continued use of STPNOC's existing off-channel reservoirs authorized under Certificate of Adjudication No. 14-5437 and a potential

[9] STPNOC's interest in the water rights evidenced in the certificate are as agent for the STPNOC owners, the City of San Antonio acting through the City Public Service Board, COA, and NRG South Texas, LP.

amendment to 14-5437 to pump greater than 102,000 acre-feet when the water is available (Water Right Permit Amendment strategy); and (3) continued pumpage of groundwater for the purposes of incorporation in STPNOC's processes. Supplementing its run-of-the-river diversions, STPNOC also has a contract with LCRA for firm backup water of 20,000 acre-feet for 2-unit operation and 40,000 acre-feet for additional generating units, for so long as electric generation facilities are operated at the site.

Refer to *Section 1.2.2.2* for socioeconomic information related to the STPNOC and *Section 3.2.1.1.2* for a description of reservoir operation. Based on current projections completed for the 2011 Lower Colorado Regional Water Plan (Region K), shortages of 53,000 ac-ft/yr or more have been identified commencing as early as 2020 for Steam Electric supplies in Matagorda County during a repeat of the DOR, refer to *Table 4.106)*. It is of additional note that STPNOC's run-of-the-river diversions can be affected by water quality at the STPNOC diversion point. In order to support a long-term reliable electric supply for Texas, alternative strategies have been identified for offsetting these shortages and to guard against the continuing escalation in upstream demands which may affect water quality at the current permitted diversion point near the plant, although the recent amendment to the water right to allow diversion upstream of the LCRA Bay City dam may provide some ability to mitigate any water quality impacts.

**Table 4.106 Steam-Electric Shortages in Matagorda County (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Steam Electric Matagorda County | (193) | (53,005) | (53,005) | (53,005) | (53,005) | (53,125) |

Note: For 2020-2060, 30,000 ac-ft of Matagorda County's shortage is due to a future planned steam-electric power plant that is not part of STPNOC. More about this shortage is discussed in Section 4.13.4

STPNOC and LCRA negotiated an extension and amendment to the water supply contract in 2006, which helps ensure a long-term, cost effective water supply for the STP plant. Additional and alternative strategies include but are not limited to the following:

- Expand supply from STPNOC reservoir
- Blend brackish surface water in STPNOC reservoir
- Rainwater harvesting
- Subordination of upstream senior water rights
- Dedication of return flows from other users

Conservation also is an integral part of STPNOC's operational philosophy as documented in the Water Conservation Plan filed with the TCEQ.

#### *4.13.3.1 Water Right Permit Amendment*

This strategy would amend STPNOC's current water right permit to increase the total authorized diversion, which would allow STPNOC to pump additional water from the Colorado River during times of high flow. During the wetter years of a drought-of-record, STPNOC would be able to increase the amount of water to their reservoir, which would provide a higher firm yield averaged over the drought-of-record.

For the Region K Plan, a firm yield analysis was performed to determine the amount of water that would potentially be available. The annual diversion limit was increased from 102,000 ac-ft to 145,000 ac-ft. This increased diversion provided an additional firm yield of 5,500 ac-ft.

Prior to applying for the permit amendment, additional studies and modeling would need to be performed. Project costs for studies and application costs are estimated at $50,000 by STPNOC, or a per ac-ft cost of $9.09/ac-ft.

STPNOC is located within the tidal reaches of Matagorda Bay, so environmental impacts to instream flows would be small. During periods of high flows, this strategy would divert water that would otherwise increase the freshwater inflows to Matagorda Bay, but should not have an impact during periods of low or average flow. Tabular results of the quantitative environmental impact are presented in *Appendix 4G*. No impacts to agriculture are expected.

#### *4.13.3.2 Expand Supply from STPNOC Reservoir*

This strategy is recommended to meet a 2010 shortage of 193 ac-ft. Because the shortage is small and near-term, the best option would be to use an additional 193 ac-ft from their on-site reservoir. This strategy has no cost associated with it, no environmental impacts, and no impacts to agriculture.

#### *4.13.3.3 Blend Brackish Surface Water in STPNOC Reservoir*

During an emergency situation, when the STPNOC reservoir reaches 30 feet mean sea level (MSL), STPNOC and LCRA will pursue relief from the TCEQ to be allowed to pump brackish surface water to blend in with the existing fresh water in the STPNOC reservoir. A firm yield of 17,505 ac-ft was determined for this planning cycle. This strategy has no cost associated with it, no environmental impacts, and no impacts to agriculture.

#### *4.13.3.4 Rainwater Harvesting*

STPNOC has proposed rainwater harvesting as a potential management strategy for meeting steam electric power generation water shortages for Matagorda County. STPNOC currently operates a Main Cooling Reservoir with a surface acreage of 7,000 acres and a maximum permitted storage of 202,600 ac-ft, plus a 47-acre Essential Cooling Pond at their facilities in Matagorda County. Both of these reservoirs are currently represented in the Region K Cutoff Model. These reservoirs are fed by a ROR diversion right and groundwater which is backed up by an LCRA contract up to a total maximum diversion of 102,000 ac-ft/yr. These reservoirs have a required low water level of approximately 59,000 ac-ft to provide necessary reliability of storage for cooling water for STPNOC's nuclear power generation plant. While these facilities are included in the model, there is no separate firm yield calculated for the storage, primarily because of the requirement to maintain a large minimum storage pool.

Since the reservoir is included in the model, the calculations of rainfall and evaporation from the surface are included in the computations of reservoir surface elevations. STPNOC estimates that an inch of rainfall falling upon the surface of the reservoirs translates into potentially 580 ac-ft of water in storage per rainfall occurrence. While the WAM only computes reservoir surfaces on a monthly basis, the impact of significant rainfall is felt on a daily basis if certain significant rainfall events were to occur. In this instance, if the reservoir is modeled as calling for water from the ROR, the water that is otherwise supplied by rainfall results in a potential supply to instream flows to the bay and estuary. Since there is a

6-day travel time between the Highland Lakes and the STP diversion location, any intervening rain cannot be subtracted from the release of inflows that have already been made to satisfy the STPNOC demand as well as meet the freshwater inflow requirements for the bay. Therefore, allowing up to 580 ac-ft to flow by its diversion location may not provide any additional benefit to the yield of the Highland Lakes. In addition, this small amount of water provided at unpredictable times may have a significant impact.

**Total Cost** $0

**Capital Cost** $0. All of the necessary infrastructure is already in place to lift water from the river

**O&M Cost** $0. There is actually a reduction in O&M cost as the water does not have to be pumped from the river into STPNOC's reservoirs

**Firm Yield** 0 ac-ft annually. It is not possible to come up with a firm yield computation with the current models. However, it is possible to estimate the reduction in the ROR draw based on the amount of rainfall that occurs during the DOR. Amounts of diversion foregone would be larger during years of normal rainfall.

*Analysis*

STPNOC provided rainfall information from data collected by its plant personnel. The rainfall data covered the period from 1996 through 2004. Annual rainfall during that period ranged from 12.35 inches per year for the low to 58.55 inches per year for the high. These rainfall amounts translate to 7,279 ac-ft/yr under the lowest annual rainfall to approximately 34,000 ac-ft during the highest annual rainfall period. Average rainfall for the area is reported by STPNOC as 42 inches per year and that translates to approximately 24,000 ac-ft/yr.

The entire cooling water need for STPNOC is met either through run of the river diversions or through contract water from LCRA released from the Highland Lakes. In either event, the scheduling of releases is such that rainfall impacting the STPNOC reservoir in small amounts during dry periods does not provide sufficient warning to LCRA to curtail releases, or the plant will not have the cooling water it needs if it doesn't rain, given the amount of time it takes water to travel from the Highland Lakes to STPNOC's location in Matagorda County. As a result, the only potential beneficiary of this water is the instream and bay and estuary flows. This small amount of water provided at unpredictable times may not have a significant benefit to the bay.

*Issues and Considerations*

There are no known environmental drawbacks from the strategy. It is currently in place and intercepting rainwater. While it is not possible to quantify the amounts of water expected from this strategy, there is certainly a benefit to reducing water drawn from the river, either ROR flows or flow released from storage. Since it is dependent upon rainfall, it is not considered a firm yield supply.

### 4.13.4 Other Steam Electric Water Management Strategies

A new steam-electric power plant is planned for Matagorda County that would implement a need for 30,000 ac-ft of water in 2020. The strategy to meet this need, which is also discussed in Section 4.6.1.5, is to purchase water through a contract with LCRA.

Capital expenditures were not included with the cost of this strategy, which is currently $138 per ac-ft of water and is estimated to increase on average about 3 percent per year.

An existing industrial plant in Wharton County has a need in 2060 based on their current demands, but also has future plans for expansion. Their run-of-river water right on the San Bernard River does not provide enough firm water to meet their current demands in 2060, leaving the plant with a need of 82 ac-ft. The strategy recommended to meet this need and any potential future needs is the development of a new well field in the Gulf Coast Aquifer.

**Table 4.107 Gulf Coast Aquifer Development Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| Steam-Electric | Wharton | Brazos-Colorado | $164,000 | $247,800 | $30,825 | $375.92 |

## 4.14 COUNTY SUMMARIES OF WATER MANAGEMENT STRATEGIES

*Table 4.108* contains the total of all of the water management strategies in each county.

There are a few strategies that involve the transfer/allocation of water from a WUG with a surplus to a WUG with a shortage. The amount of water transferred/allocated was included in the table as a strategy, but the corresponding negative shortage (subtraction from surplus) was not included in the table since these totals are going to be compared to the true shortages (WUGs that do not have surpluses).

**Table 4.108 Water Management Strategy County Summary (ac-ft/yr)**

| County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Bastrop | 4,731 | 6,756 | 10,088 | 14,202 | 21,217 | 28,429 |
| Blanco | 0 | 0 | 0 | 0 | 41 | 64 |
| Burnet | 1,286 | 2,138 | 3,614 | 5,308 | 6,642 | 8,156 |
| Colorado | 81,208 | 144,678 | 125,706 | 95,581 | 74,761 | 109,959 |
| Fayette | 253 | 643 | 999 | 22,300 | 22,661 | 29,069 |
| Gillespie | 0 | 0 | 0 | 0 | 0 | 0 |
| Hays | 2,122 | 4,919 | 7,821 | 8,507 | 12,005 | 14,295 |
| Llano | 2,400 | 2,913 | 3,313 | 3,603 | 3,899 | 4,201 |
| Matagorda | 130,282 | 231,667 | 206,424 | 192,460 | 172,720 | 179,211 |
| Mills | 851 | 854 | 976 | 955 | 1,138 | 1,150 |
| San Saba | 13 | 22 | 19 | 15 | 14 | 15 |
| Travis | 50,059 | 72,911 | 94,662 | 116,950 | 134,646 | 156,063 |
| Wharton | 76,657 | 108,163 | 96,041 | 85,596 | 79,981 | 80,137 |
| Williamson | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | 349,862 | 575,664 | 549,663 | 545,477 | 529,725 | 610,750 |

*Table 4.109* shows the difference between *Table 4.14* (County and Regional Water Supply Condition Summary Excluding Surpluses, which shows the total shortages in each county) and *Table 4.108* (Water Management Strategy County Summary, which shows the strategies for each county). The result is that all of the shortages in Region K are being met from 2010 through 2060, and in some instances there are surpluses due to the strategy implementation. There are also some additional surpluses in counties that contained WUGs that did not have any shortages and had some excess water above their demands; these surpluses are not accounted for in this table.

These surpluses in *Table 4.109* are a direct result of strategy implementation and will change as strategies are studied, refined, and updated.

**Table 4.109 Comparison of County Shortages Versus Total County Strategies (ac-ft/yr)**

| County | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Bastrop | 172 | 0 | 0 | 122 | 284 | 284 |
| Blanco | 0 | 0 | 0 | 0 | 0 | 0 |
| Burnet | 231 | 325 | 244 | 77 | 40 | 20 |
| Colorado | 23,209 | 94,375 | 83,240 | 61,036 | 48,228 | 89,561 |
| Fayette | 48 | 109 | 162 | 125 | 67 | 0 |
| Gillespie | 0 | 0 | 0 | 0 | 0 | 0 |
| Hays | 1,280 | 2,371 | 2,944 | 1,099 | 1,343 | 1,040 |
| Llano | 938 | 1,170 | 1,469 | 1,528 | 1,568 | 1,574 |
| Matagorda | 3,291 | 57,553 | 39,029 | 31,502 | 17,956 | 30,252 |
| Mills | 11 | 26 | 174 | 220 | 363 | 363 |
| San Saba | 13 | 22 | 19 | 12 | 11 | 10 |
| Travis | 46,521 | 61,858 | 80,595 | 98,816 | 79,212 | 64,100 |
| Wharton | 16,139 | 52,338 | 44,740 | 38,656 | 37,252 | 53,285 |
| Williamson | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **91,853** | **270,147** | **252,616** | **233,193** | **186,324** | **240,489** |

## 4.15 ALTERNATIVE WATER MANAGEMENT STRATEGIES

The viability of the future LSWP water management strategy and its use to meet various needs in Region K is currently unclear due to a recent lawsuit filed by the San Antonio Water System (SAWS). As such, the LCRWPG desires to identify alternative strategies that would meet the various needs if the LSWP strategy was no longer an option. In addition, the LCRA is looking at several options to help meet future needs in the decades to come, and would like to include some of the potential strategies as alternative strategies while the evaluation process continues. Mills County is interested in keeping their options open for sources of water that can meet future needs. As such, an alternative strategy for Mills County-Other is also included.

### 4.15.1 Alternative Strategies for Rice Irrigation

Rice irrigation in the Lower Basin is one water user that has a significant portion of its needs met by the LSWP strategy through agricultural conservation and groundwater development. *Table 4.110* below shows the irrigation needs that would require strategies if the LSWP strategy was no longer a viable strategy. These needs assume that the non-LSWP irrigation water management strategies would still occur. The non-LSWP irrigation strategies are shown in *Table 4.84* in *Section 4.9.*

**Table 4.110 Rice Irrigation Needs (ac-ft/yr)**

| Category Name | 2010 Needs | 2020 Needs | 2030 Needs | 2040 Needs | 2050 Needs | 2060 Needs |
|---|---|---|---|---|---|---|
| Rice Irrigation | **0** | **48,269** | **77,738** | **100,583** | **126,694** | **141,656** |

The recommended group of alternative strategies to meet these specific needs is shown below in *Table 4.111*. Descriptions of the strategies follow the table.

**Table 4.111 Rice Irrigation Alternative Water Management Strategies (ac-ft/yr)**

| Water Management Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Expansion of Gulf Coast Aquifer | | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Off-Channel Storage in Reservoirs | | | 30,000 | 40,000 | 40,000 | 40,000 |
| On-Farm Conservation | | 20,000 | 20,000 | 35,000 | 35,000 | 35,000 |
| Irrigation Divisions Delivery System Improvements | | 20,000 | 25,000 | 40,000 | 48,000 | 48,000 |
| Conjunctive Use of Groundwater Resources | | | | | 15,000 | 15,000 |
| Enhanced Recharge of Groundwater | | | | | 17,200 | 17,200 |
| **Total** | | **50,000** | **85,000** | **125,000** | **165,200** | **165,200** |

*Expansion of Gulf Coast Aquifer*

This strategy would involve pumping additional groundwater from the Gulf Coast Aquifer, and assumes that no additional wells would need to be drilled. The unit cost, provided by the LCRWPG members involved with rice farming, was determined to be $80/ac-ft, and includes no capital costs. Environmental impacts of this strategy can be found in *Section 4.7.1.3*.

*Off-Channel Storage in Reservoirs*

This strategy involves the construction of multiple reservoirs throughout the lower portion of the basin which would divert excess flow from the Colorado River for storage while allowing average flow to pass by. The reservoirs, depending on location, could either release water directly to the irrigation canals or could release stored water back into the Colorado River for downstream diversion. The shorter distance between the stored releases and the irrigators would decrease the travel time of the releases, which in turn, would potentially reduce the number of unnecessary releases that occur when unexpected rainfall hits the lower basin.

An annual unit cost of $345/ac-ft was determined. Total project costs are approximately $122,936,000, with approximately $53,388,000 of that being capital costs.

Environmental impacts should be minimal if the appropriate environmental flow restrictions are put in place. This strategy will reduce some of the higher pulse flows to Matagorda Bay by diverting water during periods of high flow. Quantitative environmental impacts are less than five percent. Tabular results are shown in *Appendix 4G*. Discussion of the methodology behind the impact analysis is in *Section 4.17*.

*On-Farm Conservation*

This strategy is generally equivalent to the strategy presented in *Section 4.9.1* as part of the LSWP strategy. An annual unit cost of $51/ac-ft was determined. Total project costs are $6,580,000, with $5,425,000 of that being capital costs. Environmental impacts can be found in *Section 4.9.1* as well.

*Irrigation Divisions Delivery System Improvements*

This strategy is generally equivalent to the strategy presented in *Section 4.9.2* as part of the LSWP strategy. An annual unit cost of $39/ac-ft was determined. Total project costs are $6,192,000, with $4,944,000 of that being capital costs. Environmental impacts can be found in *Section 4.9.2* as well.

*Conjunctive Use of Groundwater Resources*

This strategy is generally equivalent to the strategy presented in *Section 4.9.3* as part of the LSWP strategy. An annual unit cost of $963.83/ac-ft was determined. Total project costs are $19,483,200, with $14,432,000 of that being capital costs. Environmental impacts can be found in *Section 4.9.3* as well. This strategy would not require as much groundwater as the strategy for LSWP would need, which would create a smaller environmental impact.

*Enhanced Recharge of Groundwater*

This strategy consists of diverting water from the Colorado River, when available, and pumping to one or more recharge basins where the underlying aquifer is artificially recharged by means of surface spreading or potentially deep-well injection. Environmental flow requirements and senior water rights must be satisfied before water can be diverted from the river, resulting in very low reliability as a direct supply. By utilizing recharge, water is stored in the aquifer for later use. During drought conditions, when backup surface water supplies are intermittent, additional water stored underground can provide a reliable supply without detrimental impacts to the aquifer.

A detailed technical memorandum discussing this strategy is provided in *Appendix 4C*. Analysis and costs were performed assuming infiltration through surface spreading was the method of recharge. The annual unit cost of $354/ac-ft. Total project costs are $56,296,000, with $41,049,000 of that being capital costs. Due to instream flow and freshwater inflow requirements being met before water can be diverted, limited impacts to the environment are expected.

### 4.15.2 Alternative Strategies for LCRA Wholesale Water Supply

This section contains alternative new water supply options for LCRA that were developed as part of their Water Supply Resource Plan. This water would provide additional firm yield to LCRA as a wholesale water provider and could be used to meet various needs throughout Region K, including irrigation needs. The descriptions of these strategies are from the *Water Supply Resource Plan: Water Supply Option Analysis*, prepared by CH2M Hill for LCRA in July 2009.

**Table 4.112 LCRA Wholesale Water Supply Alternative Water Management Strategies (ac-ft/yr)**

| Water Management Strategy | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Groundwater Importation | | | | 35,000 | 35,000 | 35,000 |
| Brackish Desalination of the Gulf Coast Aquifer (Desalination) | | | | 22,400 | 22,400 | 22,400 |
| **Total** | | | | **57,400** | **57,400** | **57,400** |

#### *4.15.2.1 Groundwater Importation*

This water supply option would deliver approximately 35,000 acre-feet per year of untreated groundwater from outside the Planning Area and Colorado River basin to an area in eastern Travis County. The basic infrastructure required would include production wells, collection piping and other wellfield facilities, as well as an approximately 80-mile conveyance pipeline and pump stations. Costs for water treatment and disinfection are not included. The conceptual wellfield was assumed to be located in Burleson County and the conceptual delivery point was assumed to be located at approximately SH 130 and the Colorado River. Groundwater acquisition was assumed to be leased; annual payments are included in the operation and maintenance costs. The estimated development cost is approximately $395.9 million. An alternative option would be to purchase the groundwater via a third-party contract. This option would be somewhat less expensive with no capital costs.

*Opinion of Probable Costs*

Unit Cost of Water: $1,330 /ac-ft/yr Raw Water Delivered
Unit Cost of Water: $4.08 /1,000 gal/yr Raw Water Delivered
Quantity of Water: 35,000 ac-ft/yr, beginning in 2040

Reliability = Firm
Est. Development Time: 60 months

*Environmental Considerations*

There are several endangered or threatened species that would be taken into consideration during design. Additionally, there is one Unique Reservoir and 12 Unique Stream Segments within 10 miles of the proposed pipeline alignment. A quantitative impact analysis on instream flows and freshwater inflows to Matagorda Bay was performed by assuming that 60 percent of the imported groundwater would be discharged as effluent to the Colorado River. These additional return flows would mainly increase instream flows and freshwater inflows. Discussion of the impact analysis methodology is provided in Section 4.17. Tabular results of the impacts are in *Appendix 4G*.

*Water Resources Considerations*

No groundwater modeling was conducted as part of this analysis. It is assumed that the production of this volume would conform to the water management plan and rules of the Post Oak Savannah Groundwater Conservation District.

*Agricultural & Natural Resources Considerations*

None anticipated.

*Permitting and Water Rights Considerations*

Well drilling, production and transport permits are required by the Post Oak Savannah Groundwater Conservation District. Costs for obtaining the necessary permits are included in the project development cost; production and transport fees are included in the annual costs. Groundwater rights would need to be leased or purchased based on the maximum withdrawal of 2 acre feet, per contiguous acre controlled, per year.

### *4.15.2.2 Brackish Groundwater Desalination from the Gulf Coast Aquifer (Desalination)*

This option includes the extraction of brackish groundwater from the Gulf Coast Aquifer in Matagorda County, its treatment using reverse osmosis (RO), and the delivery of approximately 22,400 acre-feet per year (20 mgd) to an area near the Port of Bay City. The RO permeate would be disposed of directly into the ground via a deep injection wellfield. The estimated development cost associated with this project is $177.6 million.

A similar strategy was recommended for STPNOC in the 2006 Region K Plan. During this round of planning, it was determined that other strategy options would be more feasible for STPNOC (See *Section 4.13.3*) than desalination. For additional information on desalination strategies in Matagorda County, please refer to the 2006 Region K Plan.

*Opinion of Probable Costs*

Unit Cost of Water: $1,260 /ac-ft/yr Treated Water Delivered
Unit Cost of Water: $3.88 /1,000 gal/yr Treated Water Delivered
Quantity of Water: 22,400 ac-ft/yr, beginning in 2040
Reliability = Firm
Est. Development Time: 72 months

*Environmental Considerations*

The Matagorda Bay region includes a significant amount of acreage designated as wetlands, which serve as the habitat for numerous terrestrial and marine species, some of which are threatened and/or endangered. Thus, impacts must be eliminated to the extent possible during construction and mitigated otherwise.

Some additional potential environmental impacts would be related to the potential degradation of the quality of the groundwater in the vicinity of the proposed wells, the impacts of the additional demand on springflows, and the management of the byproducts such as concentrated salt solution. The current groundwater availability models do not include quality information or capability to model changes in water quality. For that reason, it is not possible to determine whether or not the flows being pumped will impact the overall quality of the aquifer in this area. There are no known springs in the area, so it is unlikely there would be any negative impacts from reduced springflow. Management of the concentrated salt solution by deep well injection should adequately confine the materials within deep aquifers with similar salt concentrations to minimize any negative impacts.

*Agricultural & Natural Resources Considerations*

This strategy does not put increased demand on water supplies already being used by agriculture and does not move supply from agricultural uses to other usage. As a result, there is no anticipated impact on agricultural resources.

*Permitting and Water Rights Considerations*

Well drilling and production permits would be required from Coastal Plains Groundwater Conservation District. A Class 1 Deep Injection permit from the TCEQ for discharge of RO permeate via a deep injection wellfield would also be required. TCEQ has recently proposed to draft a general permit that would streamline deep well injection permit processes.

### 4.15.3 Alternative Strategy for Mills County-Other (Desalination)

Mills County, in coordination with Fox Crossing Water District, has expressed interest in a strategy that involves the desalination of brackish groundwater from the Ellenburger-San Saba Aquifer. At this time, the cost to implement this strategy is higher than simply expanding the use of the Trinity Aquifer, so it is being included in this plan as an alternative strategy.

This alternative strategy would involve developing a new well field to pump water from the Ellenburger-San Saba Aquifer. The new well field will consist of an acquired site, four new wells, 2 ½ miles of well collection line, eight miles of distribution/transmission line, new pump stations, a water treatment plant, a brine disposal evaporation pond, and assumes that available storage capacity exists to store the additional water. *Table 4.113* presents the amount of firm yield available from the strategy along with the implementation decade.

**Table 4.113 Alternative Desalination of Brackish Ellenburger-San Saba Strategy (Desalination) (ac-ft/yr)**

| WUG | County | Basin | Water Management Strategy (ac-ft/yr) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| County-Other | Mills | Colorado | 0 | 0 | 384 | 384 | 384 | 384 |

*Opinion of Probable Costs*

*Table 4.114* presents a summary of the probable costs for implementing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Capital Cost, Total Project Cost, Annual Cost, and Unit Cost.

For this strategy, there were assumed to be six potential capital expenditures. These were drilling and installation of the required additional wells (including pump installation), installation of a well collection line(s), a distribution pipe, a pump station, a water treatment plant, and a brine disposal system. Assumptions were made for well capacity, depth of drilling required, well diameter, and pumping distance according to the aquifer being utilized. For the Ellenburger-San Saba aquifer, the values used were 200 gpm, 3,000 ft, 6 in, and 300 ft, respectively. Wells were assumed to operate 24 hours per day, at 80 percent efficiency for determining production capacity and a TWDB groundwater desalination formula (to include installation, chlorination, and pump) was used to estimate the cost once the well had been sized. Transmission piping was sized based on the maximum flow anticipated in each pipe (the largest strategy amount in one decade, increased by a factor of two to account for peak demands) and an assumed 5 ft/s velocity. The smallest assumed diameter was 6 inches. Distribution pipe was sized to handle the maximum *total* flow (from all new wells as part of the strategy), again, increased by a factor of two to account for peak demands and assuming a 5 ft/s velocity. The pump station cost estimate was based on $197,250 per mgd, taken from the San Marcos Water Supply Master Plan, December 2004, and updated to September 2008 costs.

Additional project costs included Engineering, Contingencies and Legal Services (35 percent), land acquisition (assuming 5 acres per well, at $5,000 per acre), and Environmental and Archeological Studies, Mitigation, and Permitting (assumed equal to the land acquisition cost). The total project cost was annualized over a 20-year term of debt. Along with this annualized debt cost, O&M, and annual energy costs to pump the water made up the annual cost. The unit cost was taken as the largest annual cost, divided by the largest volume of water generated by the strategy in any one decade over the planning horizon.

**Table 4.114 Desalination of Brackish Ellenburger-San Saba Groundwater Costs**

| WUG Name | County | River Basin | Total Capital Cost | Total Project Cost | Largest Annual Cost | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|
| County-Other | Mills | Colorado | $6,285,000 | $8,577,000 | $1,216,400 | $3,168 |

*Environmental Impacts*

The additional pumpage from the Ellenburger-San Saba aquifer is within the sustainable yield of the aquifer for all decades. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. If an evaporation pond is used for brine disposal, appropriate permits will need to be obtained regarding what will be done with the evaporated salt. Two options include commercial sale and burying.

*Impacts to Agriculture*

Irrigators in Mills County currently use other sources of water, so there should be no impact to agriculture.

## 4.16 OTHER POTENTIAL FUTURE WATER MANAGEMENT STRATEGIES EVALUATED

The TWDB rules require the RWPG to evaluate all potentially feasible water management strategies to meet the region's identified demand deficits. Feasibility is based on evaluation criteria established by the TWDB and the RWPG including project cost, unit cost, yield, reliability, environmental impact, local preference, and institutional constraints. Several water management strategies were identified and evaluated in terms of the potential impact on the Lower Colorado Region as a whole. These strategies are discussed in the following sections.

### 4.16.1 Lower Colorado River Inflatable Channel Dams

The use of small in-channel inflatable dams on the main stem of the lower Colorado river has previously been considered as a method to add additional system storage in the lower basin and to improve system operations and diversions for water systems in this area. A fairly detailed study of this strategy was conducted by the LCRA in 1997 which evaluated the feasibility of constructing various sized small channel dams using inflatable rubber "bladders" within the lower Colorado River between Bastrop and Wharton. The dams which were evaluated consisted of different sizes and designs ranging from approximately 3 to 10 feet in height depending on the channel characteristics at each location considered. Preliminary site locations were evaluated based on criteria designed to minimize impacts to the environment and enhance potential benefits by containing lake elevations inside the existing channel, allowing safe passage of floods by deflating the bladder and folding the dam into the channel during flood events, and providing positive impacts to local communities through enhanced water supply and recreation opportunities. System benefits were estimated in the previous study to potentially range from a combined 10,000-25,000 afy through improvements in the flexibility of releases from the Highland Lakes and by allowing for reduced operational losses in the system.

The LCRWPG is interested in conducting future additional studies for this strategy in order to further evaluate the potential dam site locations and their respective water supply and operational benefits, and to quantify the expected environmental impacts of these in-channel dam structures as well as potential impacts to downstream water rights holders. Known environmental issues include the creation of: 1) increased fluctuation of water levels in the river, 2) temporary obstruction to fish migration, 3) potential barriers to sediment transport, and 4) possible eutrophication complications. At the same time, there are potential desirable environmental features created by these potential structures, such as providing: 1) locally increased river pool depths, 2) reduced extreme temperatures during summer and winter seasons, 3) increased habitat variability, and 4) other smaller positive impacts. Further study is needed to determine if some, if not all, of the various issues associated with this future potential water management strategy could be mitigated.

### 4.16.2 Advanced Conservation

The water demands approved by TWDB and the individual Regional Water Planning Groups (RWPGs) have already been adjusted to incorporate the effects of the 1991 State Water Saving Performance Standards for Plumbing Fixtures Act. In addition, RWPGs are required to consider further water conservation measures in their plan or explain reasons for not recommending conservation. In the 2006 LCRWPG Water Plan, conservation was applied to municipal WUGs with identified shortages and a year 2000 per capita water consumption of greater than 140 gpcd as recommended by the Water Conservation Implementation Task Force (WCITF). Additional conservation was applied to the municipal WUGs with shortages and a per capita demand between 100 and 140 gpcd. This section describes an analysis that was performed to determine the possibility for expanding water conservation to municipal WUGs without shortages in the planning area.

There are several WUGs in the LCRWPA that do not have needs. The LCRWPG recommends that these entities consider water conservation as a strategy to lower their per capita water consumption and as a means of extending water supply for the entire region.

Two scenarios for increasing water conservation were proposed and analyzed in the same manner as the original conservation figures developed for the LCRWPA:

**Scenario 1 -** Apply 0.25 percent savings annually to all municipal WUGs without shortages and with a per capita demand above 140 gpcd.

**Scenario 2 -** Apply 0.5 percent savings to all municipal WUGs without shortages and with a per capita demand above 140 gpcd; Apply 0.25 percent savings annually to all municipal WUGs with a per capita demand between 100 and 140 gpcd.

Each of the scenarios listed above could be performed in conjunction with conservation practices already recommended earlier in Chapter 4. Conservation in Scenario 1 would be applied until the per capita water demand was between 100 and 140 gpcd, respectively. No conservation would be applied below these respective levels. For Scenario 2, conservation would be applied to municipal WUGs with a demand greater than 140 gpcd until demand dropped below that amount. Conservation was then applied at a rate 0.25 percent for each following decade with the per capita demand not to drop below 100 gpcd. *Table 4.115* shows the amount of water conserved by implementing the conservation practices already outlined in Sections 4.6.2.1 and 4.8.1 and the impacts of practices from each of the two scenarios.

**Table 4.115 Anticipated Reduction From Municipal Conservation (ac-ft/yr)**

| Conservation | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| COA Conservation | 7,600 | 13,000 | 18,800 | 25,000 | 29,500 | 33,537 |
| | | | | | | |
| Municipal Conservation | 2,947 | 6,104 | 9,205 | 11,834 | 14,706 | 17,778 |
| Additional Municipal Conservation | 28 | 168 | 407 | 1,055 | 2,227 | 3,928 |
| | | | | | | |
| Scenario 1 | 264 | 580 | 990 | 1,485 | 2,106 | 2,949 |
| Scenario 2 | 1,570 | 2,276 | 3,238 | 4,712 | 6,426 | 8,276 |

Note: The City of Austin conservation program is discussed in Section 4.6.2.1. Municipal conservation and additional municipal conservation is discussed in Section 4.8.1. Scenario 1 and 2 are for municipal WUGs that do not have anticipated shortages at this time.

Anticipated reductions in demand from the two scenarios are considerably less than the expected savings from the strategies already recommended in Sections 4.6.2.1 and 4.8.1.

*Opinion of Probable Cost*

The conservation cost estimates were developed using information from the TWDB GDS Associates Inc. Study, *Quantifying the Effectiveness of Various Water Conservation Techniques in Texas*, May 2003. The study divided each RWPG into urban, suburban, and rural areas. The urban areas in Region K are comprised of the City of Austin and the City of Round Rock. The suburban areas are Travis, Hays, Bastrop, and Williamson Counties; and all of the other counties are considered rural.

For the cost estimates, the conservation savings were divided into plumbing fixture savings and irrigation savings. The plumbing fixture savings included toilet retrofits, showerhead and aerator replacements, and clothes washer rebates. The irrigation savings included irrigation audits. The total conservation savings calculated for each WUG was proportioned between plumbing fixture savings and irrigation savings using an average of the estimated savings per measure in the study. Then the savings costs for plumbing fixture savings and irrigation savings were calculated using the cost per acre foot estimates in the study. These unit costs were only applied to the incremental savings; therefore, the savings that occur the year before will not have a cost the next year, only the additional savings have a cost associated with them.

The table below contains the percent of plumbing savings versus irrigation savings and the cost per ac-ft for the three categories (urban, suburban, and rural).

**Table 4.116 Municipal Water Conservation Savings Unit Costs**

| Conservation Savings | Percent of Total Savings | Cost per Acre-Foot |
|---|---|---|
| **Urban** | | |
| Plumbing Fixture Savings | 32% | $481.60 |
| Irrigation Savings | 68% | $515.89 |
| **Suburban** | | |
| Plumbing Fixture Savings | 31% | $564.82 |
| Irrigation Savings | 69% | $540.94 |
| **Rural** | | |
| Plumbing Fixture Savings | 30% | $704.65 |
| Irrigation Savings | 70% | $543.28 |

*Environmental Impact*

The environmental impacts for this strategy are discussed in Section 4.8.1.

### 4.16.3 Brush Management

Texas rangelands were generally described as grassland or open savanna prior to widespread settlement of the area. The pressure on the vegetation created by grazing animals tended to be light and/or periodic, allowing for the establishment of a robust stand of grass. Tree seedlings that were able to survive the competition with the grass stands tended to perish in wildfires, which periodically occur in "natural" rangelands. Thus, with fire and light grazing pressure, grasslands and savannas were stable and sustainable ecosystems characteristic of many Texas rangelands.

Over time, however, the character of rangelands has been altered through increased grazing and fire suppression activities. These changes allowed the development of large stands of trees and other woody vegetation, termed “brush.” Continuous, often heavy, livestock grazing pressure reduced the ability of grasses to suppress tree seedling establishment. Furthermore, some invasive woody species (e.g., juniper and mesquite) have noxious chemicals in their leaves, resulting in livestock tending to avoid the tree seedlings, while repeatedly grazing the adjacent palatable grasses. This selective grazing behavior gives noxious-tasting tree seedlings a competitive advantage over the native grasses.

These changes have allowed juniper and mesquite trees to dominate large areas of the Edwards Plateau. These species have been documented to adversely affect the water yield from the land (groundwater recharge and surface runoff) due to the significant evapotranspiration rates. It has been documented that juniper and the associated litter have an annual interception loss averaging 73 percent of precipitation, compared with 46 percent interception loss for live oak and 14 percent interception loss for grass (Thurow and Hester 1997). These data indicate that the amount of water reaching the soil is markedly different depending on the type of vegetation.

Brush management as a water supply strategy is currently being investigated within the state of Texas. Both field studies and modeling investigations conclude that water yield increases exponentially as brush cover declines (i.e., very little change in water yield from dense brush cover down to about 15 percent brush cover, and a rapid rise in water yield from 15 percent cover to 0 percent brush cover). These findings imply that it is necessary to have sustained removal of most of the brush cover to maximize water yield potential. This conclusion is corroborated by numerous anecdotal observations by ranchers and agency personnel with brush control experience in the region (C. F. Kelton 1975; Willard, et al. 1993). The exponential pattern of water yield increase relative to a decrease in brush cover has also been postulated for the Colorado River Basin (Hibbert 1983). The exponential relationship is believed to occur because the intraspecific competition among trees (Ansley et al. 1998) and interspecific competition with herbaceous vegetation results in little increase in water yield until the tree density becomes sparse. In other words, trees have a capability for luxuriant water use; thus, if a stand is thinned, the remaining trees will expand their root systems to use the extra water in a short time. Only when the thinning reduces tree cover to less than about 15 percent is an opportunity created for significant yields of surplus water.

The use of brush management to increase the supply of water may provide excellent results for individual owners of large tracts of land. However, brush management on a regional scale requires the cooperation of numerous private landowners. It is not realistic to expect communities like Blanco or Goldthwaite to influence the range management practices of enough landowners to make this alternative a reliable long-term source of water. Although brush management is a preferred water supply strategy within the LCRWPA, the LCRWPG supports efforts to develop brush management on a statewide basis, as indicated in Chapter 6 of the regional water planning report.

### 4.16.4 Weather Modification

The modern science of weather modification began in 1946. By the 1960s and 1970s, Texas was the site for many weather modification studies, including cloud seeding. Water droplets that form in the atmosphere by condensation of water vapor onto existing particles suspended in the atmosphere are called cloud condensation nuclei (CCN). Concentrations of CCN vary from place to place and even from day to day at a given location and are affected by proximity to cities and industrial areas. The most successful attempts to deliberately modify clouds have involved some modification of the population of CCN on which cloud droplets form, or of the ice nuclei (IN), which are responsible for the appearance of ice and are important in the formation of precipitation in some clouds. The background aerosol or small particle concentration in the atmosphere varies between 1,000 particles per cubic centimeter ($cm^3$) in clean air, to around 100,000 particles/$cm^3$ in heavily polluted air. These particles range in size from less than 0.01 microns to over 10 microns in diameter; where one micron is one thousandth of a millimeter. An ambitious cloud seeding program might increase (locally and for a very short time) this atmospheric load by 15 percent in the case of clean air or 0.15 percent in an urban environment. Any nuclei added would be almost immediately swept up into the treated cloud and washed out in the resulting rainfall. Silver iodide, dry ice, and potassium chloride crystals have been used as CCN, none of which are harmful to the environment.

Cloud seeding has been used to reduce hail damage in the High Plains and has been investigated as a means of drought prevention in the Edwards aquifer area, Corpus Christi, and West Central Texas. San Angelo and the Colorado River Municipal Water District in Big Spring sponsored testing to see if weather modification increases the amount of water in lakes and boosts cotton yields.

Different sizes and types of clouds are seeded depending upon the weather modification goal. To lessen hail damage, large thunderstorms likely to produce hail are seeded. To increase rainfall, smaller clouds that are likely to grow are seeded. Successful cloud seeding involves many variables due to the array of environmental conditions and seeding procedures that exist; therefore, a successful seeding program in one region does not guarantee success in another. In addition, the unpredictable nature of weather modification in general continues to fuel debate within the scientific community regarding its validity.

As with brush management, weather modification has demonstrated the capacity to provide additional water to a region, but the results may not provide a reliable quantifiable source of additional water to help meet the demand deficits identified within the LCRWPA. Therefore, these strategies should be dealt with more as long-term best management practices rather than specific water supply options to meet demands. In addition, issues concerning the negative impact on rainfall amounts in areas surrounding the target area persist.

### 4.16.5 Additional Water Reuse

The use of reclaimed water to meet water demands is increasing in Texas. However, with the exception of the City of Austin's uses, this strategy is not deemed appropriate due to the nature of the identified demand deficits. The municipal needs identified in the Hill Country area are generally isolated and stem from a lack of sufficient storage to draw from during extended dry periods when river flows cease. These municipalities generally restrict non-essential water use when the river stops flowing. Therefore, the use of reclaimed water would not extend their water supply. Use of reclaimed water to meet other needs is discussed in Section 4.5.1 of this chapter.

The COA is currently constructing the major infrastructure needed to allow the use of reclaimed water as an additional source of water. Information concerning the City's Water Reclamation Initiative is presented in Section 4.6.2.2.

### 4.16.6 Rainwater Harvesting

Rainwater catchment systems provide a source of soft, high-quality water, reduce reliance on wells and other water sources, and can be cost-effective. In light of Texas' current regional water planning efforts and increased attention on conservation and sustainability, a renewed interest in rainwater harvesting has emerged due to the following:

- The escalating environmental and economic costs of providing water by centralized water systems or by well drilling
- Health concerns regarding the source and treatment of polluted waters
- A perception that there are cost efficiencies associated with reliance on rainwater

RWPG and the TWDB should focus on rainwater catchment as a water management strategy and develop specific cost and yield data that will enable the consideration of this strategy as a meaningful source of water.

### 4.16.7 Additional Studies

Two additional analyses are contained in the appendices to this chapter. These analyses were completed with supplemental funding from TWDB during this planning round, but they were completed after the completion of the Initially Prepared Plan. The Sustainability and Advanced Water Conservation Analyses, contained in *Appendix 4D*, looked at developing policies that would fit the supply available to the population to be served, and also included an analysis of the potential for advanced conservation to provide greater use of the existing supplies. The second study, Dry Year Option, is shown in *Appendix 4E*. This study looked at potential buy out of second crops of rice as a means of providing additional water for other uses, or of reducing the need for pumping groundwater.

## 4.17 ENVIRONMENTAL IMPACTS OF WATER MANAGEMENT STRATEGIES

### 4.17.1 Environmental Impacts of Strategies from the 2006 Region K Plan

During the initial development of the 2006 Region K Plan, each strategy was evaluated qualitatively in sufficient detail to address its potential overall impact on wildlife and general natural resources; however, the water availability assumptions which were incorporated into the model for the 2006 Plan did not allow for practical model adjustments needed to obtain information on environmental flow impacts. Therefore, the quantitative analyses included a large amount of uncertainty with regard to simulated changes in instream and bay and estuary flows. As a part of the first biennium studies for the 2011 Lower Colorado Regional Water Plan, the TWDB provided additional funding for this study to conduct these further analyses in order to better quantify the potential changes to these flows which may result over time as a result of the various strategies contained in the 2006 Region K Plan.

#### *4.17.1.1 Criteria Used*

The Region K Cutoff Model (cutoff model) was used for the surface water availability modeling in a separate portion of the first biennium studies for the current round of planning. Discussion of the cutoff model and its availability results can be found in Chapter 3. In order to use the cutoff model for analysis of the environmental flow impacts, a few adjustments were required, including:

1. turning off the environmental flow caps (“caps” are upper limits on the amount of flow released – turning them off allows more water to be released to the environment, if available) ,
2. using the 2006 FINS Criteria for the bay and estuary inflow requirements (the supply model used the 1997 FINS),
3. using weather-variable irrigation demands for the run-of-river irrigation rights, owned by LCRA
4. using the curtailment of LCRA interruptible water to satisfy LCRA municipal and industrial firm demands, and
5. using projected decadal demands versus authorized demands.

The adjusted cutoff model was used to quantifiably measure the impact that certain water management strategies could potentially have on the Colorado River and its major tributaries, as well as Matagorda

Bay, by comparing the regulated stream flow in the base model without the strategy to the regulated stream flow in the model with the strategy in place. The instream flow results were also compared to the seven-day, two-year low-flow (7Q2 flows) obtained from the *Texas Administrative Code (TAC) 307.10(2) – Appendix B – Low Flow Criteria*. It should be noted that the 7Q2 flow information was provided simply as information and was not used to determine whether or not a strategy was reasonable based on whether the strategy caused the instream flows to go above or below a particular value. Again, the main comparison for the study was the flow with and without the strategy implemented.

The bay and estuary inflow results were also compared to the target and critical bay and estuary monthly inflows as presented in the 2006 Matagorda Bay Freshwater Inflow Needs Study. The frequency of the flows meeting the target and critical levels at certain control points were analyzed for each strategy, as well as duration and flow volume statistics in order to provide a more complete picture of the impacts of each strategy. Thirteen proposed water management strategies from the 2006 Region K Plan were chosen as potentially impacting the Colorado River or its major tributaries in a way that could be quantifiably determined using the adjusted cutoff model. The strategies were analyzed for the years 2010 and 2060 if they were expected to be implemented by 2010, as dictated by the 2006 Plan. If a strategy was expected to be implemented after 2010, it was analyzed only for 2060.

#### *4.17.1.2 Strategies Evaluated*

Several of the recommended water management strategies from the 2006 Region K Plan that were evaluated using the above criteria are not listed as strategies in the 2011 Region K Plan because either they had already been implemented since the 2006 planning cycle, and thus are now considered supplies rather than strategies, or they were determined to no longer be appropriate strategies and were replaced in this planning cycle.

Some of the recommended strategies from the 2006 Region K Plan that were evaluated using the above criteria had new or changed conditions for this planning cycle and have been re-evaluated using new criteria that is discussed in *Section 4.17.2*.

The recommended water management strategies in this chapter that were evaluated only using the above criteria as part of the first biennium studies include the following:

- Construct Goldthwaite Channel Dam (*Section 4.8.4*)
- HB 1437 (*Sections 4.8.6 and 4.9.5*)
- LCRA Excess Flows Permit and Off-Channel Storage (*Section 4.6.1.8*)

The results of the comparison of environmental impacts from these strategies can be found in *Appendix 4F.*

For the full list of strategies evaluated as part of the first biennium studies, please refer to the report entitled *LCRWPG 2011 Water Plan, First Biennium Studies, Environmental Impacts of Water Management Strategies Study*, which is available on the TWDB website.

### 4.17.2 2011 Region K Plan New Strategies or Changed Condition Strategies

As part of the development of Chapter 4 for the 2011 Region K Plan, new water management strategies or changes to certain water management strategies from the 2006 Region K Plan were recommended. In addition, alternative water management strategies are suggested that would take the place of those under LSWP if the LSWP strategy was unable to happen. The qualitative and quantitative environmental impacts for these new or changed conditions strategies have been evaluated as well, but the evaluation involved revised criteria recommended by the Environmental Flows Committee of the LCRWPG during the second half of the 2011 planning cycle.

#### *4.17.2.1 Criteria Used*

The same cutoff model as the one discussed above in *Section 4.17.1.1* was used for the evaluation of the new or changed condition water management strategies. The main difference is in the criteria used as the benchmark for comparing the model with and without the strategy. For new or changed condition water management strategies in the 2011 Region K Plan, the flow criteria (recommended guidelines) presented in the LSWP Environmental Studies on both the *Lower Colorado River, Texas Instream Flow Guidelines* and the *Matagorda Bay Health Evaluation* was recommended for use by the Environmental Flows Committee of the LCRWPG. The use of these studies for the environmental impact analysis does not mean the LCRWPG endorses the results of the studies. These results meet the TWDB's best available site-specific definition of environmental criteria, which is the reason for their use.

**4.17.2.1.1.** Freshwater Inflow Criteria

The following tables are taken from the *Matagorda Bay Health Evaluation* as part of the LSWP Studies to help define the criteria used for environmental impact analysis of the freshwater inflows to Matagorda Bay (Control Point M10000 in the cutoff model). An exhibit showing control point locations can be found in *Appendix 4G*.

**Table 4.117 Inflow Categories and Range of Inflow Criteria**

| Inflow Category | Inflow Criteria | Description |
|---|---|---|
| LONG-TERM | Long-term Average Volume and Variability | provide adequate bay food supply to maintain the essential food supply and existing primary productivity of the bay system |
| MBHE INFLOW REGIME | MBHE 4 | provide inflow variability and support high levels of primarily productivity, and high quality oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat. |
| | MBHE 3 | provide inflow variability and support quality oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat. |
| | MBHE 2 | provide inflow variability and sustain oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat |
| | MBHE 1 | maintain tolerable oyster reef health, benthic character, and habitat conditions |
| MINIMUM | Threshold | refuge conditions for all species and habitats |

*Table 4.117* above shows the different levels of criteria and gives a description of what each level of flow can provide to the bay. There are three categories of criteria: long-term, minimum, and the MBHE inflow regime, which consists of four levels of increasing flow volumes.

*Table 4.118* below shows specific numerical flow volumes for the four levels of the MBHE inflow regime, which are separated into three "seasons". Achievement guidelines for the percentage of time a particular MBHE level should be met are also provided. It should be noted that the achievement guidelines are provided as information, but that the environmental impact analysis that was done for the water management strategies as part of the 2011 Region K Plan did not try to determine whether or not a strategy was reasonable based on whether the strategy caused the freshwater inflows to go above or below a particular value. Again, the main comparison for the study was the flow with and without the strategy implemented.

**Table 4.118 Recommended MBHE Inflow Regime Criteria and Proposed Distribution**

| Onset Month | Flow Distribution (% of annual) | INFLOW CRITERIA (Acre-feet) | | | |
|---|---|---|---|---|---|
| | | MBHE 1 | MBHE 2 | MBHE 3 | MBHE 4 |
| **Spring** January February March April May | 38% | 114,000 ac-ft 3 consecutive month total | 168,700 ac-ft 3 consecutive month total | 246,200 ac-ft 3 consecutive month total | 433,200 ac-ft 3 consecutive month total |
| **Fall** August September October | 27% | 81,000 ac-ft 3 consecutive month total | 119,900 ac-ft 3 consecutive month total | 175,000 ac-ft 3 consecutive month total | 307,800 ac-ft 3 consecutive month total |
| **Intervening Six months** | 35% | 105,000 ac-ft Total for 6 month period | 155,400 ac-ft Total for 6 month period | 226,800 ac-ft Total for 6 month period | 399,000 ac-ft Total for 6 month period |
| **Achievement Guideline** | | 90% | 75% | 60% | 35%* (See Sec. 5.2) |

*modified application as discussed in Section 5.2. (Of the *Matagorda Bay Health Evaluation Study*)

**4.17.2.1.2.** Instream Flow Criteria

The following tables show the Colorado River Instream Flow Criteria that was developed as part of the LSWP Studies to help define the criteria used for environmental impact analysis of the water management strategies on the Colorado River instream flows at various control points downstream of the Highland Lakes. An exhibit showing control point locations can be found in *Appendix 4G*.

**Table 4.119 Instream Flow Guidelines for the Lower Colorado River Specific to the LSWP (cfs)**

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AUSTIN REACH** | | | | | | | | | | | | |
| Subsistence | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| **BASTROP REACH** | | | | | | | | | | | | |
| Subsistence | 208 | 274 | 274 | 184 | 275 | 202 | 137 | 123 | 123 | 127 | 180 | 186 |
| Base-DRY | 313 | 317 | 274 | 287 | 579 | 418 | 347 | 194 | 236 | 245 | 283 | 311 |
| Base-AVERAGE | 433 | 497 | 497 | 635 | 824 | 733 | 610 | 381 | 423 | 433 | 424 | 450 |
| **COLUMBUS REACH** | | | | | | | | | | | | |
| Subsistence | 340 | 375 | 375 | 299 | 425 | 534 | 342 | 190 | 279 | 190 | 202 | 301 |
| Base-DRY | 407 | 590 | 525 | 554 | 966 | 967 | 570 | 310 | 405 | 356 | 400 | 464 |
| Base-AVERAGE | 828 | 895 | 1,020 | 977 | 1,316 | 1,440 | 895 | 516 | 610 | 741 | 755 | 737 |
| **WHARTON REACH** | | | | | | | | | | | | |
| Subsistence | 315 | 303 | 204 | 270 | 304 | 371 | 212 | 107 | 188 | 147 | 173 | 202 |
| Base-DRY | 492 | 597 | 531 | 561 | 985 | 984 | 577 | 314 | 410 | 360 | 486 | 470 |
| Base-AVERAGE | 838 | 906 | 1,036 | 1,011 | 1,397 | 1,512 | 906 | 522 | 617 | 749 | 764 | 746 |

*Table 4.119* provides the instream flow guidelines (in cfs) for three different categories of flow conditions and four separate reaches downstream of the Highland Lakes. The Austin Reach begins at Control Point I20000 in Travis County (see exhibit in *Appendix 4G*). The Bastrop Reach begins at Control Point J30000 in Bastrop County. The Columbus Reach begins at Control Point J10000 in Colorado County. The Wharton Reach begins at Control Point K20000 in Wharton County. The three categories of flow are: Subsistence, Base-Dry Conditions, and Base-Average Conditions. The LSWP report also recommends pulse flows, but the modeling used to analyze the environmental impacts is a monthly flow application, which makes it difficult to analyze pulse flows which occur on a daily level rather than monthly. The Austin Reach only has a Subsistence Flow guideline due to the limited locations of return flows downstream of the Longhorn Dam.

*Table 4.120* below provides the instream flow guidelines in ac-ft/yr.

**Table 4.120 Instream Flow Guidelines for the Lower Colorado River (ac-ft/yr))**

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AUSTIN REACH** | | | | | | | | | | | | |
| Subsistence | 3,074 | 2,777 | 3,074 | 2,975 | 3,074 | 2,975 | 3,074 | 3,074 | 2,975 | 3,074 | 2,975 | 3,074 |
| **BASTROP REACH** | | | | | | | | | | | | |
| Subsistence | 12,789 | 15,217 | 16,848 | 11,127 | 16,909 | 12,020 | 8,424 | 7,563 | 7,319 | 7,809 | 10,711 | 11,437 |
| Base-DRY | 19,246 | 17,605 | 16,848 | 17,078 | 35,601 | 24,873 | 21,336 | 11,929 | 14,043 | 15,064 | 16,840 | 19,123 |
| Base-AVERAGE | 26,624 | 27,602 | 30,559 | 37,785 | 50,666 | 43,617 | 37,507 | 23,427 | 25,170 | 26,624 | 25,230 | 27,669 |
| **COLUMBUS REACH** | | | | | | | | | | | | |
| Subsistence | 20,906 | 20,826 | 23,058 | 17,792 | 26,132 | 31,775 | 21,029 | 11,683 | 16,602 | 11,683 | 12,020 | 18,508 |
| Base-DRY | 29,944 | 32,767 | 32,281 | 32,965 | 59,397 | 57,540 | 35,048 | 19,061 | 24,099 | 21,890 | 28,562 | 28,530 |
| Base-AVERAGE | 50,912 | 49,706 | 62,717 | 58,136 | 80,918 | 85,686 | 55,031 | 31,728 | 36,298 | 45,562 | 44,926 | 45,316 |
| **WHARTON REACH** | | | | | | | | | | | | |
| Subsistence | 19,369 | 16,828 | 12,543 | 16,066 | 18,692 | 22,076 | 13,035 | 6,579 | 11,187 | 9,039 | 10,294 | 12,420 |
| Base-DRY | 30,252 | 33,156 | 32,650 | 33,382 | 60,565 | 58,552 | 35,478 | 19,307 | 24,397 | 22,136 | 28,919 | 28,899 |
| Base-AVERAGE | 51,527 | 50,317 | 63,701 | 60,159 | 85,898 | 89,970 | 55,708 | 32,097 | 36,714 | 46,054 | 45,461 | 45,870 |

The instream flow impact analysis was focused on a comparison of the percentage of time the model met these values, both with and without the strategy was implemented. The impact is shown as the difference between the two scenarios, rather than how often either the base model or the model with the strategy met the criteria.

### *4.17.2.2 Strategies Evaluated*

The recommended and alternative water management strategies in this chapter that were evaluated using the criteria developed as part of the LSWP studies include the following:

- LCRA New Contracts and Contract Amendments (*Sections 4.6.1.4 and 4.6.1.5*)
- LCRA Off-Channel Storage (*Section 4.15.1*)
- LCRA Aquifer Storage and Recovery (ASR) (*Section 4.6.1.11*)
- LCRA-SAWS Water Project (LSWP) (*Section 4.6.1.9*)
- City of Austin Return Flows/Reuse (*Section 4.6.2*)
- STPNOC Water Right Permit Amendment (*Section 4.13.3.2*)
- Groundwater Importation (*Section 4.15.2.1*)
- A Comprehensive Model containing all Strategies (Discussed in Chapter 7)

Results of the environmental impacts are discussed in their respective chapter sections and tabular results can be found in *Appendix 4G*.

# *APPENDIX 4A*

# *WATER MANAGEMENT STRATEGY TABLES*

# *APPENDIX 4B*

# *WATER MANAGEMENT STRATEGY COST BREAKDOWN & THE COST ASSUMPTIONS & METHODOLOGY*

# *APPENDIX 4C*

# *TECHNICAL MEMORANDUMS FOR GOLDTHWAITE, LLANO, AND ENHANCED RECHARGE GROUNDWATER STRATEGIES*

# *APPENDIX 4D*

# *SUSTAINABILITY AND ADVANCED WATER CONSERVATION ANALYSES*

# *DROUGHT MANAGEMENT TABLE*

# *APPENDIX 4E*

# *DRY YEAR OPTION*

# *APPENDIX 4F*

# *ENVIRONMENTAL IMPACTS OF STRATEGIES FROM THE 2006 REGION K PLAN*

# *APPENDIX 4G*

# *ENVIRONMENTAL IMPACTS OF NEW STRATEGIES OR CHANGED CONDITION STRATEGIES IN THE 2011 REGION K PLAN*

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 3,812 | 1,157 | (602) | (3,709) | (6,221) | (9,415) |
| AQUA WSC | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | | | 602 | 3,709 | 6,109 | 7,850 |
| AQUA WSC | BASTROP | COLORADO | Additional Municipal Conservation | | | | | 122 | 396 | 908 |
| AQUA WSC | BASTROP | COLORADO | Drought Management (5% water use reduction) | | | | | | | 898 |
| Remaining Surplus/Shortage | | | | | **3,812** | **1,157** | **0** | **122** | **284** | **241** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (65) | (812) | (1,532) | (2,590) | (3,455) | (4,542) |
| BASTROP | BASTROP | COLORADO | Conservation | | 146 | 396 | 755 | 1,224 | 1,438 | 1,728 |
| BASTROP | BASTROP | COLORADO | Expand Other Aquifer supply | Other Aquifer | | 416 | 777 | 1,366 | 2,017 | 2,814 |
| Remaining Surplus/Shortage | | | | | **81** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 830 | 698 | 545 | 370 | 142 | (144) |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | | | | | | 144 |
| Remaining Surplus/Shortage | | | | | **830** | **698** | **545** | **370** | **142** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 524 | (663) | (1,879) | (3,437) | (4,528) | (5,864) |
| COUNTY-OTHER | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | | 663 | 1,879 | 3,037 | 2,922 | 3,700 |
| COUNTY-OTHER | BASTROP | COLORADO | New Carrizo-Wilcox well field (Guadalupe basin) | Carrizo-Wilcox | | | | | 975 | 1,230 |
| | | | Additional municipal conservation | | | | | 400 | 631 | 936 |
| Remaining Surplus/Shortage | | | | | **524** | **0** | **0** | **0** | **0** | **2** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 133 | 108 | 84 | 49 | 20 | (16) |
| COUNTY-OTHER | BASTROP | GUADALUPE | New Carrizo-Wilcox well field | Carrizo-Wilcox | | | | | | 16 |
| Remaining Surplus/Shortage | | | | | **133** | **108** | **84** | **49** | **20** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 21 | (604) | (1,176) | (2,033) | (2,734) | (3,624) |
| ELGIN | BASTROP | COLORADO | Conservation | | 91 | 79 | 40 | 0 | 0 | 0 |
| ELGIN | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | | 525 | 1,136 | 2,033 | 2,734 | 400 |
| ELGIN | BASTROP | COLORADO | Drought Management (5% water use reduction) | | | | | | | 265 |
| ELGIN | BASTROP | COLORADO | New LCRA Contract | Highland Lakes | | | | | | 3,000 |
| Remaining Surplus/Shortage | | | | | **112** | **0** | **0** | **0** | **0** | **41** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 7 | (2) | (7) | (16) | (23) | (30) |
| POLONIA WSC | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | | 2 | 7 | 16 | 23 | 30 |
| Remaining Surplus/Shortage | | | | | **7** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (74) | (311) | (526) | (946) | (1,115) | (1,601) |
| SMITHVILLE | BASTROP | COLORADO | Conservation | | 25 | 0 | 0 | 0 | 0 | 0 |
| SMITHVILLE | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | 49 | 311 | 526 | 946 | 1,115 | 733 |
| SMITHVILLE | BASTROP | COLORADO | Drought Management (10% water use reduction) | | | | | | | 288 |
| SMITHVILLE | BASTROP | COLORADO | New Well Field in Queen City Aquifer | Queen City | | | | | | 580 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Shortage/Surplus | | (61) | (50) | (40) | (31) | (24) | (17) |
| IRRIGATION | BASTROP | BRAZOS | Expand current Queen City supply | Queen City | 40 | 40 | 40 | 31 | 24 | 17 |
| IRRIGATION | BASTROP | BRAZOS | Temporary Drought Period Use of Queen City | Queen City | 21 | 10 | | | | |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | (58) | 134 | 305 | 450 | 581 | 694 |
| IRRIGATION | BASTROP | COLORADO | Expand current Queen City supply | Queen City | 58 | | | | | |
| | | | Remaining Surplus/Shortage | | **0** | **134** | **305** | **450** | **581** | **694** |
| | | | Shortage/Surplus | | 2 | (7) | (17) | (25) | (32) | (44) |
| MANUFACTURING | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | | 7 | 17 | 25 | 32 | 44 |
| | | | Remaining Surplus/Shortage | | **2** | **0** | **0** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | (8) | (10) | (11) | (13) | (14) | (16) |
| MANUFACTURING | BASTROP | GUADALUPE | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | 8 | 10 | 11 | 13 | 14 | 16 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | (4,293) | (4,297) | (4,298) | 0 | 0 | 0 |
| MINING | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Carrizo-Wilcox | 4,293 | 4,297 | 4,298 | | | |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | 4,720 | 2,720 | 720 | (1,280) | (2,780) | (2,780) |
| STEAM ELECTRIC POWER | BASTROP | COLORADO | Amend Contract with LCRA | Highland Lakes | | | | 1,280 | 2,780 | 2,780 |
| | | | Remaining Surplus/Shortage | | **4,720** | **2,720** | **720** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | 0 | 0 | 0 | 0 | (41) | (64) |
| COUNTY-OTHER | BLANCO | GUADALUPE | New well field in Ellenburger-San Saba Aquifer | Ellenburger-San Saba | | | | | 41 | 64 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | 218 | 140 | 55 | (27) | (74) | (130) |
| BERTRAM | BURNET | BRAZOS | Conservation | | 22 | 54 | 80 | 91 | 96 | 106 |
| BERTRAM | BURNET | BRAZOS | Expand current Ellenburger-San Saba supply (Colorado Basin) | Ellenburger-San Saba | | | | | | 24 |
| | | | Remaining Surplus/Shortage | | **240** | **194** | **135** | **64** | **22** | **0** |
| | | | Shortage/Surplus | | (26) | (198) | (386) | (601) | (840) | (1,130) |
| COTTONWOOD SHORES | BURNET | COLORADO | Amend Contract with LCRA | Highland Lakes | 26 | 198 | 386 | 601 | 840 | 1,130 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | 1,048 | 482 | (232) | (898) | (1,345) | (1,720) |
| COUNTY-OTHER | BURNET | COLORADO | Expand current Trinity supply | Trinity | | | 480 | 480 | 541 | 541 |
| COUNTY-OTHER | BURNET | COLORADO | Expand current Ellenburger-San Saba supply | Ellenburger-San Saba | | | | 418 | 804 | 1,179 |
| | | | Remaining Surplus/Shortage | | **1,048** | **482** | **248** | **0** | **0** | **0** |
| | | | Shortage/Surplus | | 406 | 295 | 172 | 55 | (14) | (95) |
| GRANITE SHOALS | BURNET | COLORADO | Amend contract with LCRA | Highland Lakes | | | | | 14 | 95 |
| | | | Remaining Surplus/Shortage | | **406** | **295** | **172** | **55** | **0** | **0** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 23 | 15 | 8 | 1 | (7) | (17) |
| KINGSLAND WSC | BURNET | COLORADO | Amend Contract with LCRA | Highland Lakes | 10 | 11 | 12 | 13 | 14 | 17 |
| Remaining Surplus/Shortage | | | | | **33** | **26** | **20** | **14** | **7** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 503 | (211) | (976) | (1,719) | (2,154) | (2,653) |
| MARBLE FALLS | BURNET | COLORADO | Conservation | | 199 | 510 | 920 | 1,415 | 1,879 | 2,405 |
| MARBLE FALLS | BURNET | COLORADO | Amend contract with LCRA | Highland Lakes | | | 56 | 304 | 275 | 248 |
| Remaining Surplus/Shortage | | | | | **702** | **299** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (318) | (576) | (857) | (1,130) | (1,292) | (1,470) |
| MEADOWLAKES | BURNET | COLORADO | Conservation | | 77 | 194 | 351 | 537 | 710 | 897 |
| MEADOWLAKES | BURNET | COLORADO | Amend contract with LCRA | Highland Lakes | 241 | 382 | 506 | 593 | 593 | 593 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **11** | **20** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (23) | (23) | (23) | (23) | (23) | (23) |
| LIVESTOCK | BURNET | BRAZOS | Expand current Trinity supply | Trinity | 23 | 23 | 23 | 23 | 23 | 23 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (7) | (10) | (12) | (22) | (24) | (25) |
| MINING | BURNET | BRAZOS | Expand current Trinity supply | Trinity | 7 | 10 | 12 | 22 | 24 | 25 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (681) | (756) | (788) | (811) | (829) | (873) |
| MINING | BURNET | COLORADO | Expand current Ellenburger-San Saba supply | Ellenburger-San Saba | 681 | 756 | 788 | 811 | 829 | 873 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (105) | (109) | (106) | (97) | (93) | (90) |
| COUNTY-OTHER | COLORADO | LAVACA | Expand current Gulf Coast supply | Gulf Coast | 105 | 109 | 106 | 97 | 93 | 90 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (16,169) | (13,871) | (11,640) | (9,480) | (7,380) | (5,370) |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (8,326) |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Transfer supply to M&I | | (4,568) | (7,392) | (9,240) | (9,240) | (11,550) | (19,025) |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 4,886 | 4,886 | 4,886 | 4,886 | 4,886 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 4,715 | 4,715 | 4,715 | 4,715 | 4,715 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 8,282 | 8,282 | 8,282 | 8,282 | 8,282 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Develop water conserving rice variety | | 0 | 4,548 | 4,548 | 4,548 | 4,548 | 4,548 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 24,317 | 22,528 | 16,993 | 10,542 | 0 | 0 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Continued use of Austin return flows | Colorado ROR | 620 | 728 | 936 | 1,143 | 1,220 | 1,388 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Continued use of Downstream return flows | Colorado ROR | | | 6 | 28 | 55 | 65 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | HB-1437: Water conservation | | 0 | 0 | 0 | 0 | 0 | 0 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Firm up RoR with off-channel storage | | 0 | 0 | 0 | 0 | 0 | 11,220 |
| Remaining Surplus/Shortage | | | | | **4,200** | **24,424** | **19,486** | **15,424** | **4,776** | **2,383** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| Shortage/Surplus | | | | | (33,131) | (28,219) | (23,449) | (18,832) | (14,343) | (10,046) |
| IRRIGATION | COLORADO | LAVACA | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (17,704) |
| IRRIGATION | COLORADO | LAVACA | Transfer supply to M&I | | (10,079) | (15,008) | (18,760) | (18,760) | (23,450) | (38,627) |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 9,920 | 9,920 | 9,920 | 9,920 | 9,920 |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 9,405 | 9,405 | 9,405 | 9,405 | 9,405 |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 14,056 | 14,056 | 14,056 | 14,056 | 14,056 |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Develop water conserving rice variety | | 0 | 10,181 | 10,181 | 10,181 | 10,181 | 10,181 |
| IRRIGATION | COLORADO | LAVACA | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 46,316 | 45,738 | 32,488 | 9,265 | 0 | 0 |
| IRRIGATION | COLORADO | LAVACA | Continued use of Austin return flows | Colorado ROR | 1,256 | 1,478 | 1,900 | 2,321 | 2,570 | 3,373 |
| IRRIGATION | COLORADO | LAVACA | Continued use of Downstream return flows | Colorado ROR | | | 13 | 56 | 113 | 158 |
| IRRIGATION | COLORADO | LAVACA | HB-1437: Water conservation | | 0 | 0 | 0 | 0 | 0 | 0 |
| IRRIGATION | COLORADO | LAVACA | Firm up RoR with off-channel storage | | 0 | 0 | 0 | 0 | 0 | 22,780 |
| Remaining Surplus/Shortage | | | | | **4,362** | **47,551** | **35,754** | **17,612** | **8,452** | **3,496** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (14) | (14) | (14) | (14) | (14) | (14) |
| LIVESTOCK | COLORADO | COLORADO | Expand current Gulf Coast supply | Gulf Coast | 14 | 14 | 14 | 14 | 14 | 14 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (11) | (11) | (11) | (11) | (11) | (11) |
| LIVESTOCK | COLORADO | LAVACA | Expand current Gulf Coast supply | Gulf Coast | 11 | 11 | 11 | 11 | 11 | 11 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (19) | (22) | (23) | (24) | (25) | (26) |
| MINING | COLORADO | BRAZOS-COLORADO | Expand current Gulf Coast supply | Gulf Coast | 19 | 22 | 23 | 24 | 25 | 26 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (8,450) | (7,925) | (7,072) | (5,919) | (4,483) | (4,642) |
| MINING | COLORADO | COLORADO | New Other Aquifer well Field | Other Aquifer | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 | 4,269 |
| MINING | COLORADO | COLORADO | Expand Gulf Coast supply (Colorado basin) | Gulf Coast | 3,600 | 3,600 | 2,803 | 1,650 | 214 | 373 |
| MINING | COLORADO | COLORADO | Expand Gulf Coast supply (Lavaca basin) | Gulf Coast | 581 | 56 | | | | |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (100) | (132) | (151) | (168) | (184) | (199) |
| MINING | COLORADO | LAVACA | Expand current Gulf Coast supply | Gulf Coast | 100 | 132 | 151 | 168 | 184 | 199 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (118) | (115) | (14) | 55 | 99 | 128 |
| COUNTY-OTHER | FAYETTE | COLORADO | Expand current Sparta supply | Sparta | 123 | 120 | 19 | | | |
| Remaining Surplus/Shortage | | | | | **5** | **5** | **5** | **55** | **99** | **128** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 41 | 93 | 28 | (32) | (25) | (16) |
| COUNTY-OTHER | FAYETTE | LAVACA | Expand current Gulf Coast supply | Gulf Coast | | | | 32 | 25 | 16 |
| Remaining Surplus/Shortage | | | | | **41** | **93** | **28** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 111 | (236) | (507) | (719) | (976) | (1,317) |
| FAYETTE WSC | FAYETTE | COLORADO | Expand current Gulf Coast supply | Gulf Coast | | 236 | 428 | 428 | 428 | 428 |
| FAYETTE WSC | FAYETTE | COLORADO | New Other Aquifer well field | Other Aquifer | | | 79 | 291 | 548 | 889 |
| Remaining Surplus/Shortage | | | | | **111** | **0** | **0** | **0** | **0** | **0** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| Shortage/Surplus | | | | | 10 | (21) | (45) | (63) | (86) | (116) |
| FAYETTE WSC | FAYETTE | LAVACA | Expand current Gulf Coast supply | Gulf Coast | 0 | 21 | 45 | 63 | 86 | 116 |
| Remaining Surplus/Shortage | | | | | **10** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 175 | 86 | 18 | (34) | (100) | (193) |
| SCHULENBERG | FAYETTE | LAVACA | Conservation | | 43 | 104 | 157 | 159 | 167 | 184 |
| SCHULENBERG | FAYETTE | LAVACA | Expand Yegua-Jackson Aquifer Supply | Yegua-Jackson | | | | | | 9 |
| Remaining Surplus/Shortage | | | | | **218** | **190** | **175** | **125** | **67** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (20) | (18) | (16) | (14) | (12) | (10) |
| IRRIGATION | FAYETTE | LAVACA | Expand current Sparta supply | Sparta | 20 | 18 | 16 | 14 | 12 | 10 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (22) | (22) | (22) | (22) | (22) | (22) |
| LIVESTOCK | FAYETTE | BRAZOS | New Other Aquifer well field (Colorado Basin) | Other Aquifer | 22 | 22 | 22 | 22 | 22 | 22 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (45) | (70) | (94) | (117) | (137) | (162) |
| MANUFACTURING | FAYETTE | LAVACA | Expand current Gulf Coast supply | Gulf Coast | | | | 2 | 20 | 43 |
| MANUFACTURING | FAYETTE | LAVACA | Expand current Sparta supply | Sparta | 45 | 70 | 94 | 115 | 117 | 119 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 13 | (4) | (22) | (28) | (29) | (29) |
| MINING | FAYETTE | BRAZOS | Expand current Gulf Coast supply | Gulf Coast | | 4 | 22 | 28 | 29 | 29 |
| Remaining Surplus/Shortage | | | | | **13** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 13,246 | 13,166 | 9,866 | (20,975) | (20,975) | (26,885) |
| STEAM ELECTRIC POWER | FAYETTE | COLORADO | New Contract with LCRA | Highland Lakes | | | | 20,975 | 20,975 | 26,885 |
| Remaining Surplus/Shortage | | | | | **13,246** | **13,166** | **9,866** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 257 | 143 | (332) | (817) | (1,395) | (1,869) |
| BUDA | HAYS | COLORADO | Develop Edwards-BFZ supply through brackish groundwater desalination | Edwards-BFZ | | | | | | 500 |
| BUDA | HAYS | COLORADO | Development of Carrizo-Wilcox Aquifer in Caldwell and Gonzales Counties (Region L) | Carrizo-Wilcox | | 1,687 | 1,687 | 1,687 | 1,687 | 1,687 |
| Remaining Surplus/Shortage | | | | | **257** | **1,830** | **1,355** | **870** | **292** | **318** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (150) | (236) | (329) | (423) | (536) | (629) |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Conservation | | 24 | 17 | 13 | 9 | 5 | 7 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Drought Management (30% permitted pumpage reduction) | | 109 | 109 | 109 | 109 | 109 | 109 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Allocate from County-Other | | 17 | 110 | | | | |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Develop Edwards-BFZ supply through brackish groundwater desalination | Edwards-BFZ | | | 250 | 350 | 500 | 600 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **43** | **45** | **78** | **87** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Shortage/Surplus | | 760 | (838) | (2,072) | (3,440) | (5,144) | (6,482) |
| COUNTY-OTHER | HAYS | COLORADO | Purchase water from COA for Hays County | City of Austin | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 |
| COUNTY-OTHER | HAYS | COLORADO | Develop Edwards-BFZ supply through brackish groundwater desalination | Edwards-BFZ | | 250 | 2,500 | 2,500 | 5,000 | 6,000 |
| | | | Remaining Surplus/Shortage | | **1,860** | **512** | **1,528** | **160** | **956** | **618** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (574) | (1,350) | (1,791) | (2,239) | (2,794) | (3,230) |
| DRIPPING SPRINGS | HAYS | COLORADO | Conservation | | 81 | 277 | 470 | 549 | 661 | 748 |
| DRIPPING SPRINGS | HAYS | COLORADO | Amend Contract with LCRA (through Dripping Springs WSC) | Highland Lakes | 493 | 1,073 | 1,321 | 1,690 | 2,133 | 2,482 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | 452 | 299 | 140 | (17) | (213) | (366) |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | Amend Contract with LCRA | Highland Lakes | | | | 17 | 213 | 366 |
| | | | Remaining Surplus/Shortage | | **452** | **299** | **140** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (25) | (23) | (23) | (22) | (22) | (22) |
| MOUNTAIN CITY | HAYS | COLORADO | Conservation | | 2 | 0 | 0 | 0 | 0 | 0 |
| MOUNTAIN CITY | HAYS | COLORADO | Drought Management (30% permitted pumpage reduction) | | 39 | 39 | 39 | 39 | 39 | 39 |
| | | | Remaining Surplus/Shortage | | **16** | **16** | **16** | **17** | **17** | **17** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (93) | (211) | (330) | (450) | (558) | (657) |
| MANUFACTURING | HAYS | COLORADO | New well field for Trinity Aquifer | Trinity | | | 75 | 200 | 301 | 400 |
| MANUFACTURING | HAYS | COLORADO | Drought Management (30% permitted pumpage reduction) | | 257 | 257 | 257 | 257 | 257 | 257 |
| | | | Remaining Surplus/Shortage | | **164** | **46** | **2** | **7** | **0** | **0** |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | 396 | 144 | (41) | (221) | (397) | (583) |
| COUNTY-OTHER | LLANO | COLORADO | Conservation | | 873 | 1,150 | 1,408 | 1,568 | 1,724 | 1,890 |
| | | | Remaining Surplus/Shortage | | **1,269** | **1,294** | **1,367** | **1,347** | **1,327** | **1,307** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (175) | (220) | (217) | (215) | (223) | (237) |
| KINGSLAND WSC | LLANO | COLORADO | Amend contract with LCRA | Highland Lakes | 240 | 240 | 240 | 240 | 240 | 240 |
| | | | Remaining Surplus/Shortage | | **65** | **20** | **23** | **25** | **17** | **3** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (135) | (290) | (338) | (382) | (439) | (510) |
| LAKE LBJ MUD | LLANO | COLORADO | Conservation | | 135 | 290 | 420 | 541 | 666 | 777 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **82** | **159** | **227** | **267** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (1,090) | (1,171) | (1,183) | (1,192) | (1,207) | (1,232) |
| LLANO | LLANO | COLORADO | Conservation | | 100 | 205 | 299 | 383 | 468 | 558 |
| LLANO | LLANO | COLORADO | New Ellenburger-San Saba Well Field | Ellenburger-San Saba | 478 | 478 | 478 | 478 | 478 | 478 |
| LLANO | LLANO | COLORADO | Development of Hickory Aquifer | Hickory | 512 | 488 | 406 | 331 | 261 | 196 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | (62) | (62) | (62) | (62) | (62) | (62) |
| LIVESTOCK | LLANO | COLORADO | Expand current Hickory supply | Hickory | 62 | 62 | 62 | 62 | 62 | 62 |
| | | | Remaining Surplus/Shortage | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | | Shortage/Surplus | | 14,200 | 14,200 | 14,200 | 700 | 700 | 700 |
| STEAM ELECTRIC POWER | LLANO | COLORADO | Reduction in LCRA Commitment due to Improved Efficiency (Ferguson) | | 0 | (12,000) | (12,000) | 0 | 0 | 0 |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| Remaining Surplus/Shortage | | | | | **14,200** | **2,200** | **2,200** | **700** | **700** | **700** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (61,582) | (58,908) | (55,750) | (52,725) | (49,813) | (47,007) |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (6,491) |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Transfer supply to M&I | | 0 | 0 | 0 | (3,430) | (3,430) | (3,430) |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 14,437 | 14,437 | 14,437 | 14,437 | 14,437 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 2,848 | 2,848 | 2,848 | 2,848 | 2,848 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 6,107 | 6,107 | 6,107 | 6,107 | 6,107 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Develop water conserving rice variety | | 0 | 3,661 | 3,661 | 3,661 | 3,661 | 3,661 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 55,615 | 42,626 | 33,684 | 25,847 | 6,427 | 0 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Continued use of Austin return flows | Colorado ROR | 8,108 | 8,488 | 9,440 | 11,357 | 12,373 | 13,747 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Continued use of Downstream return flows | Colorado ROR | | | 67 | 351 | 429 | 910 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | HB-1437: Water conservation | | 0 | 0 | 0 | 0 | 10,800 | 12,200 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Firm up RoR with off-channel storage | | 0 | 0 | 0 | 0 | 0 | 6,370 |
| Remaining Surplus/Shortage | | | | | **2,141** | **19,259** | **14,494** | **8,453** | **3,839** | **3,352** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (6,605) | (6,263) | (5,860) | (5,474) | (5,102) | (4,744) |
| IRRIGATION | MATAGORDA | COLORADO | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (344) |
| IRRIGATION | MATAGORDA | COLORADO | Transfer supply to M&I | | 0 | 0 | 0 | (350) | (350) | (350) |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 1,473 | 1,473 | 1,473 | 1,473 | 1,473 |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 502 | 502 | 502 | 502 | 502 |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 2,983 | 2,983 | 2,983 | 2,983 | 2,983 |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Develop water conserving rice variety | | 0 | 486 | 486 | 486 | 486 | 486 |
| IRRIGATION | MATAGORDA | COLORADO | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 5,979 | 15,248 | 8,556 | 5,078 | 150 | 0 |
| IRRIGATION | MATAGORDA | COLORADO | Continued use of Austin return flows | Colorado ROR | 776 | 870 | 1,380 | 1,857 | 2,150 | 2,180 |
| IRRIGATION | MATAGORDA | COLORADO | Continued use of Downstream return flows | Colorado ROR | | | 36 | 75 | 150 | 0 |
| IRRIGATION | MATAGORDA | COLORADO | HB-1437: Water conservation | | 0 | 0 | 0 | 0 | 0 | 200 |
| IRRIGATION | MATAGORDA | COLORADO | Firm up RoR with off-channel storage | | | | | | | 650 |
| Remaining Surplus/Shortage | | | | | **150** | **15,299** | **9,556** | **6,630** | **2,442** | **3,036** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (58,555) | (55,882) | (52,724) | (49,698) | (46,788) | (43,980) |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (5,587) |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Transfer supply to M&I | | 0 | 0 | 0 | (3,220) | (3,220) | (3,220) |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 13,553 | 13,553 | 13,553 | 13,553 | 13,553 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 3,617 | 3,617 | 3,617 | 3,617 | 3,617 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 6,160 | 6,160 | 6,160 | 6,160 | 6,160 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Develop water conserving rice variety | | 0 | 4,468 | 4,468 | 4,468 | 4,468 | 4,468 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 50,711 | 42,077 | 29,744 | 22,306 | 13,216 | 0 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Continued use of Austin return flows | Colorado ROR | 7,844 | 8,002 | 9,062 | 10,862 | 11,767 | 12,788 |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Water Management Strategies (ac-ft/yr) | | | | | |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Continued use of Downstream return flows | Colorado ROR | | | 90 | 335 | 834 | 973 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | HB-1437: Water conservation | | 0 | 0 | 0 | 0 | 0 | 8,600 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Firm up RoR with off-channel storage | | | | | | | 5,980 |
| Remaining Surplus/Shortage | | | | | **0** | **21,995** | **13,970** | **8,383** | **3,607** | **3,352** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (56) | (56) | (56) | (56) | (56) | (56) |
| LIVESTOCK | MATAGORDA | COLORADO-LAVACA | Expand current Gulf Coast supply | Gulf Coast | 56 | 56 | 56 | 56 | 56 | 56 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 1,902 | 1,390 | 1,038 | 707 | 433 | (47) |
| MANUFACTURING | MATAGORDA | COLORADO | Temporary Drought Period Use of Gulf Coast | Gulf Coast | | | | | | 47 |
| Remaining Surplus/Shortage | | | | | **1,902** | **1,390** | **1,038** | **707** | **433** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (193) | (53,005) | (53,005) | (53,005) | (53,005) | (53,125) |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Expand supply from STPNOC reservoir | | 193 | | | | | |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Water Right Permit Amendment | Colorado ROR | | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Blend brackish surface water in STPNOC reservoir | Gulf of Mexico Sea Water | | 17,505 | 17,505 | 17,505 | 17,505 | 17,625 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | ROR Increase due to COA Return Flows | Colorado ROR | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Reduction in LCRA Commitment | Highland Lakes | (1,000) | (1,000) | (1,000) | (1,000) | (1,000) | (1,000) |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | ROR Increase due to downstream Return | Colorado ROR | | | 9 | 36 | 68 | 90 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Reduction in LCRA Commitment | Highland Lakes | | | (9) | (36) | (68) | (90) |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | New LCRA Contract | Highland Lakes | | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 83 | 80 | 42 | 56 | (1) | (9) |
| COUNTY-OTHER | MILLS | BRAZOS | Expand current Trinity supply | Trinity | | | | | 1 | 9 |
| Remaining Surplus/Shortage After Sales | | | | | **83** | **80** | **42** | **56** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 27 | 73 | 23 | 43 | (33) | (45) |
| COUNTY-OTHER | MILLS | COLORADO | Expand current Trinity supply | Trinity | | | | | 40 | 52 |
| Remaining Surplus/Shortage After Sales | | | | | **27** | **73** | **23** | **43** | **7** | **7** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (8) | (9) | (9) | (9) | (8) | (8) |
| GOLDTHWAITE | MILLS | BRAZOS | Conservation | | 1 | 2 | 3 | 3 | 3 | 3 |
| GOLDTHWAITE | MILLS | BRAZOS | Expand current Trinity supply | Trinity | 7 | 7 | 6 | 6 | 5 | 5 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (493) | (544) | (552) | (546) | (540) | (539) |
| GOLDTHWAITE | MILLS | COLORADO | Conservation | | 46 | 98 | 144 | 184 | 220 | 256 |
| GOLDTHWAITE | MILLS | COLORADO | Expand current Trinity supply (Brazos Basin) | Trinity | 102 | 109 | 0 | 0 | | |
| GOLDTHWAITE | MILLS | COLORADO | Expand current Trinity supply | Trinity | 0 | 7 | 226 | 226 | 320 | 283 |
| GOLDTHWAITE | MILLS | COLORADO | Drought Management | | 56 | 56 | 56 | 56 | 56 | 56 |
| GOLDTHWAITE | MILLS | COLORADO | New LCRA Contract | Highland Lakes | 300 | 300 | 300 | 300 | 300 | 300 |
| GOLDTHWAITE | MILLS | COLORADO | Construct Goldthwaite channel dam | Goldthwaite Res. | 0 | 0 | 0 | 0 | 0 | 0 |
| Remaining Surplus/Shortage | | | | | **11** | **26** | **174** | **220** | **356** | **356** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| Shortage/Surplus | | | | | (180) | (173) | (184) | (177) | (193) | (186) |
| IRRIGATION | MILLS | BRAZOS | Expand current Trinity supply | Trinity | 180 | 173 | 184 | 177 | 193 | 186 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (159) | (102) | (57) | (3) | 39 | 90 |
| IRRIGATION | MILLS | COLORADO | Expand current Trinity supply | Trinity | 109 | 102 | 57 | 3 | | |
| IRRIGATION | MILLS | COLORADO | Allocate water from County-Other | Trinity | 50 | | | | | |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **39** | **90** |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 22 | 11 | 3 | (3) | (3) | (5) |
| RICHLAND SUD | SAN SABA | COLORADO | Conservation | | 13 | 22 | 19 | 15 | 14 | 15 |
| Remaining Surplus/Shortage | | | | | **35** | **33** | **22** | **12** | **11** | **10** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 127,091 | 96,275 | 53,817 | 10,238 | (30,459) | (62,934) |
| AUSTIN | TRAVIS | COLORADO | Advanced water conservation for the City of Austin | | 11,030 | 18,795 | 24,036 | 25,385 | 30,401 | 36,370 |
| AUSTIN | TRAVIS | COLORADO | COA reuse | Reuse | 5,143 | 13,620 | 22,077 | 30,268 | 36,218 | 40,468 |
| AUSTIN | TRAVIS | COLORADO | ROR Increase due to COA Return Flows | Colorado ROR | 27,188 | 24,954 | 25,692 | 33,549 | 33,263 | 39,528 |
| AUSTIN | TRAVIS | COLORADO | Reduction in LCRA Commitment | Highland Lakes | (27,188) | (24,954) | (25,692) | (33,549) | (33,263) | (39,528) |
| AUSTIN | TRAVIS | COLORADO | ROR Increase due to downstream Return Flows | Colorado ROR | | | 190 | 760 | 1,425 | 1,900 |
| AUSTIN | TRAVIS | COLORADO | Reduction in LCRA Commitment | Highland Lakes | | | (190) | (760) | (1,425) | (1,900) |
| Remaining Surplus/Shortage | | | | | **143,263** | **128,690** | **99,930** | **65,891** | **36,161** | **13,904** |
| AUSTIN | TRAVIS | COLORADO | Water sold to Hays County-Other | City of Austin | (1,100) | (1,100) | (1,100) | (1,100) | (1,100) | (1,100) |
| Remaining Surplus/Shortage After Sales | | | | | **142,163** | **127,590** | **98,830** | **64,791** | **35,061** | **12,804** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (53) | (50) | (47) | (45) | (43) | (43) |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | Conservation | | 37 | 68 | 97 | 123 | 147 | 163 |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | Purchase additional water from West Travis County RWS (Amend LCRA Contract) | Highland Lakes | 16 | | | | | |
| Remaining Surplus/Shortage | | | | | **0** | **18** | **50** | **78** | **104** | **120** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (936) | (1,172) | (1,406) | (1,615) | (1,768) | (1,923) |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | Conservation | | 106 | 247 | 417 | 600 | 778 | 965 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | Purchase additional water from West Travis County RWS (Amend LCRA Contract) | Highland Lakes | 830 | 925 | 989 | 1,015 | 990 | 958 |
| Remaining Surplus/Shortage | | | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 46 | 1 | (45) | (87) | (117) | (149) |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | Conservation | | 16 | 39 | 61 | 66 | 70 | 75 |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | Amend Contract with LCRA | Highland Lakes | | | | 21 | 47 | 74 |
| Remaining Surplus/Shortage | | | | | **62** | **40** | **16** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 305 | (431) | (548) | (632) | (715) | (807) |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | New LCRA Contract | Highland Lakes | | 431 | 548 | 632 | 715 | 807 |
| Remaining Surplus/Shortage | | | | | **305** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 0 | 3 | 3 | 1 | (1) | (3) |
| ELGIN | TRAVIS | COLORADO | Expand current Carrizo-Wilcox supply (Bastrop County) | Carrizo-Wilcox | | | | | 1 | 3 |
| Remaining Surplus/Shortage | | | | | **0** | **3** | **3** | **1** | **0** | **0** |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Shortage/Surplus | | | (11) | (21) | (30) | (37) | (43) | (48) |
| GOFORTH WSC | TRAVIS | COLORADO | Transfer water from Goforth WSC in Region L | Canyon Reservoir | 11 | 21 | 30 | 37 | 43 | 48 |
| | | Remaining Surplus/Shortage | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | (129) | (233) | (329) | (416) | (481) | (554) |
| JONESTOWN | TRAVIS | COLORADO | Amend Contract with LCRA | Highland Lakes | 129 | 233 | 329 | 416 | 481 | 554 |
| | | Remaining Surplus/Shortage | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | (1,681) | (2,613) | (3,513) | (4,338) | (4,954) | (5,572) |
| LAKEWAY | TRAVIS | COLORADO | Conservation | | 396 | 938 | 1,579 | 2,297 | 3,017 | 3,765 |
| LAKEWAY | TRAVIS | COLORADO | Amend Contract with LCRA | Highland Lakes | 1,285 | 1,675 | 1,934 | 2,041 | 2,041 | 2,041 |
| | | Remaining Surplus/Shortage | | | **0** | **0** | **0** | **0** | **104** | **234** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 1,265 | (940) | (1,173) | (1,390) | (1,552) | (1,717) |
| MANOR | TRAVIS | COLORADO | Conservation | | 102 | 235 | 393 | 490 | 522 | 557 |
| MANOR | TRAVIS | COLORADO | New LCRA Contract | Highland Lakes | | 705 | 780 | 900 | 1,030 | 1,160 |
| | | Remaining Surplus/Shortage | | | **1,367** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 2,581 | 1,961 | (831) | (2,184) | (2,584) | (3,034) |
| MANVILLE WSC | TRAVIS | COLORADO | New LCRA Contract | Highland Lakes | | | 831 | 2,184 | 2,584 | 3,034 |
| | | Remaining Surplus/Shortage | | | **2,581** | **1,961** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 3,299 | 1,996 | 442 | 140 | (918) | (1,981) |
| PFLUGERVILLE | TRAVIS | COLORADO | Conservation | | 541 | 748 | 810 | 844 | 915 | 986 |
| PFLUGERVILLE | TRAVIS | COLORADO | Amend Contract with LCRA | Highland Lakes | | | | | 3 | 995 |
| | | Remaining Surplus/Shortage | | | **3,840** | **2,744** | **1,252** | **984** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | (570) | (823) | (823) | (817) | (817) | (817) |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | Conservation | | 132 | 295 | 431 | 549 | 661 | 762 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | Amend Contract with LCRA | Highland Lakes | 438 | 528 | 392 | 268 | 156 | 55 |
| | | Remaining Surplus/Shortage | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 0 | (376) | (374) | (372) | (371) | (373) |
| ROLLINGWOOD | TRAVIS | COLORADO | Conservation | | 31 | 60 | 85 | 109 | 132 | 143 |
| ROLLINGWOOD | TRAVIS | COLORADO | New LCRA Contract | Highland Lakes | | 373 | 373 | 373 | 373 | 373 |
| | | Remaining Surplus/Shortage | | | **31** | **57** | **84** | **110** | **134** | **143** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | (158) | (339) | (528) | (669) | (813) | (957) |
| ROUND ROCK | TRAVIS | COLORADO | Conservation | | 32 | 93 | 179 | 243 | 277 | 312 |
| ROUND ROCK | TRAVIS | COLORADO | HB 1437 - Region G | Highland Lakes | 126 | 246 | 349 | 426 | 536 | 645 |
| | | Remaining Surplus/Shortage | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 547 | 325 | 122 | (4) | (135) | (283) |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | Amend Contract with LCRA | Highland Lakes | | | | 4 | 135 | 283 |
| | | Remaining Surplus/Shortage | | | **547** | **325** | **122** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 0 | (1,833) | (2,049) | (2,178) | (2,320) | (2,471) |
| WEST LAKE HILLS | TRAVIS | COLORADO | Conservation | | 139 | 303 | 495 | 677 | 870 | 1,074 |
| WEST LAKE HILLS | TRAVIS | COLORADO | New LCRA Contract | Highland Lakes | | 1,833 | 2,049 | 2,178 | 2,320 | 2,471 |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Remaining Surplus/Shortage | | | **139** | **303** | **495** | **677** | **870** | **1,074** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 9,260 | 8,540 | 7,836 | 7,311 | 6,694 | 6,139 |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | Conservation | | 17 | 9 | 0 | 0 | 0 | 0 |
| | | Remaining Surplus/Shortage | | | **9,277** | **8,549** | **7,836** | **7,311** | **6,694** | **6,139** |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | Water sold to Barton Creek West | Highland Lakes | (16) | | | | | |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | Water sold to Bee Cave Village | Highland Lakes | (830) | (925) | (989) | (1,015) | (990) | (958) |
| | | Remaining Surplus/Shortage After Sales | | | **8,431** | **7,624** | **6,847** | **6,296** | **5,704** | **5,181** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 0 | (2,222) | (2,201) | (2,180) | (2,180) | (2,180) |
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | New LCRA Contract | Highland Lakes | | 2,222 | 2,201 | 2,180 | 2,180 | 2,180 |
| | | Remaining Surplus/Shortage | | | **0** | **0** | **0** | **0** | **0** | **0** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 287 | 369 | 443 | 511 | 558 | 615 |
| IRRIGATION | TRAVIS | COLORADO | Water allocated to Irrigation (Guadalupe basin) | Irrigation Local Supply | (124) | (114) | (105) | (97) | (89) | (82) |
| | | Remaining Surplus/Shortage After Sales | | | **163** | **255** | **338** | **414** | **469** | **533** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 4,830 | 3,830 | (170) | (1,170) | (5,170) | (6,170) |
| STEAM ELECTRIC POWER | TRAVIS | COLORADO | COA Reuse | Reuse | 2,315 | 3,315 | 7,315 | 8,315 | 12,315 | 13,315 |
| STEAM ELECTRIC POWER | TRAVIS | COLORADO | Reduction in LCRA Commitment due to COA Reuse | | | (3,000) | (5,000) | | | |
| | | Remaining Surplus/Shortage | | | **7,145** | **4,145** | **2,145** | **7,145** | **7,145** | **7,145** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 18 | 3 | (4) | (4) | 0 | 6 |
| WHARTON | WHARTON | COLORADO | Conservation | | 41 | 29 | 18 | 8 | 4 | 4 |
| | | Remaining Surplus/Shortage | | | **59** | **32** | **14** | **4** | **4** | **10** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | (42,928) | (39,361) | (35,920) | (32,607) | (29,410) | (17,276) |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (15,709) |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Transfer supply to M&I | | (5,351) | (14,666) | (16,394) | (16,394) | (18,554) | (18,601) |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 12,766 | 12,766 | 12,766 | 12,766 | 12,766 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 8,803 | 8,803 | 8,803 | 8,803 | 8,803 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 16,303 | 16,303 | 16,303 | 16,303 | 16,303 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Develop water conserving rice variety | | 0 | 13,293 | 13,293 | 13,293 | 13,293 | 13,293 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 45,689 | 12,253 | 8,312 | 3,658 | 0 | 0 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Continued use of Austin return flows | Colorado ROR | 44 | 87 | 131 | 174 | 217 | 261 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Continued use of Downstream return flows | Colorado ROR | | | 1 | 4 | 9 | 13 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | HB-1437: Water conservation | | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
| | | Remaining Surplus/Shortage | | | **1,054** | **13,078** | **10,895** | **9,600** | **7,027** | **3,453** |
| | | | | | | | | | | |
| | | Shortage/Surplus | | | 484 | 2,335 | 4,121 | 5,843 | 7,503 | 13,802 |
| IRRIGATION | WHARTON | COLORADO | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (13,238) |
| IRRIGATION | WHARTON | COLORADO | Transfer supply to M&I | | (575) | (611) | (683) | (683) | (773) | (775) |

| WUG Name | County | River Basin | Water Management Strategy Name | Source Name | Water Management Strategies (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 532 | 532 | 532 | 532 | 532 |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 150 | 150 | 150 | 150 | 150 |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 2,518 | 2,518 | 2,518 | 2,518 | 2,518 |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Develop water conserving rice variety | | 0 | 144 | 144 | 144 | 144 | 144 |
| IRRIGATION | WHARTON | COLORADO | Continuation of LCRA Water Management Plan for interruptible water | | 3,528 | 6,079 | 3,021 | 152 | 0 | 0 |
| IRRIGATION | WHARTON | COLORADO | Continued use of Austin return flows | | 2 | 4 | 6 | 7 | 9 | 11 |
| IRRIGATION | WHARTON | COLORADO | Continued use of Downstream return flows | Colorado ROR | | | 0 | 0 | 1 | 1 |
| IRRIGATION | WHARTON | COLORADO | HB-1437: Water conservation | | 200 | 200 | 200 | 200 | 200 | 200 |
| Remaining Surplus/Shortage | | | | | **3,639** | **11,351** | **10,009** | **8,863** | **10,284** | **3,345** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | (15,290) | (14,164) | (13,077) | (12,029) | (11,019) | (7,186) |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Supply Reduction due to LSWP | | 0 | 0 | 0 | 0 | 0 | (3,982) |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Transfer supply to M&I | | (4,792) | (5,092) | (5,692) | (5,692) | (6,442) | (6,459) |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Gulf Coast | 0 | 4,433 | 4,433 | 4,433 | 4,433 | 4,433 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation on-farm water conservation | | 0 | 4,110 | 4,110 | 4,110 | 4,110 | 4,110 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation delivery system water conservation | | 0 | 8,591 | 8,591 | 8,591 | 8,591 | 8,591 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Develop water conserving rice variety | | 0 | 4,019 | 4,019 | 4,019 | 4,019 | 4,019 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Continuation of LCRA Water Management Plan for interruptible water | Highland Lakes | 23,338 | 10,019 | 4,845 | 1,870 | 0 | 0 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Continued use of Austin return flows | Colorado ROR | 15 | 30 | 45 | 60 | 76 | 90 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Continued use of Downstream return flows | Colorado ROR | | | 0 | 1 | 3 | 5 |
| IRRIGATION | WHARTON | COLORADO-LAVACA | HB-1437: Water conservation | | 200 | 200 | 200 | 200 | 200 | 200 |
| Remaining Surplus/Shortage | | | | | **3,471** | **12,146** | **7,474** | **5,563** | **3,971** | **3,821** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 43 | 31 | 22 | 13 | 5 | (8) |
| MANUFACTURING | WHARTON | COLORADO-LAVACA | Expand current Gulf Coast supply | Gulf Coast | | | | | | 8 |
| Remaining Surplus/Shortage | | | | | **43** | **31** | **22** | **13** | **5** | **0** |
| | | | | | | | | | | |
| Shortage/Surplus | | | | | 420 | 246 | 186 | 114 | 25 | (82) |
| STEAM-ELECTRIC | WHARTON | BRAZOS-COLORADO | New well field in Gulf Coast | Gulf Coast | | | | | | 82 |
| Remaining Surplus/Shortage | | | | | **420** | **246** | **186** | **114** | **25** | **0** |

# Region K
## New Potentially Feasible Water Management Strategy Screening (for 2011 Region K Plan)

| | Water Management Strategy | Water User Group or Wholesale Provider | Strategy Description | Alternative ? | Strategy Cost ($) | Cost of Water ($/ac-ft) | Max Yield (ac-ft/yr) | Starting Decade | Basin | Interbasin Transfer (Yes/No) | Impacts on Habitat / Stream / B&E Flows | Impacts on Landform | Additional Impacts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Drought Management** | Various | Mandatory water use reduction by certain percentage (e.g. 5% or 10%) | Yes | NA | $50.00 | Varies | 2010 | All | No | None expected | None expected | None expected |
| 2 | **Additional Municipal Conservation** | Aqua WSC (Bastrop) | Increased conservation efforts of additional 0.25% per year GPCD reduction between 140 GPCD and 100 GPCD | No | $442,823 | $487.69 | 908 | 2040 | Colorado | No | None expected | None expected | None expected |
| 3 | **Additional Municipal Conservation** | County-Other (Bastrop) | Increased conservation efforts of additional 0.25% per year GPCD reduction between 140 GPCD and 100 GPCD | No | $456,478 | $487.69 | 936 | 2040 | Colorado | No | None expected | None expected | None expected |
| 4 | **New Carrizo-Wilcox Aquifer well field** | County-Other (Bastrop) | New well fields in Guadalupe Basin with distribution | No | $859,055 | $689.45 | 1,246 | 2050 | Guadalupe | NA | None expected | Construction of wells and pipeline | None expected |
| 5 | **Purchase water from LCRA with new SWTP** | Elgin (Bastrop) | Purchase SW through contract and construct new SWTP and transmission line from Colorado River | Yes | $3,426,000 | $1,142.00 | 3,000 | 2060 | Colorado | No | Decrease stream flow downstream of Lake Travis | Construction of pipeline | |
| 6 | **Purchase water from LCRA** | Steam-Electric (Fayette) | Purchase SW through contract | No | $3,710,130 | $138.00 | 26,885 | 2040 | Colorado | No | May increase or decrease instream flows and lake levels | None expected | None expected |
| 7 | **Purchase water from LCRA** | Steam-Electric (Matagorda) | Purchase SW through contract | No | $4,140,000 | $138.00 | 30,000 | 2020 | Colorado | No | May increase instream flows | None expected | None expected |
| 8 | **Temporary overdraft of Carrizo-Wilcox** | Elgin (Bastrop) | overdraft aquifer in 2060 | Yes | $112,230 | $37.41 | 3,000 | 2060 | Colorado | NA | None expected | None expected | increases aquifer drawdown |
| 9 | **Temporary overdraft of Carrizo-Wilcox** | Smithville (Bastrop) | overdraft aquifer in 2060 | Yes | $32,472 | $37.41 | 868 | 2060 | | NA | None expected | None expected | increases aquifer drawdown |
| 10 | **Expansion of Current Carrizo-Wilcox Aquifer supply** | Polonia WSC (Bastrop) | Pump additional groundwater, using existing wells | No | $1,122 | $37.41 | 30 | 2020 | Colorado | NA | None expected | None expected | None expected |
| 11 | **New "Other Aquifer" well field** | Smithville (Bastrop) | New well field site with distribution | Yes | $80,834 | $146.97 | 550 | 2060 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 12 | **New Sparta Aquifer well field** | Smithville (Bastrop) | New well field site with distribution | Yes | $9,732 | $19.86 | 490 | 2060 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 13 | **New Queen City Aquifer well field** | Smithville (Bastrop) | New well field site with distribution | Yes | $11,519 | $19.86 | 580 | 2060 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 14 | **New Yegua-Jackson Aquifer well field** | Smithville (Bastrop) | New well field site with distribution (Fayette County) | Yes | NA | NA | 868 | 2060 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 15 | **New well field in Ellenburger-San Saba** | County-Other (Blanco) | New well field site with distribution | No | $2,394 | $37.41 | 64 | 2050 | Guadalupe | NA | None expected | Construction of wells and pipeline | None expected |
| 16 | **Expansion of Current Ellenburger-San Saba Aquifer supply** | Bertram (Burnet) | Pump additional groundwater, using existing wells or drilling new wells | No | $401,283 | $785.29 | 511 | 2010 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 17 | **Expansion of Current Ellenburger-San Saba Aquifer supply** | County-Other (Burnet) | Pump additional groundwater, using existing wells or drilling new wells | No | $947,410 | $803.57 | 1,179 | 2040 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 18 | **Expansion of Current Ellenburger-San Saba Aquifer supply** | Mining (Burnet) | Pump additional groundwater, using existing wells or drilling new wells | No | $692,766 | $793.55 | 873 | 2010 | Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 19 | **Amend (Expand) Contract with LCRA** | Granite Shoals (Burnet) | Increase amount of currently contracted surface water with LCRA | No | $13,110 | $138.00 | 95 | 2040 | Colorado | No | Decrease amount of uncommitted Highland Lakes water | None expected | None expected |
| 20 | **Amend (Expand) Contract with LCRA** | Marble Falls (Burnet) | Increase amount of currently contracted surface water with LCRA | No | $41,952 | $138.00 | 304 | 2030 | Colorado | No | Decrease amount of uncommitted Highland Lakes water | None expected | None expected |
| 21 | **Amend (Expand) Contract with LCRA** | Kingsland WSC (Llano) | Increase amount of currently contracted surface water with LCRA | No | $33,120 | $138.00 | 240 | 2010 | Colorado | No | Decrease amount of uncommitted Highland Lakes water | None expected | None expected |
| 22 | **Conservation** | Schulenberg (Fayette) | Conservation | No | $108,871 | $591.69 | 184 | 2010 | Lavaca | No | None expected | None expected | None expected |

# Region K
## New Potentially Feasible Water Management Strategy Screening (for 2011 Region K Plan)

| | Water Management Strategy | Water User Group or Wholesale Provider | Strategy Description | Alternative ? | Strategy Cost ($) | Cost of Water ($/ac-ft) | Max Yield (ac-ft/yr) | Starting Decade | Basin | Interbasin Transfer (Yes/No) | Impacts on Habitat / Stream / B&E Flows | Impacts on Landform | Additional Impacts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | **Expand Yegua-Jackson Supply** | Schulenberg (Fayette) | Pump additional groundwater | No | $337 | $37.41 | 9 | 2060 | Lavaca | No | None expected | None expected | None expected |
| 24 | **Conservation** | Mountain City (Hays) | Conservation | No | $1,097 | $548.34 | 2 | 2010 | Colorado | No | None expected | None expected | None expected |
| 25 | **Expand Edwards-BFZ Supply through brackish groundwater desalination** | County-Other (Hays) | Desalination of "saline zone" of Edwards-BFZ aquifer in Travis County | No | $4,740,000 | $790.00 | 6,000 | 2030 | Colorado | NA | None expected | potential distribution system construction | brine waste |
| 26 | **Expand Edwards-BFZ Supply through brackish groundwater desalination** | Cimarron Park Water Company (Hays) | Desalination of "saline zone" of Edwards-BFZ aquifer in Travis County | No | $513,500 | $790.00 | 650 | 2030 | Colorado | NA | None expected | potential distribution system construction | brine waste |
| 27 | **Expand Edwards-BFZ Supply through brackish groundwater desalination** | Buda (Hays) | Desalination of "saline zone" of Edwards-BFZ aquifer in Travis County | No | $395,000 | $790.00 | 500 | 2060 | Colorado | NA | None expected | potential distribution system construction | brine waste |
| 28 | **Development of Carrizo-Wilcox Aquifer in Caldwell and Gonzales Counties (Region L)** | Buda (Hays) | Purchase groundwater | No | $1,149,235 | $681.23 | 1,687 | 2020 | Colorado | NA | None expected | Construction of pipeline | None expected |
| 29 | **Water Allocation** | Cimarron Park Water Company (Hays) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | No | NA | NA | 110 | 2010 - 2020 | Colorado | NA | None expected | None expected | None expected |
| 30 | **Water Allocation** | Mountain City (Hays) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | Yes | NA | NA | 23 | 2010 - 2060 | Colorado | NA | None expected | None expected | None expected |
| 31 | **Water Allocation** | Manufacturing (Hays) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | No | NA | NA | 211 | 2010 only | Colorado | NA | None expected | None expected | None expected |
| 32 | **Water Allocation** | Llano (Llano) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | No | NA | NA | 512 | 2010-2060 | Colorado | NA | None expected | None expected | None expected |
| 33 | **Water Allocation** | Irrigation (Matagorda) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | No | NA | NA | 3,319 | 2010 only | Colorado-Lavaca | NA | None expected | None expected | None expected |
| 34 | **Water Allocation** | Irrigation (Matagorda) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | No | NA | NA | 1,567 | 2010 only | Colorado | NA | None expected | None expected | None expected |
| 35 | **Water Allocation** | Irrigation (Mills) | Allocate oversupply of County-Other groundwater to be available for pumping by another WUG within the same basin | No | NA | NA | 50 | 2010 only | Colorado | NA | None expected | None expected | None expected |
| 36 | **Expand Supply from STPNOC Reservoir** | Steam-Electric (Matagorda) | Use additional reservoir supply to meet remaining need | No | NA | NA | 193 | 2010 | Colorado | No | None expected | None expected | Reduce supply held in reservoir |
| 37 | **Pump brackish surface water to blend in STPNOC reservoir** | Steam-Electric (Matagorda) | approve STPNOC to pump brackish surface water to blend with the freshwater in their | No | $0 | $0.00 | 17,505 | 2020 | Colorado | No | None expected | None expected | None expected |
| 38 | **Water Right Permit Amendment** | Steam-Electric (Matagorda) | Amend existing water right permit to divert additional water, when available | No | $49,995 | $9.09 | 5,500 | 2020 | Colorado | No | Decrease in streamflow during periods of high flow | None expected | None expected |
| 39 | **Expand Current Trinity Aquifer Supply** | County-Other (Mills) | Pump additional groundwater, using existing wells | No | $337 | $37.41 | 9 | 2050 | Brazos | NA | None expected | None expected | None expected |
| 40 | **Expand Current Trinity Aquifer Supply** | County-Other (Mills) | Pump additional groundwater, using existing wells | No | $30,768 | $591.69 | 52 | 2050 | Colorado | NA | None expected | None expected | None expected |
| 41 | **Expand Current Trinity Aquifer Supply** | Goldthwaite (Mills) | Pump additional groundwater, using existing wells | No | $4,142 | $591.69 | 7 | 2010 | Brazos | NA | None expected | None expected | None expected |
| 42 | **Expand Current Trinity Aquifer Supply** | Goldthwaite (Mills) | Pump additional groundwater, using existing wells | No | $64,494 | $591.69 | 109 | 2010 | Brazos | NA | None expected | None expected | None expected |
| 43 | **Expand Current Trinity Aquifer Supply** | Goldthwaite (Mills) | Pump additional groundwater, new well needed | No | $189,341 | $591.69 | 320 | 2020 | Colorado | NA | None expected | None expected | None expected |
| 44 | **Expand Current Trinity Aquifer Supply** | Irrigation (Mills) | Pump additional groundwater, using existing wells | No | $64,495 | $591.69 | 109 | 2010 | Colorado | NA | None expected | None expected | None expected |
| 45 | **Temporary overdraft of Trinity Aquifer** | Goldthwaite (Mills) | Overdraft aquifer in 2010 and 2020 | No | $6,621 | $37.41 | 177 | 2010 | Colorado | NA | None expected | None expected | increases aquifer drawdown |
| 46 | **Brackish groundwater desalination** | Goldthwaite (Mills) | Desalination of saline groundwater through treatment | No | $1,961,000 | $1,961.00 | 1,000 | 2020 | Colorado | NA | None expected | distribution system construction | brine waste |

## Region K
## New Potentially Feasible Water Management Strategy Screening (for 2011 Region K Plan)

| | Water Management Strategy | Water User Group or Wholesale Provider | Strategy Description | Alternative ? | Strategy Cost ($) | Cost of Water ($/ac-ft) | Max Yield (ac-ft/yr) | Starting Decade | Basin | Interbasin Transfer (Yes/No) | Impacts on Habitat / Stream / B&E Flows | Impacts on Landform | Additional Impacts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | **Conservation** | Manor (Travis) | Conservation | No | $305,428 | $548.34 | 557 | 2010 | Colorado | No | None expected | None expected | None expected |
| 48 | **Amend (Expand) Contract with LCRA** | Pflugerville (Travis) | Increase amount of currently contracted surface water with LCRA | No | $137,310 | $138.00 | 995 | 2060 | Colorado | No | Decrease amount of uncommitted Highland Lakes water | None expected | None expected |
| 49 | **New Well Field in Gulf Coast Aquifer** | Steam-Electric (Wharton) | New well field site with distribution | No | $0 | $0.00 | 82 | 2060 | Brazos-Colorado | NA | None expected | Construction of wells and pipeline | None expected |
| 50 | | | | | | | | | | | | | |
| 51 | **Enhanced Municipal and Industrial Conservation** | LCRA | Advanced conservation methods for reducing municipal and industrial water use by LCRA and its customers | Yes | $8,000,000 | $400.00 | 20,000 | 2030 | Colorado | No | Possible decrease in streamflow | None expected | None expected |
| 52 | **Aquifer Storage and Recovery (ASR)** | LCRA | Divert excess Colorado River flow for treatment and immediate use or storage underground for later use | Yes | $38,024,800 | $3,802.48 | 10,000 | 2040 | Colorado | No | Possible decrease in streamflow | Potential distribution system construction | None expected |
| 53 | **Reuse by Highland Lakes Communities** | LCRA | Reuse wastewater effluent for irrigation purposes in Highland Lakes Communities which are not allowed to discharge to the lakes | Yes | $2,750,000 | $550.00 | 5,000 | 2020 | Colorado | No | None expected | Potential distribution system construction | None expected |
| 54 | | | | | | | | | | | | | |
| 55 | **Alternative Water Management Strategies** | | | | | | | | | | | | |
| 56 | **Expand Gulf Coast Aquifer Supply** | Irrigation (Colorado, Matagorda, and Wharton Counties) | Pump additional groundwater using existing wells | | $1,200,000 | $80.00 | 15,000 | 2010 | Various | No | Increased return flows to river during times of low flow | None expected | |
| 57 | **Develop High Yield Rice Variety** | Irrigation (Colorado, Matagorda, and Wharton Counties) | High Yield rice variety reduces amount of water needed per year | | $19,200 | $0.64 | 30,000 | 2020 | Various | No | Reduced return flows to river, but less diversion needed from no ratoon crop | None expected | No ratoon crop may affect waterfowl |
| 58 | **On-Farm Conservation** | Irrigation (Colorado, Matagorda, and Wharton Counties) | On-Farm conservation measures to reduce the amount of water required for rice growing | | $1,537,301 | $51.24 | 30,000 | 2020 | Various | No | Reduced return flows to river | None expected | |
| 59 | **In-District Water Delivery System Improvements** | Irrigation (Colorado, Matagorda, and Wharton Counties) | Improvements to the methods of water delivery to the rice fields in order to reduce the amount of water needed/lost | | $2,151,766 | $39.12 | 55,000 | 2020 | Various | No | Reduced diversions from river | None expected | |
| 60 | **Enhanced Aquifer Recharge through Infiltration Basin** | Irrigation (Colorado, Matagorda, and Wharton Counties) | Use an off-channel infiltration basin that would receive excess surface water flows and allow infiltration into the aquifer to provide additional groundwater | | $5,882,400 | $342.00 | 17,200 | 2050 | Various | No | Reduced pulse flows to Matagorda Bay | None expected | None expected |
| 61 | **Development of New Groundwater (conjunctive use)** | Irrigation (Colorado, Matagorda, and Wharton Counties) | Installing additional wells in the Gulf Coast Aquifer to provide an extra amount of water for irrigation, using a rolling average | | $14,457,450 | $963.83 | 15,000 | 2050 | Various | No | Increased return flows to river during times of low flow | None expected | additional aquifer drawdown |
| 62 | **Off-Channel Storage in Reservoirs** | Irrigation (Colorado, Matagorda, and Wharton Counties) | Divert excess Colorado River flow for storage in constructed reservoirs | | $13,800,000 | $345.00 | 40,000 | 2030 | Various | No | Reduction in some of the higher pulse flows to Matagorda Bay | Construction of reservoirs | None expected |
| 63 | **Groundwater Importation** | LCRA | Importation of groundwater from outside of the planning area | | $46,550,000 | $1,330.00 | 35,000 | 2040 | Colorado | No | Increased return flows to river | Construction of pipeline | None expected |
| 64 | **Brackish desalination of Gulf Coast aquifer** | LCRA | Installing wells in the Gulf Coast Aquifer to pump brackish groundwater, desalinate it, and provide it to local LCRA customers | | $28,224,000 | $1,260.00 | 22,400 | 2040 | Colorado | No | Increased return flows to river | Construction of Desal plant and pipeline | Disposal of brine |
| 65 | **Brackish desalination of Ellenburger-San Saba aquifer** | Mills County-Other | Aquifer to pump brackish groundwater, desalinate it, and provide it through a distribution system to county residents | | $1,216,512 | $3,168.00 | 384 | 2030 | Colorado | No | None expected | Construction of Desal plant and pipeline | Disposal of brine |

# Alternative Water Management Strategy Summary Table



| Region | ID | Alternative Water Management Strategy | Total Capital Costs ($) | First Decade Estimated Annual Average Unit Cost ($/ac-ft/yr) | Water Supply Volume (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 | Year 2060 Estimated Annual Average Unit Cost ($/ac-ft/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| K | KS | Desalination of Ellenburger-San Saba Aquifer | $6,285,000 | $3,168 | 0 | 0 | 384 | 384 | 384 | 384 | $3,168 |
| K | KS | Desalination of Brackish Gulf Coast Aquifer | $177,600,000 | $1,260 | 0 | 0 | 0 | 22400 | 22400 | 22400 | $1,260 |
| K | KT | Groundwater Importation | $395,900,000 | $1,330 | 0 | 0 | 0 | 35000 | 35000 | 35000 | $1,330 |
| K | KD4 | Expansion of Gulf Coast Aquifer | $0 | $80 | 0 | 10000 | 10000 | 10000 | 10000 | 10000 | $80 |
| K | KL1 | On-Farm Conservation | $5,425,000 | $51 | 0 | 20000 | 20000 | 30000 | 35000 | 35000 | $51 |
| K | KL2 | Irrigation Divisions Delivery System Improvements | $4,944,000 | $39 | 0 | 20000 | 25000 | 40000 | 48000 | 48000 | $39 |
| K | KL3 | Conjunctive Use of Groundwater - Includes Overdrafts | $14,432,000 | $964 | 0 | 0 | 0 | 0 | 15000 | 15000 | $964 |
| K | KO3 | Enhanced Recharge of Groundwater (Gulf Coast Aquifer) | $41,049,000 | $354 | 0 | 0 | 0 | 0 | 17200 | 17200 | $354 |
| K | KO4 | Off-Channel Storage in Additional Reservoirs | $53,388,000 | $345 | 0 | 0 | 30000 | 40000 | 40000 | 40000 | $345 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AQUA WSC | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 6,248,640 | $ 9,069,004 | $ - | $ - | $ 1,185,314 | $ 2,500,791 | $ 3,516,930 | $ 4,254,054 | 7,850 | $ 4,254,054 | $ 541.92 |
| AQUA WSC | BASTROP | COLORADO | Additional Municipal Conservation | | | | | | | $ 66,897 | $ 150,245 | $ 280,750 | 512 | $ 280,750 | $ 548.34 |
| AQUA WSC | BASTROP | COLORADO | Drought Management | | | | | | | | | $ 44,900 | 898 | $ 44,900 | $ 50.00 |
| BASTROP | BASTROP | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 80,058 | $ 137,086 | $ 196,856 | $ 257,174 | $ 117,346 | $ 159,020 | 469 | $ 257,174 | $ 548.34 |
| BASTROP | BASTROP | COLORADO | Expand Other Aquifer supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 1,721,920 | $ 2,548,868 | $ - | $ 260,323 | $ 271,293 | $ 289,191 | $ 308,974 | $ 333,193 | 2,814 | $ 333,193 | $ 118.41 |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 5,386 | 144 | $ 5,386 | $ 37.41 |
| COUNTY-OTHER | BASTROP | COLORADO | Additional Municipal Conservation | | | | | | | $ 219,336 | $ 126,667 | $ 167,244 | 400 | $ 219,336 | $ 548.34 |
| COUNTY-OTHER | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 4,280,640 | $ 6,189,196 | $ - | $ 763,900 | $ 1,022,730 | $ 1,269,214 | $ 1,244,736 | $ 1,410,336 | 3,700 | $ 1,410,336 | $ 381.17 |
| COUNTY-OTHER | BASTROP | COLORADO | New Carrizo-Wilcox well field (Guadalupe basin) | Expand groundwater pumping efforts through installation of new well(s). | $ 5,434,871 | $ 7,932,044 | $ - | $ - | $ - | $ - | $ 856,991 | $ 881,392 | 1,246 | $ 881,392 | $ 707.38 |
| COUNTY-OTHER | BASTROP | GUADALUPE | New Carrizo-Wilcox well field | Expand groundwater pumping efforts through installation of new well(s). Costs accounted for in County-Other Bastrop Guadalupe Basin. | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 11,318 | 16 | $ 11,318 | $ 707.38 |
| ELGIN | BASTROP | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 49,899 | $ - | $ - | $ - | $ - | $ - | 91 | $ 49,899 | $ 548.34 |
| ELGIN | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 2,082,880 | $ 3,023,001 | $ - | $ 385,048 | $ 472,222 | $ 600,201 | $ 700,216 | $ 367,214 | 2,734 | $ 700,216 | $ 256.11 |
| ELGIN | BASTROP | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ 17,556,000 | $ 23,545,000 | $ - | $ - | $ - | $ - | $ - | $ 3,425,066 | 3,000 | $ 3,425,066 | $ 1,142.00 |
| ELGIN | BASTROP | COLORADO | Drought Management | | | | | | | | | $ 13,250 | 265 | $ 13,250 | $ 50.00 |
| POLONIA WSC | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ 75 | $ 262 | $ 598 | $ 860 | $ 1,122 | 30 | $ 1,122 | $ 37.41 |
| SMITHVILLE | BASTROP | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 13,709 | $ - | $ - | $ - | $ - | $ - | 25 | $ 13,709 | $ 548.34 |
| SMITHVILLE | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 1,041,440 | $ 1,511,501 | $ 158,624 | $ 177,618 | $ 193,205 | $ 223,652 | $ 235,904 | $ 208,211 | 1,115 | $ 235,904 | $ 211.57 |
| SMITHVILLE | BASTROP | COLORADO | New Well Field in Queen City Aquifer | Expand groundwater pumping efforts through installation of new well(s). | $ 4,190,135 | $ 6,132,554 | $ - | $ - | $ - | $ - | $ - | $ 627,800 | 580 | $ 627,800 | $ 1,082.41 |
| SMITHVILLE | BASTROP | COLORADO | Drought Management | | | | | | | | | $ 14,400 | 288 | $ 14,400 | $ 50.00 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | BASTROP | BRAZOS | Expand current Queen City supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 794 | $ 794 | $ 794 | $ 616 | $ 477 | $ 338 | 40 | $ 794 | $ 19.86 |
| IRRIGATION | BASTROP | BRAZOS | Temporary Drought Period Use of Queen City Aquifer | Temporary measure. Cost associated with additional pumping costs (energy costs) | $ - | $ - | $ 417 | $ 199 | $ - | $ - | $ - | $ - | 21 | $ 417 | $ 19.86 |
| IRRIGATION | BASTROP | COLORADO | Expand current Queen City supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 1,152 | $ - | $ - | $ - | $ - | $ - | 58 | $ 1,152 | $ 19.86 |
| MANUFACTURING | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ 262 | $ 636 | $ 935 | $ 1,197 | $ 1,646 | 44 | $ 1,646 | $ 37.41 |
| MANUFACTURING | BASTROP | GUADALUPE | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 299 | $ 374 | $ 411 | $ 486 | $ 524 | $ 598 | 16 | $ 598 | $ 37.41 |
| MINING | BASTROP | COLORADO | Expand current Carrizo-Wilcox supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 3,219,360 | $ 4,670,504 | $ 1,391,947 | $ 1,392,798 | $ 1,393,011 | $ - | $ - | $ - | 4,298 | $ 1,393,011 | $ 324.11 |
| STEAM ELECTRIC POWER | BASTROP | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ - | $ - | $ - | $ 176,640 | $ 383,640 | $ 383,640 | 2,780 | $ 383,640 | $ 138.00 |
| COUNTY-OTHER | BLANCO | GUADALUPE | New Well Field in Ellenburger-San Saba | Expand groundwater pumping efforts through installation of new well(s) | $ 1,977,110 | $ 2,868,976 | | | | | $ 275,444 | $ 276,304 | 64 | $ 276,304 | $ 4,317.25 |
| BERTRAM | BURNET | BRAZOS | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 13,017 | $ 18,934 | $ 15,384 | $ 6,509 | $ 2,958 | $ 5,917 | 32 | $ 18,934 | $ 591.69 |
| BERTRAM | BURNET | BRAZOS | Expand current Ellenburger-San Saba supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 898 | 24 | $ 898 | $ 37.41 |
| COTTONWOOD SHORES | BURNET | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 3,588 | $ 27,324 | $ 53,268 | $ 82,938 | $ 115,920 | $ 155,940 | 1,130 | $ 155,940 | $ 138.00 |
| COUNTY-OTHER | BURNET | COLORADO | Expand current Trinity supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 2,029,440 | $ 2,967,729 | $ - | $ - | $ 477,016 | $ 477,016 | $ 499,632 | $ 499,632 | 541 | $ 499,632 | $ 923.53 |
| COUNTY-OTHER | BURNET | COLORADO | Expand current Ellenburger-San Saba supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 8,367,840 | $ 12,249,979 | $ - | $ - | $ - | $ 1,612,760 | $ 1,965,813 | $ 2,308,805 | 1,179 | $ 2,308,805 | $ 1,958.27 |
| GRANITE SHOALS | BURNET | COLORADO | Amend contract with LCRA | Renew contract with LCRA - WUG exists in several counties, contract amount split based on demands of each | $ - | $ - | $ - | $ - | $ - | $ - | $ 1,932 | $ 13,110 | 95 | $ 13,110 | $ 138.00 |
| KINGSLAND WSC | BURNET | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 1,380 | $ 1,518 | $ 1,656 | $ 1,794 | $ 1,932 | $ 2,346 | 17 | $ 2,346 | $ 138.00 |
| MARBLE FALLS | BURNET | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 117,747 | $ 184,016 | $ 242,594 | $ 292,888 | $ 274,545 | $ 311,230 | 526 | $ 311,230 | $ 591.69 |
| MARBLE FALLS | BURNET | COLORADO | Amend contract with LCRA | Purchase additional water from the LCRA | $ - | | $ - | $ - | $ 7,728 | $ 41,952 | $ 37,950 | $ 34,224 | 304 | $ 41,952 | $ 138.00 |
| MEADOWLAKES | BURNET | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 45,560 | $ 69,228 | $ 92,896 | $ 110,055 | $ 102,363 | $ 110,647 | 187 | $ 110,647 | $ 591.69 |
| MEADOWLAKES | BURNET | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 33,258 | $ 52,716 | $ 69,828 | $ 81,834 | $ 81,834 | $ 81,834 | 593 | $ 81,834 | $ 138.00 |
| LIVESTOCK | BURNET | BRAZOS | Expand current Trinity supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 226,780 | $ 226,780 | $ 92,894 | $ 92,894 | $ 92,894 | $ 92,894 | $ 92,894 | $ 92,894 | 23 | $ 92,894 | $ 4,038.88 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MINING | BURNET | BRAZOS | Expand current Trinity supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 446 | $ 637 | $ 765 | $ 1,402 | $ 1,529 | $ 1,593 | 25 | $ 1,593 | $ 63.72 |
| MINING | BURNET | COLORADO | Expand current Ellenburger-San Saba supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 6,114,960 | $ 8,951,908 | $ 1,354,768 | $ 1,404,944 | $ 1,426,353 | $ 1,441,740 | $ 1,453,783 | $ 1,483,219 | 873 | $ 1,483,219 | $ 1,698.99 |
| COUNTY-OTHER | COLORADO | LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 3,928 | $ 4,077 | $ 3,965 | $ 3,628 | $ 3,479 | $ 3,366 | 109 | $ 4,077 | $ 37.41 |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | COLORADO | BRAZOS-COLORADO | Firm up RoR with off-channel storage | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | COLORADO | LAVACA | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | COLORADO | LAVACA | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | COLORADO | LAVACA | Firm up RoR with off-channel storage | Part of LCRA-SAWS Plan. No cost applicable | $ - | | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| LIVESTOCK | COLORADO | COLORADO | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 138,040 | $ 146,322 | $ 45,615 | $ 45,615 | $ 45,615 | $ 45,615 | $ 45,615 | $ 45,615 | 14 | $ 45,615 | $ 3,258.22 |
| LIVESTOCK | COLORADO | LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 108,460 | $ 114,968 | $ 34,682 | $ 34,682 | $ 34,682 | $ 34,682 | $ 34,682 | $ 34,682 | 11 | $ 34,682 | $ 3,152.95 |
| MINING | COLORADO | BRAZOS-COLORADO | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 167 | $ 193 | $ 202 | $ 211 | $ 219 | $ 228 | 26 | $ 228 | $ 8.77 |
| MINING | COLORADO | COLORADO | New Other Aquifer well Field | Expand groundwater pumping efforts through installation of new well(s) | $ - | $ - | $ 37,449 | $ 37,449 | $ 37,449 | $ 37,449 | $ 37,449 | $ 37,449 | 4,269 | $ 37,449 | $ 8.77 |
| MINING | COLORADO | COLORADO | Expand Gulf Coast supply (Colorado basin) | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 31,809 | $ 31,809 | $ 24,589 | $ 14,474 | $ 1,877 | $ 3,272 | 3,626 | $ 31,809 | $ 8.77 |
| MINING | COLORADO | COLORADO | Expand Gulf Coast supply (Lavaca basin) | Use additional water provided by expansion of current groundwater pumping efforts by the Mining-Colorado County-Lavaca river basin WUG | $ - | $ - | $ 4,869 | $ 263 | $ - | $ - | $ - | $ - | 555 | $ 4,869 | $ 8.77 |
| MINING | COLORADO | LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 877 | $ 1,158 | $ 1,325 | $ 1,474 | $ 1,614 | $ 1,746 | 199 | $ 1,746 | $ 8.77 |
| COUNTY-OTHER | FAYETTE | COLORADO | Expand current Sparta supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 4,601 | $ 4,489 | $ 711 | $ - | $ - | $ - | 123 | $ 4,601 | $ 37.41 |
| COUNTY-OTHER | FAYETTE | LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ - | $ - | $ 1,197 | $ 935 | $ 598 | 32 | $ 1,197 | $ 37.41 |
| FAYETTE WSC | FAYETTE | COLORADO | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 676,480 | $ 989,243 | $ - | $ 116,793 | $ 130,712 | $ 130,712 | $ 130,712 | $ 130,712 | 428 | $ 130,712 | $ 305.40 |
| FAYETTE WSC | FAYETTE | COLORADO | New Other Aquifer well field | Expand groundwater pumping efforts through installation of new well(s) | $ 2,887,868 | $ 4,260,602 | $ - | $ - | $ 411,892 | $ 418,334 | $ 426,144 | $ 436,506 | 889 | $ 436,506 | $ 491.01 |
| FAYETTE WSC | FAYETTE | LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ 786 | $ 1,683 | $ 2,357 | $ 3,217 | $ 4,339 | 116 | $ 4,339 | $ 37.41 |
| SCHULENBURG | FAYETTE | LAVACA | Conservation | Reduction of municipal water demand through municipal conservation | | | $ 25,443 | $ 36,093 | $ 31,360 | $ 1,183 | $ 4,734 | $ 10,059 | 61 | $ 36,093 | $ 591.69 |
| SCHULENBURG | FAYETTE | LAVACA | Expand current Yegua-Jackson supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | | | $ - | $ - | $ - | $ - | $ - | $ 337 | 9 | $ 337 | $ 37.41 |
| IRRIGATION | FAYETTE | LAVACA | Expand current Sparta supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 748 | $ 673 | $ 598 | $ 524 | $ 449 | $ 374 | 20 | $ 748 | $ 37.41 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LIVESTOCK | FAYETTE | BRAZOS | New Other Aquifer well field (Colorado Basin) | Expand groundwater pumping efforts through installation of new well(s) | $ 216,920 | $ 229,935 | $ 62,958 | $ 62,958 | $ 62,958 | $ 62,958 | $ 62,958 | $ 62,958 | 22 | $ 62,958 | $ 2,861.71 |
| MANUFACTURING | FAYETTE | LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ - | $ - | $ 75 | $ 748 | $ 1,608 | 43 | $ 1,608 | $ 37.41 |
| MANUFACTURING | FAYETTE | LAVACA | Expand current Sparta supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 1,683 | $ 2,618 | $ 3,516 | $ 4,302 | $ 4,376 | $ 4,451 | 119 | $ 4,451 | $ 37.41 |
| MINING | FAYETTE | BRAZOS | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ 150 | $ 823 | $ 1,047 | $ 1,085 | $ 1,085 | 29 | $ 1,085 | $ 37.41 |
| STEAM ELECTRIC POWER | FAYETTE | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ - | $ - | $ 2,894,550 | $ 2,894,550 | $ 3,710,130 | 26,885 | $ 3,710,130 | $ 138.00 |
| BUDA | HAYS | COLORADO | Expand Edwards-BFZ supply through brackish GW desalination | Develop new wellfield in Saline Zone of Edwards-BFZ | $ 1,391,124 | $ 1,949,445 | $ - | $ - | $ - | $ - | $ - | $ 489,334 | 500 | $ 489,334 | $ 978.67 |
| BUDA | HAYS | COLORADO | Development of Carrizo-Wilcox Aquifer in Caldwell and Gonzales Counties (Region L) | Purchase water through HCPUA | $ 6,807,200 | $ 10,905,253 | $ - | $ 1,300,027 | $ 1,300,027 | $ 1,300,027 | $ 1,300,027 | $ 1,300,027 | 1,687 | $ 1,300,027 | $ 770.61 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 13,160 | $ - | $ - | $ - | $ - | $ 1,097 | 24 | $ 13,160 | $ 548.34 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Allocate from county-other | No cost associated due to re-allocation of supply. See text. | | | | | | | | | | | $ - |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | Expand Edwards-BFZ supply through brackish GW desalination | Develop new wellfield in Saline Zone of Edwards-BFZ | $ 1,669,349 | $ 2,339,334 | | | $ 244,667 | $ 342,534 | $ 489,335 | $ 587,200 | 600 | $ 587,200 | $ 978.67 |
| COUNTY-OTHER | HAYS | COLORADO | Purchase water from COA for Hays County | Construction of transmission facilities to transport water from the COA's dist. System to N. Hays County | $ 2,280,200 | $ 2,280,200 | $ 1,059,254 | $ 1,059,254 | $ 1,059,254 | $ 1,059,254 | $ 1,059,254 | $ 1,059,254 | 1,100 | $ 1,059,254 | $ 962.96 |
| COUNTY-OTHER | HAYS | COLORADO | Expand Edwards-BFZ supply through brackish GW desalination | Develop new wellfield in Saline Zone of Edwards-BFZ | $ 16,693,491 | $ 23,393,343 | | $ 244,668 | $ 2,446,680 | $ 2,446,680 | $ 4,893,350 | $ 5,872,020 | 6,000 | $ 5,872,020 | $ 978.67 |
| DRIPPING SPRINGS | HAYS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 44,416 | $ 107,476 | $ 105,830 | $ 43,319 | $ 61,415 | $ 47,706 | 196 | $ 107,476 | $ 548.34 |
| DRIPPING SPRINGS | HAYS | COLORADO | Amend contract with LCRA (through Dripping Springs WSC) | Purchase water from the LCRA | $ - | $ - | $ 68,034 | $ 148,074 | $ 182,298 | $ 233,220 | $ 294,354 | $ 342,516 | 2,482 | $ 342,516 | $ 138.00 |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ - | $ - | $ - | $ 2,346 | $ 29,394 | $ 50,508 | 366 | $ 50,508 | $ 138.00 |
| MOUNTAIN CITY | HAYS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | | | $ 1,097 | $ - | $ - | $ - | $ - | $ - | 2 | $ 1,097 | $ 548.34 |
| MOUNTAIN CITY | HAYS | COLORADO | Allocate from county-other | No cost associated due to re-allocation of supply. See text. | | | $ 6,249 | $ 6,249 | $ 6,249 | $ 6,249 | $ 6,249 | $ 6,249 | 39 | $ 6,249 | $ 160.22 |
| MANUFACTURING | HAYS | COLORADO | New well field for Trinity Aquifer | Expand groundwater pumping efforts through installation of new well(s) | $ 4,084,198 | $ 6,000,820 | $ - | $ - | $ 610,537 | $ 630,564 | $ 646,747 | $ 662,608 | 400 | $ 662,608 | $ 1,656.52 |
| COUNTY-OTHER | LLANO | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 516,548 | $ 163,899 | $ 152,657 | $ 94,671 | $ 92,304 | $ 98,221 | 873 | $ 516,548 | $ 591.69 |
| KINGSLAND WSC | LLANO | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 33,120 | $ 33,120 | $ 33,120 | $ 33,120 | $ 33,120 | $ 33,120 | 240 | $ 33,120 | $ 138.00 |
| LAKE LBJ MUD | LLANO | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 79,879 | $ 91,712 | $ 76,920 | $ 71,595 | $ 73,962 | $ 65,678 | 155 | $ 91,712 | $ 591.69 |
| LLANO | LLANO | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 59,169 | $ 62,128 | $ 55,619 | $ 49,702 | $ 50,294 | $ 53,252 | 105 | $ 62,128 | $ 591.69 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LLANO | LLANO | COLORADO | New Ellenburger-San Saba Well Field | Expand groundwater pumping efforts through installation of new well(s) | $ 3,624,413 | $ 5,411,080 | $ 736,897 | $ 736,897 | $ 736,897 | $ 736,897 | $ 736,897 | $ 736,897 | 478 | $ 736,897 | $ 1,541.63 |
| LLANO | LLANO | COLORADO | New Hickory Well Field | Expand groundwater pumping efforts through installation of new well(s) | $ 4,697,200 | $ 6,908,443 | $ 876,077 | $ 866,336 | $ 833,057 | $ 802,618 | $ 774,209 | $ 747,829 | 512 | $ 876,077 | $ 1,711.09 |
| LIVESTOCK | LLANO | COLORADO | Expand current Hickory supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 611,320 | $ 647,999 | $ 306,436 | $ 306,436 | $ 306,436 | $ 306,436 | $ 306,436 | $ 306,436 | 62 | $ 306,436 | $ 4,942.52 |
| MANUFACTURING | LLANO | COLORADO | Allocate water from Llano County - Other | No cost associated due to re-allocation of supply. See text. | | | | | | | | | | | $ - |
| STEAM ELECTRIC POWER | LLANO | COLORADO | Reduction in LCRA Commitment due to Improved Efficiency (Ferguson) | No cost associated | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ 1,863,134 | $ 1,863,134 | $ - | $ - | $ - | $ - | $ 162,437 | $ 162,437 | 12,200 | $ 162,437 | $ 13.31 |
| IRRIGATION | MATAGORDA | BRAZOS-COLORADO | Firm up RoR with off-channel storage | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | MATAGORDA | COLORADO | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ 30,543 | $ 30,543 | $ - | $ - | $ - | $ - | $ - | $ 2,663 | 200 | $ 2,663 | $ 13.31 |
| IRRIGATION | MATAGORDA | COLORADO | Firm up RoR with off-channel storage | | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ 1,313,357 | $ 1,313,357 | $ - | $ - | $ - | $ - | $ - | $ 114,504 | 8,600 | $ 114,504 | $ 13.31 |
| IRRIGATION | MATAGORDA | COLORADO-LAVACA | Firm up RoR with off-channel storage | | | | | | | | | | | | |
| LIVESTOCK | MATAGORDA | COLORADO-LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ 552,160 | $ 585,290 | $ 264,991 | $ 264,991 | $ 264,991 | $ 264,991 | $ 264,991 | $ 264,991 | 56 | $ 264,991 | $ 4,731.98 |
| MANUFACTURING | MATAGORDA | COLORADO | Temporary drought period use of Gulf Coast Aquifer | Temporary measure. Cost associated with additional pumping costs (energy costs) | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 1,758 | 47 | $ 1,758 | $ 37.41 |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | ROR Increase due to COA Return Flows | No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Reduction in LCRA Commitment | No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | ROR Increase due to downstream Return Flows | No cost associated | | | | | | | | | | | $ - |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | Reduction in LCRA Commitment | No cost associated | | | | | | | | | | | $ - |
| STEAM ELECTRIC POWER | MATAGORDA | COLORADO | New LCRA Contract | Purchase water from the LCRA | | | $ - | $ 4,140,000 | $ 4,140,000 | $ 4,140,000 | $ 4,140,000 | $ 4,140,000 | 30,000 | $ 4,140,000 | $ 138.00 |
| COUNTY-OTHER | MILLS | BRAZOS | Expand current Trinity supply | Expand groundwater pumping efforts through installation of new well(s) | $ - | | $ - | $ - | $ - | $ - | $ 37 | $ 337 | 9 | $ 337 | $ 37.41 |
| COUNTY-OTHER | MILLS | COLORADO | Expand current Trinity supply | Expand groundwater pumping efforts through installation of new well(s) | $ - | | $ - | $ - | $ - | $ - | $ 1,496 | $ 1,945 | 52 | $ 1,945 | $ 37.41 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GOLDTHWAITE | MILLS | BRAZOS | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 592 | $ 592 | $ 592 | $ - | $ - | $ - | 1 | $ 592 | $ 591.69 |
| GOLDTHWAITE | MILLS | BRAZOS | Expand current Trinity supply | See Goldthwaite-Mills-Colorado for costs. No additional for this basin | $ - | | | | | | | | | $ - | $ - |
| GOLDTHWAITE | MILLS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 27,218 | $ 30,768 | $ 27,218 | $ 23,668 | $ 21,301 | $ 21,301 | 52 | $ 30,768 | $ 591.69 |
| GOLDTHWAITE | MILLS | COLORADO | Expand current Trinity supply (from Brazos basin) | See Goldthwaite-Mills-Colorado for costs. No additional costs | $ - | $ - | | | | | | $ - | | $ - | $ - |
| GOLDTHWAITE | MILLS | COLORADO | Expand current Trinity supply | Expand groundwater pumping efforts through installation of new well(s) | $ 1,352,960 | $ 1,903,826 | $ 233,664 | $ 231,381 | $ 225,960 | $ 225,960 | $ 239,228 | $ 233,949 | 325 | $ 239,228 | $ 736.09 |
| GOLDTHWAITE | MILLS | COLORADO | Construct Goldthwaite channel dam | Construction of a low dam approx. 300' downstream of the City of Goldthwaite's existing intake structure on the Colorado | $ 1,405,950 | $ 2,495,692 | $ 317,203 | $ 317,203 | $ 317,203 | $ 317,203 | $ 317,203 | $ 317,203 | - | $ 317,203 | NA |
| IRRIGATION | MILLS | BRAZOS | Expand current Trinity supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 6,733 | $ 6,471 | $ 6,883 | $ 6,621 | $ 7,219 | $ 6,957 | 193 | $ 7,219 | $ 37.41 |
| IRRIGATION | MILLS | COLORADO | Expand current Trinity supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ 4,077 | $ 3,815 | $ 2,132 | $ 112 | $ - | $ - | 109 | $ 4,077 | $ 37.41 |
| IRRIGATION | MILLS | COLORADO | Allocate water from County-Other | No cost associated due to re-allocation of supply. See text. | | | | | | | | | | | $ - |
| MANUFACTURING | MILLS | COLORADO | Allocate water from Mills County - Other | No cost associated due to re-allocation of supply. See text. | | | | | | | | | | | $ - |
| RICHLAND SUD | SAN SABA | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 7,692 | $ 5,325 | $ - | $ - | $ - | $ 592 | 13 | $ 7,692 | $ 591.69 |
| AUSTIN | TRAVIS | COLORADO | COA reuse | City of Austin reclaimed water initiative to provide reclaimed water to meet non-potable water demands | $ 302,250,510 | $ 429,195,724 | $ 4,376,693 | $ 11,590,620 | $ 18,787,527 | $ 25,758,608 | $ 30,821,518 | $ 34,438,268 | 40,468 | $ 34,438,268 | $ 851.00 |
| AUSTIN | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | | | $ 5,569,268 | $ 3,920,704 | $ 2,646,286 | $ 681,137 | $ 2,532,679 | $ 3,013,867 | 11,030 | $ 5,569,268 | $ 504.92 |
| AUSTIN | TRAVIS | COLORADO | ROR Increase due to COA Return Flows | No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| AUSTIN | TRAVIS | COLORADO | Reduction in LCRA Commitment | No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| AUSTIN | TRAVIS | COLORADO | ROR Increase due to downstream Return Flows | No cost associated | | | | | | | | | | | $ - |
| AUSTIN | TRAVIS | COLORADO | Reduction in LCRA Commitment | No cost associated | | | | | | | | | | | $ - |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 20,289 | $ 16,999 | $ 15,902 | $ 14,257 | $ 13,160 | $ 8,774 | 37 | $ 20,289 | $ 548.34 |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | Purchase additional water from West Travis County RWS (Amend contract with LCRA) | Purchase water from the LCRA | $ - | $ - | $ 2,208 | $ - | $ - | $ - | $ - | $ - | 16 | $ 2,208 | $ 138.00 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 58,125 | $ 77,317 | $ 93,219 | $ 100,347 | $ 97,605 | $ 102,540 | 187 | $ 102,540 | $ 548.34 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | Purchase additional water from West Travis County RWS (Amend contract with LCRA) | Purchase water from the LCRA | $ - | $ - | $ 114,540 | $ 127,650 | $ 136,482 | $ 140,070 | $ 136,620 | $ 132,204 | 1,015 | $ 140,070 | $ 138.00 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 8,774 | $ 12,612 | $ 12,064 | $ 2,742 | $ 2,193 | $ 2,742 | 23 | $ 12,612 | $ 548.34 |
| BRIARCLIFF | TRAVIS | COLORADO | Amend contract with | Purchase water from the LCRA | $ - | $ - | $ - | $ - | $ - | $ 2,898 | $ 6,486 | $ 10,212 | 74 | $ 10,212 | $ 138.00 |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ 59,478 | $ 75,624 | $ 87,216 | $ 98,670 | $ 111,366 | 807 | $ 111,366 | $ 138.00 |
| ELGIN | TRAVIS | COLORADO | Expand current Carrizo-Wilcox supply (Bastrop County) | Expand current groundwater pumping efforts through increased pumping rates or new well(s). See costs for Elgin Bastrop Colorado Basin. No additional costs | $ - | $ - | $ - | $ - | $ - | $ - | $ 37 | $ 112 | 3 | $ 112 | $ 37.41 |
| GOFORTH WSC | TRAVIS | COLORADO | Transfer water from Goforth WSC in Region L | No cost. Transfer of water within same WUG | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| JONESTOWN | TRAVIS | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 17,802 | $ 32,154 | $ 45,402 | $ 57,408 | $ 66,378 | $ 76,452 | 554 | $ 76,452 | $ 138.00 |
| LAKEWAY | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 217,144 | $ 297,203 | $ 351,489 | $ 393,711 | $ 394,808 | $ 410,162 | 748 | $ 410,162 | $ 548.34 |
| LAKEWAY | TRAVIS | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 177,330 | $ 231,150 | $ 266,892 | $ 281,658 | $ 281,658 | $ 281,658 | 2,041 | $ 281,658 | $ 138.00 |
| MANOR | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | | | $ 55,931 | $ 72,930 | $ 86,638 | $ 53,189 | $ 17,547 | $ 19,192 | 158 | $ 86,638 | $ 548.34 |
| MANOR | TRAVIS | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ 97,290 | $ 107,640 | $ 124,200 | $ 142,140 | $ 160,080 | 1,160 | $ 160,080 | $ 138.00 |
| MANVILLE WSC | TRAVIS | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ - | $ 114,678 | $ 301,392 | $ 356,592 | $ 418,692 | 3,034 | $ 418,692 | $ 138.00 |
| PFLUGERVILLE | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 296,654 | $ 113,507 | $ 33,997 | $ 18,644 | $ 38,932 | $ 38,932 | 541 | $ 296,654 | $ 548.34 |
| PFLUGERVILLE | TRAVIS | COLORADO | Amend contract with LCRA | Renew contract with LCRA - WUG exists in several counties, contract amount split based on demands of each | $ - | $ - | $ - | $ - | $ - | $ - | $ 414 | $ 137,310 | 995 | $ 137,310 | $ 138.00 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 72,381 | $ 89,380 | $ 74,575 | $ 64,705 | $ 61,415 | $ 55,383 | 163 | $ 89,380 | $ 548.34 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ 60,444 | $ 72,864 | $ 54,096 | $ 36,984 | $ 21,528 | $ 7,590 | 528 | $ 72,864 | $ 138.00 |
| ROLLINGWOOD | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 16,999 | $ 15,902 | $ 13,709 | $ 13,160 | $ 12,612 | $ 6,032 | 31 | $ 16,999 | $ 548.34 |
| ROLLINGWOOD | TRAVIS | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ 51,474 | $ 51,474 | $ 51,474 | $ 51,474 | $ 51,474 | 373 | $ 51,474 | $ 138.00 |
| ROUND ROCK | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 16,157 | $ 30,800 | $ 43,423 | $ 32,315 | $ 17,167 | $ 17,672 | 86 | $ 43,423 | $ 504.92 |
| ROUND ROCK | TRAVIS | COLORADO | HB 1437 - Region G | Farm and irrigation conservation. The conserved water can be utilized by some municipal users. | $ - | $ - | $ 21,735 | $ 42,435 | $ 60,203 | $ 73,485 | $ 92,460 | $ 111,263 | 645 | $ 111,263 | $ 172.50 |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | Amend contract with LCRA | Purchase water from the LCRA | $ - | $ - | $ - | $ - | $ - | $ 552 | $ 18,630 | $ 39,054 | 283 | $ 39,054 | $ 138.00 |
| WEST LAKE HILLS | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 76,220 | $ 89,928 | $ 105,282 | $ 99,799 | $ 105,830 | $ 111,862 | 204 | $ 111,862 | $ 548.34 |
| WEST LAKE HILLS | TRAVIS | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ 252,954 | $ 282,762 | $ 300,564 | $ 320,160 | $ 340,998 | 2,471 | $ 340,998 | $ 138.00 |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 9,322 | $ - | $ - | $ - | $ - | $ - | 17 | $ 9,322 | $ 548.34 |
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | New LCRA Contract | Purchase water from the LCRA | $ - | $ - | $ - | $ 306,636 | $ 303,738 | $ 300,840 | $ 300,840 | $ 300,840 | 2,222 | $ 306,636 | $ 138.00 |
| IRRIGATION | TRAVIS | GUADALUPE | Allocate from Irrigation (Colorado basin) | Additional supply taken from local irrigation surface water supply (stock ponds). No costs as irrigation ditches already in place. | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MANUFACTURING | TRAVIS | COLORADO | Water from City of Austin | Part of the COA system, no cost associated | | | | | | | | | | $ - | $ - |
| STEAM ELECTRIC POWER | TRAVIS | COLORADO | COA Reuse | Costs shown as part of Austin-Travis-Colorado reuse strategy ABOVE | $ - | $ - | $ 1,970,065 | $ 2,821,065 | $ 6,225,065 | $ 7,076,065 | $ 10,480,065 | $ 11,331,065 | 13,315 | $ 11,331,065 | $ 851.00 |
| STEAM ELECTRIC POWER | TRAVIS | COLORADO | Reduction in LCRA Commitment | Reduction of LCRA commitment assumes no cost | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| WHARTON | WHARTON | COLORADO | Conservation | Reduction of municipal water demand through municipal conservation | $ - | $ - | $ 24,259 | $ - | $ - | $ - | $ - | $ - | 41 | $ 24,259 | $ 591.69 |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | - | $ - | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | BRAZOS-COLORADO | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ 549,777 | $ 549,777 | $ 47,932 | $ 47,932 | $ 47,932 | $ 47,932 | $ 47,932 | $ 47,932 | 3,600 | $ 47,932 | $ 13.31 |
| IRRIGATION | WHARTON | COLORADO | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ 30,543 | $ 30,543 | $ 2,663 | $ 2,663 | $ 2,663 | $ 2,663 | $ 2,663 | $ 2,663 | 200 | $ 2,663 | $ 13.31 |

| WUG Name | County | River Basin | Water Management Strategy | Strategy Description | Total Capital Cost ($) | Total Project Costs ($) | Total Annual Cost 2010 ($) | Total Annual Cost 2020 ($) | Total Annual Cost 2030 ($) | Total Annual Cost 2040 ($) | Total Annual Cost 2050 ($) | Total Annual Cost 2060 ($) | Largest Firm Yield (ac-ft/yr) | Largest Annual Cost ($) | Unit Cost ($/ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION | WHARTON | COLORADO-LAVACA | Supply Reduction due to LSWP | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Transfer supply to M&I | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Develop the Gulf Coast aquifer for rice irrigation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation on-farm water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Rice irrigation delivery system water conservation | Part of LCRA-SAWS Plan. No cost applicable | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | LCRA-SAWS: Develop water conserving rice variety | Part of LCRA-SAWS Plan. No cost applicable | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Continuation of LCRA Water Management Plan for interruptible water | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Continued use of Austin return flows | No change in usage. No cost associated | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | | $ - | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | Continued use of Downstream return flows | No cost associated as this is simply a continuation of current practices | | | | | | | | | | | $ - |
| IRRIGATION | WHARTON | COLORADO-LAVACA | HB-1437: Water conservation | Irrigation users will split 20% of capital cost of precision leveling. Split based on quantity of water received | $ 30,543 | $ 30,543 | $ 2,663 | $ 2,663 | $ 2,663 | $ 2,663 | $ 2,663 | $ 2,663 | 200 | $ 2,663 | $ 13.31 |
| MANUFACTURING | WHARTON | COLORADO-LAVACA | Expand current Gulf Coast supply | Expand current groundwater pumping efforts through increased pumping rates or new well(s) | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ 299 | 8 | $ 299 | $ 37.41 |
| STEAM ELECTRIC POWER | WHARTON | BRAZOS-COLORADO | New well field in Gulf Coast | Expand groundwater pumping efforts through installation of new well(s) | $ 164,000 | $ 247,800 | | | | | | $ 30,825 | 82 | $ 30,825 | $ 375.92 |
| VARIOUS | N/A | N/A | Reuse by Highland Lakes Communities | LCRA WWP strategy | $ 15,920,000 | $ 25,675,000 | | $ 275,000 | $ 1,100,000 | $ 2,750,000 | $ 2,750,000 | $ 2,750,000 | 5,000 | $ 2,750,000 | $ 550.00 |

**List of assumptions/methodology for strategy cost development**

**Expansion of Groundwater**

All costs based on or converted to September 2008 $
Assumed that any need less than 1/4 mgd could be met by additional pumping w/o need for additional wells for all WUGs except Livestock
For these WUGS, only the increased Annual Energy Cost was assumed to be required for providing the water.
(livestock received 1 well per ac-ft/yr needed)

**Capital Costs Assumed**

| | |
|---|---|
| Wells - | Probable capacity (mgd) of well to be installed based on location and aquifer (see table below) |
| | Assumed well runs 24hrs a day at 80% efficiency |
| | Number of wells anticipated to be installed based on each well's production (@ 80% efficiency) and the largest quantity of water supplied (ac-ft/yr) by the strategy over the planning period, times a factor of two for peak demands. |
| | Quantity includes any amounts supplied to different WUG(s), if applicable |
| | Assumed well diameter based on assumed capacity and guidance from Randy Williams |
| | Depth assumed using guidance from Randy Williams based on location and aquifer |
| | Cost determined by using $41/in-ft - assumed to include all installation, clorination, and pump |
| | **Different assumptions used for livestock WUGs** |
| | Number wells based on 1ac-ft/yr per well and largest quantity of water supplied (ac-ft/yr) by the strategy over the planning period |
| | 8" well diameter assumed (not used in cost calculation) |
| | Cost determined using $9860 per well - asuumed to include all installation, treatment, pump |
| Transmission Line- | Assumed 1/2 mile transmission line for each well needed to connect to existing system |
| | Max flow in line taken from the largest quantity of water supplied, value converted to cfs |
| | Velocity in line assumed to be 5 ft/s |
| | Calculate cross-sectional area of line based on max flow and assumed velocity. |
| | Calculate required diameter based on circular pipe |
| | Smallest possible diameter allowed = 6". Rounded required diameter up nearest readily available pipe size |
| | Unit cost of X" diameter pipe taken from 2nd Q 2002 value provided by Region H, converted to September 2008 $ |
| | Cost based on length of 1/2 mile, multiplied by the unit cost, multiplied by the number of wells required from well calc sheet |
| | **Different assumptions used for livestock WUGs** |
| | No transmission line assumed for livestock WUGs |

**Project Costs Assumed**

| | |
|---|---|
| Engineering, etc - | 35% of the total capital cost |
| Environmental, etc - | Assumed to be equal to the land acquisition cost. |
| | Assumption borrowed from San Marcos Water Supply Master Plan (SMWSMP) |
| Land acquisition - | Assumed 1 acre per well, at $5,000/acre |
| Interest Earned - | Assumes 4% interest and uses an assumed construction time of 1 year |
| Interest Accrued - | Assumes 6% interest and uses an assumed construction time of 1 year |
| | **Different assumptions used for livestock WUGs** |
| | No Project Costs assumed for livestock WUGs |

**Annual Costs Assumed**

| | |
|---|---|
| Term of Debt - | 20 years assumed for this strategy. Conforms with Exhibit B |
| O&M - | Calculated as 4% of well costs and 1% of transmission/distribution pipe costs plus a 15% contingency |
| Pumping Water Level Distance - | Pumping lift from table below, based on location and aquifer PLUS five feet for every 1000' of transmission pipe required |

Annual Energy Cost- Calculated based on the max. quantity of water (ac-ft/yr) provided over the planning period, the pumping distance, and $0.09/kWh*

Unit Cost - Based on the largest quantity of water (ac-ft/yr) provided by the strategy (per decade) and the largest annual cost over the planning period (per decade)

**Different assumptions used for livestock WUGs**

Term of Debt at 5 years.

*Annual Energy Conversion: acft/yr * 325851 = gal/yr ; gal/yr * 8.34 = lb(water)/yr ; lb(water/yr*head(ft) = lb-ft/yr ; lb-ft/yr * 3.766x10^-7 = kWh/yr

**Well assumptions**

| County | Aquifer | Well capacity (MGD) | Depth (ft) | Diameter (in) | Pumping water level height |
|---|---|---|---|---|---|
| Bastrop | Carrizo-Wilcox | 1.5 | 500 | 16 | 200 |
| Bastrop | Sparta | 0.2 | 300 | 6 | 50 |
| Bastrop | Queen City | 0.75 | 500 | 16 | 100 |
| Bastrop | other (alluvial) | 0.75 | 100 | 10 | 20 |
| Blanco | Ellenburger-San Saba | 0.1 | 200 | 6 | 100 |
| Burnet | Trinity | 0.2 | 500 | 8 | 350 |
| Burnet | Marble Falls | 0.25 | 500 | 8 | 200 |
| Colorado | other (alluvial) | 0.75 | 100 | 10 | 20 |
| Colorado | Gulf Coast | 0.5 | 500 | 8 | 200 |
| Fayette | Gulf Coast | 0.5 | 500 | 8 | 200 |
| Fayette | other (alluvial) | 0.75 | 100 | 10 | 20 |
| Hays | Trinity | 0.2 | 500 | 8 | 200 |
| Hays | Edwards BFZ | 0.5 | 400 | 8 | 200 |
| Llano | Ellenburger-San Saba | 0.1 | 600 | 6 | 200 |
| Mills | Trinity | 0.04 | 500 | 8 | 200 |

**List of assumptions/methodology for strategy cost development**

**New Well or Well Field**

All costs based on or converted to September 2008 $

**Capital Costs Assumed**

| | |
|---|---|
| Wells - | Probable capacity (mgd) of well to be installed from Randy Williams based on location and aquifer<br>Assumed well runs 24hrs a day at 80% efficiency<br>Number of wells anticipated to be installed based on each well's production (@ 80% efficiency) and the largest quantity of water supplied (ac-ft/yr) by the strategy over the planning period, times a factor of two for peak demands.<br>Quantity includes any amounts supplied to different WUG(s), if applicable<br>Assumed well diameter based on assumed capacity and guidance from Randy Williams<br>Depth assumed using guidance from Randy Williams based on location and aquifer<br>Cost determined by using $41/in-ft - assumed to include all installation and pump |
| Transmission Line - | Assumed 1/2 mile transmission line for each well needed to connect to existing system<br>Max flow in pipe taken from the largest quantity of water supplied, value converted to cfs<br>Velocity in line assumed to be 5 ft/s<br>Calculate cross-sectional area of line based on max flow and assumed velocity.<br>Calculate required diameter based on circular pipe<br>Smallest possible diameter allowed = 6". Rounded required diameter up nearest readily available pipe size<br>Unit cost of X" diameter pipe taken from 2nd Q 2002 value provided by Region H<br>Cost based on length of 1/2 mile, multiplied by the unit cost, multiplied by the number of wells required from well calc sheet |
| Distribution Line - | Assumed 5 mile distribution pipe to transport water from pump station to treatment plant.<br>Assume just one pipe<br>Max flow in pipe taken from the largest quantity of water supplied, multiplied by 2 to account for peak - value converted to cfs<br>Velocity in line assumed to be 5 ft/s<br>Calculate cross-sectional area of line based on max flow and assumed velocity.<br>Calculate required diameter based on circular pipe<br>Smallest possible diameter allowed = 6". Rounded required diameter up nearest readily available pipe size<br>Unit cost of X" diameter pipe taken from 2nd Q 2002 value provided by Region H, converted to September 2008 $<br>Cost based on length of 5 miles, multiplied by the unit cost |
| Pump Station - | Cost estimate based on $197,226/MGD, taken from 2006 Region K Water Plan and adjusted to Sept 2008 costs<br>Value converted to $/ac-ft/yr and multiplied by the largest supply provided |

**Project Costs Assumed**

| | |
|---|---|
| Engineering, etc - | 35% of the total capital cost |
| Environmental, etc - | Assumed to be equal to the land acquisition cost. Assumption borrowed from San Marcos Water Supply Master Plan (SMWSMP) |
| Land acquisition - | Assumed 5 acres for pump station PLUS 1 acre per well, at $5,000/acre |
| Interest Earned - | Assumes 4% interest and uses an assumed construction time of 1 year |
| Interest Accrued - | Assumes 6% interest and uses an assumed construction time of 1 year |

**Annual Costs Assumed**

| | |
|---|---|
| Term of Debt - | 20 years assumed for this strategy. Conforms with Exhibit B |
| O&M - | Calculated as 4% of well costs, 2.5% of pump station costs, and 1% of transmission/distribution pipe costs plus a 15% contingency |
| Pumping Water Level Distance - | Pumping lift from table below, based on location and aquifer<br>PLUS five feet for every 1000' of transmission pipe required PLUS 100' to storage tank |
| Annual Energy Cost- | Calculated based on the max. quantity of water (ac-ft/yr) provided over the planning period, |

the pumping distance, and $0.09/kWh*

Unit Cost - Based on the largest quantity of water (ac-ft/yr) provided by the strategy (per decade) and the largest annual cost over the planning period (per decade)

*Annual Energy Conversion: acft/yr * 325851 = gal/yr ; gal/yr * 8.34 = lb(water)/yr ; lb(water/yr*head(ft) = lb-ft/yr ; lb-ft/yr * 3.766x10^-7 = kWh/yr

**Well assumptions**

| County | Aquifer | Well capacity (MGD) | Depth (ft) | Diameter (in) | Pumping water level height |
|---|---|---|---|---|---|
| Bastrop | Carrizo-Wilcox | 1.5 | 500 | 16 | 200 |
| Bastrop | other (alluvial) | 0.75 | 100 | 10 | 20 |
| Burnet | Trinity | 0.2 | 500 | 8 | 350 |
| Burnet | Marble Falls | 0.25 | 500 | 8 | 200 |
| Colorado | other (alluvial) | 0.75 | 100 | 10 | 20 |
| Colorado | Gulf Coast | 0.5 | 500 | 8 | 200 |
| Fayette | Gulf Coast | 0.5 | 500 | 8 | 200 |
| Fayette | other (alluvial) | 0.75 | 100 | 10 | 20 |
| Hays | Trinity | 0.2 | 500 | 8 | 200 |
| Hays | Edwards BFZ | 0.5 | 400 | 8 | 200 |
| Llano | Ellenburger-San Saba | 0.1 | 600 | 6 | 200 |
| Mills | Trinity | 0.04 | 500 | 8 | 200 |

**List of assumptions/methodology for strategy cost development**

**<u>Municipal Conservation</u>**

Strategy breaks costs down into two savings categories - plumbing fixture repairs and irrigation upgrades
The costs per family for achieving savings in these two categories is different for Urban,
Suburban, and Rural WUG type classifications
The percentage of water conserved between the two savings categories was applied to the costs for each,
to develop a composite unit cost for each WUG type

**Annual Costs Assumed**

| | |
|---|---|
| Unit Cost - | \$591.69/acft for Rural users, \$548.34/acft for Suburban users, \$504.92/acft for Urban users |
| Total Annual Cost - | Based on the amount of water conserved mulitplied by the unit cost for that WUG type |
| | A 3% annual increase was applied to 2nd qtr 2002 costs |

**List of assumptions/methodology for strategy cost development**

**<u>Purchase Water</u>**

Costs updated to current water purchase prices (2009)

**Annual Costs Assumed**

| | |
|---|---|
| Unit Cost - | Based on water purchase price from the major water provided (LCRA - $138/acft, COA - $990.71/acft) |
| Total Annual Cost - | Based on the amount of water needed mulitplied by the unit cost |

**List of assumptions/methodology for strategy cost development**

**<u>House Bill 1437 - Municipal Users</u>**

Costs updated to current water purchase prices (2009)
For municipal users, the strategy simply involves the purchase of conserved LCRA water at a 25% premium
Assumes that users have treatment capacity for additional water

**Annual Costs Assumed**

| | |
|---|---|
| Unit Cost - | \$138/acft increased by 25% - Total of \$172.50/ac-ft |
| Total Annual Cost - | Based on the amount of water supplied mulitplied by the unit cost |

**List of assumptions/methodology for strategy cost development**

**<u>House Bill 1437 - Irrigation Users</u>**

For irrigation users in Region K, the strategy involves a WUG contribution totalling 20% of the Precision Leveling Construction Cost

| | |
|---|---|
| 2nd Q 2002 value: | $14,518,454 |
| CCI Factor (2008/2002): | 1.31484327 |
| September 2008 value: | $19,089,492 |

**Capital Costs Assumed**

| | |
|---|---|
| Precision Leveling | The total Region K irrigation WUG contribution was split between WUGs.<br>Split based on the quantity of supply provided to that WUG<br>For WUGs whose supply provided varies over each decade, the largest supply provided was used to determine the cost for that WUG. |

**Annual Costs Assumed**

| | |
|---|---|
| Term of Debt - | 20 years assumed for this strategy. |
| O&M - | none |
| Unit Cost - | Based on the largest quantity of water (ac-ft/yr) provided by the strategy (per decade) and the largest annual cost over the planning period (per decade) |

**List of assumptions/methodology for strategy cost development**

**<u>Purchase Water from City of Austin for Hays County</u>**

**Capital Costs Assumed**

**Project Costs Assumed**

ALL CAPITAL AND PROJECT COSTS PROVIDED AS ONE VALUE FROM THE COA.
Costs converted to September 2008 $

**Annual Costs Assumed**

| | |
|---|---|
| Term of De | 30 years assumed for this strategy. Conforms with Exhibit B |
| O&M - | Assumed to be equal to the O&M cost provided by the COA, converted to September 2008 $ |
| Purchase of water | Dollar amount provided by the COA |
| Unit Cost - | Based on the largest quantity of water (ac-ft/yr) provided by the strategy (per decade) and the largest annual cost over the planning period (per decade) |

**List of assumptions/methodology for strategy cost development**

**Construct Goldthwaite Channel Dam**

**Capital Costs Assumed**

| | |
|---|---|
| Reservoir Construction - | Capital construction cost taken from the old Region K Plan, increased to September 2008 $ |

**Project Costs Assumed**

| | |
|---|---|
| Engineering, etc - | 35% of the total capital cost |
| Environmental, etc - | Assumed to be equal to the environmental cost from the old Region K Plan, increased to Septmber 2008 $ |
| Land acquisition - | Assumed to be equal to the land acquisition cost from the old Region K Plan, increased to Septmber 2008 $ |
| Interest Earned - | Assumes 4% interest and uses an assumed construction time of 5 years |
| Interest Accrued - | Assumes 6% interest and uses an assumed construction time of 5 year |

**Annual Costs Assumed**

| | |
|---|---|
| Term of Debt - | 40 years assumed for this strategy. Conforms with Exhibit B |
| O&M - | Assumed to be equal to the O&M cost from the old Region K Plan, increased to September 2008 $ |
| Treatment at Existing Facility | Assumed to be equal to the cost from the old Region K Plan, increased to September 2008 $ |
| Unit Cost - | Based on the largest quantity of water (ac-ft/yr) provided by the strategy (per decade) and the largest annual cost over the planning period (per decade) |

City of Elgin Costs
Purchase Water from LCRA with Construction of a Surface Water Treatment Plan

Costs based on September 2008 $

Probable Construction Costs

| Item | Cost |
|---|---|
| Treatment Plant | $9,407,000 |
| Transmission Pump Stations (2) | $1,066,000 |
| Transmission Pipeline (12 in. dia., 17 miles total) | $7,083,000 |
| TOTAL | $17,556,000 |

Probable Capital Costs

| Item | Cost |
|---|---|
| Construction (Capital) Cost | $17,556,000 |
| Engineering, Legal, and Contingencies | $5,541,000 |
| Land Acquisition and Environmental Studies | $180,000 |
| Interest During Construction (1 year) | $268,000 |
| TOTAL | $23,545,000 |

Annual Costs

| Item | Cost |
|---|---|
| Debt Service | $2,053,000 |
| Operation and Maintenance: | |
| Treatment Plant | $749,066 |
| Transmission Pump Station | $36,000 |
| Transmission Pipeline (? in. dia., ? miles) | $93,000 |
| | $0 |
| Purchased water | $414,000 |
| Energy Cost | $80,000 |
| TOTAL | $3,425,066 |

Yield and Unit Cost

| Item | Value |
|---|---|
| Project Yield (ac-ft/yr) | 3,000 |
| Annual Cost Per Ac-Ft | $1,142 |
| Annual Cost Per 1,000 gallons | $3.50 |

| Description | Capital Cost | O&M |
|---|---|---|
| Water Plant | $16,735,000 | $3,988,000 |
| Wells | $1,502,365 | $390,386 |
| Well Collection Lines | $427,700 | $4,277 |
| Pump Station | $2,442,000 | $61,000 |
| Line to Distribution | $496,600 | $4,966 |
| Brine Disposal | $5,763,680 | $86,455 |
| Int. During Constr. | $314,778 | $0 |
| **TOTALS:** | **$27,682,123** | **$4,535,084** |

2,867,489 x1000 gal/yr
$2.42 per 1000 gal

8,800 ac-ft
$790 per ac-ft

Debt Service: $2,413,454
Annual Cost: **$6,948,538**

| WUG | County | River Basin | Water Management Strategy (ac-ft/yr) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 | Project Cost | Annual Cost | Capital Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Buda | Hays | Colorado | | | | | | 500 | $1,949,445 | $489,334 | $1,391,124 |
| Cimarron Park Water Company | Hays | Colorado | | | 250 | 350 | 500 | 600 | $2,339,334 | $587,200 | $1,669,349 |
| County-Other | Hays | Colorado | | | 2,500 | 2,500 | 5,000 | 6,000 | $23,393,343 | $5,872,004 | $16,693,491 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Plant Capacity:** | 11,000 | ac-ft/yr | Loan: | 20 | yrs | | | |
| | 9.9 | mgd | Int Rate: | 6.0% | | | | |
| **CCIs:** | Aug-00 | 6233 | Jun-02 | 6532 | | 2nd Qtr 2002 | | 6508 |
| | Sep-08 | 8557 | Sep-08 | 8557 | | Sep-08 | | 8557 |
| | Factor: | 1.37 | Factor: | 1.31 | | Factor: | | 1.31 |

**Water Treatment Plant (Sep-2008 Costs)**

| | |
|---|---|
| Plant Construction: | $12,396,000 |
| Eng, Legal, & Cont (35%): | $4,339,000 |
| Total Project Cost: | $16,735,000 |
| | |
| O&M Cost / 1000 gal: | $1.10 |
| Annual O&M Cost: | $3,988,000 |

**Yr 2000 Trtmt Plnt Costs from HDR Report**

| Capacity (mgd) | Cost |
|---|---|
| 0.1 | $478,000 |
| 0.5 | $1,077,000 |
| 1 | $1,823,000 |
| 3 | $3,946,000 |
| 5 | $5,718,000 |
| 10 | $9,097,000 |

**Wells**

| | | |
|---|---|---|
| Number Wells: | 23 | |
| Well Capacity (gpm): | 750 | |
| Casing Dia (in): | 12 | |
| Depth to Hydrostatic Lvl (ft): | 300 | *(confined w/ large pressurizing head)* |
| Well Depth (ft): | 1,000 | |
| | | |
| Construction Cost: | $260,365 | *(per TWDB GW Desal cost eq'n)* |
| Eng, Legal, & Cont (35%): | $92,000 | |
| Land Cost: | $575,000 | *(5 ac/well x $5k/ac)* |
| Env. Cost: | $575,000 | *(= land cost)* |
| Total Cost: | $1,502,365 | |
| | | |
| O&M Cost / 1000 gal: | $0.40 | |
| Annual O&M Cost: | $10,415 | *4.00% of construction* |
| Energy Cost: | $379,972 | *80% pump eff, $0.09/kWh* |

**Yr 2000 O&M Costs from HDR Report**

| Capacity (mgd) | Cost per 1000 gal |
|---|---|
| 0.1 | 1.32 |
| 0.5 | 1.30 |
| 1 | 1.25 |
| 3 | 1.12 |
| 5 | 1.00 |
| 10 | 0.80 |

3,198,414
3,998,017
$359,822

**Well Collection Lines**

| | | |
|---|---|---|
| Total Length of Line (ft): | 5,000 | |
| Velocity (ft/s): | 5 | |
| Calculated Line Size (in): | 8 | |
| Actual Line Size (in): | 6 | *(minimum 6" diameter* |
| | | |
| Construction Cost: | $329,000 | |
| Eng, Legal, & Cont (30%): | $98,700 | |
| Total Cost: | $427,700 | |
| | | |
| Annual O&M Cost (1%): | $4,277 | |

| | |
|---|---|
| Capital Cost | $19,753,965 |
| Project Cost | $27,367,345 |

**Pump Station**

| | |
|---|---|
| Construction Cost: | $1,953,000 |
| Eng, Legal, & Cont (35%): | $489,000 |
| Total Cost: | $2,442,000 |
| | |
| Annual O&M Cost (2.5%): | $61,000 |

**Distribution Line (Pump St to Distribution Sys)**

| | | |
|---|---|---|
| Length (ft): | 5,280 | *(1 miles)* |
| Velocity (ft/s): | 5 | |
| Calculated Line Size (in): | 23.60 | |
| Actual Line Size (in): | 8 | |
| | | |
| Construction Cost: | $382,000 | |
| Eng, Legal, & Cont (30%): | $114,600 | |
| Total Cost: | $496,600 | |
| | | |
| Annual O&M Cost (1%): | $4,966 | |

**Brine Disposal (Deep well injection)**

| | |
|---|---|
| Waste (ac-ft/yr) | 550 |
| No. of wells | 2 |
| Tubing diameter (in.) | 12 |
| Depth of injection (feet) | 1000 |
| Construction Cost ($) | $4,433,600 |
| Eng, Legal, & Cont (30%): | $1,330,080 |
| Total Cost: | $5,763,680 |
| | |
| Annual O&M Cost (1.5%): | $86,455 |

Cost Table for Desalination of Brackish Groundwater from the Ellenburger-San Saba for Mills County-Other (Alternative Strategy)

Costs based on September 2008 $

Probable Construction Costs

| Item | Cost |
|---|---|
| Treatment Plant | $1,479,000 |
| Transmission Pump Station | $99,000 |
| Transmission Pipeline (6 in. dia., 8 miles) | $2,777,000 |
| Water Wells and Collection Lines (4-200 gpm wells, 4.75 mi of 6 in. line) | $1,449,000 |
| Brine Disposal | $481,000 |
| TOTAL | $6,285,000 |

Probable Capital Costs

| Item | Cost |
|---|---|
| Construction (Capital) Cost | $6,285,000 |
| Engineering, Legal, and Contingencies | $1,994,000 |
| Land Acquisition and Environmental Studies | $200,000 |
| Interest During Construction (1 year) | $98,000 |
| TOTAL | $8,577,000 |

Annual Costs

| Item | Cost |
|---|---|
| Debt Service | $748,000 |
| Operation and Maintenance: | |
| Treatment Plant | $326,000 |
| Transmission Pump Station | $3,400 |
| Transmission Pipeline (6 in. dia., 8 miles) | $37,000 |
| Water Wells and Collection Lines | $35,000 |
| Brine Disposal | $10,000 |
| Energy Cost | $57,000 |
| TOTAL | $1,216,400 |

Yield and Unit Cost

| Item | Value |
|---|---|
| Project Yield (ac-ft/yr) | 384 |
| Annual Cost Per Ac-Ft | $3,168 |
| Annual Cost Per 1,000 gallons | $9.72 |

## Groundwater Supply Alternative for the City of Goldthwaite

According to the demand projections and water availability analysis, the City of Goldthwaite will have a maximum water shortage of 454 acre-feet per year (ac-ft/yr) in 2010 after municipal conservation is applied. To determine groundwater options available for this area, the following resources were consulted: TWDB Report 319 – Evaluation of Water Resources in Part of Central Texas (January 1990), a general knowledge of the groundwater resources for the area, and TWDB groundwater database on wells information posted at http://wiid.twdb.state.tx.us/ims/wwm_drl/viewer.htm

The TWDB well information available for Mills County gave information on four of the City of Goldthwaite's wells, and this information was used in evaluating the available options. These wells are around 500 feet deep and are producing water from the Travis Peak Formation in the Trinity Group. These wells are approximately 1 mile outside the city limits and yield water at roughly 30 gallons per minute (gpm).

Using this information, it was assumed that additional wells drilled in the Goldthwaite area would draw from the Travis Peak Formation as well. *Table 1* gives more information on this hydrologic unit.

**Table 1: Goldthwaite Area Geological and Hydrological Units and Their Water-Bearing Properties***

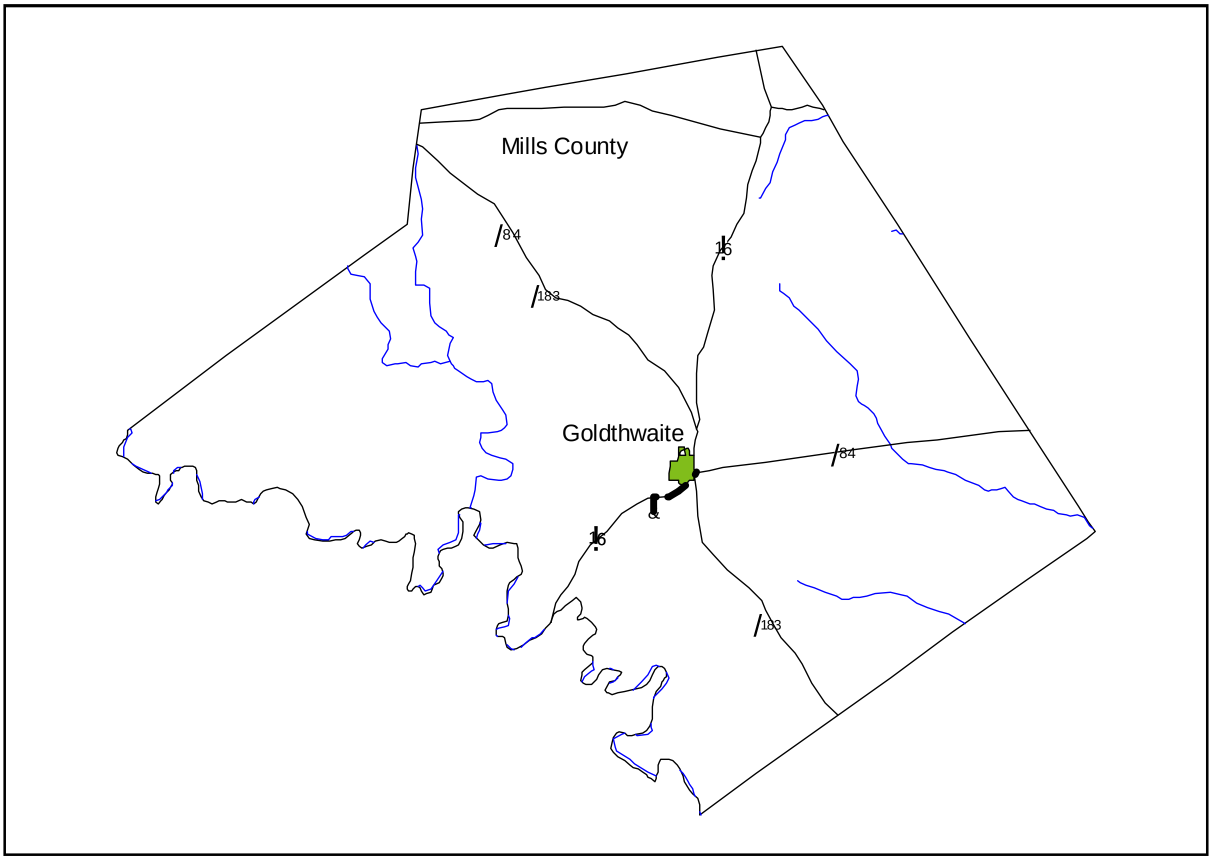
| Geological Units | | | | | | |
|---|---|---|---|---|---|---|
| **Era** | Mesozoic | | | | | |
| **System** | Cretaceous | | | | | |
| **Group** | Trinity | | | | | |
| **Formation** | Antlers Formation | | | | | |
| | Travis Peak Formation | | | | | |
| **Member or Unit** | Hensell Sand Member | Pearsall Member | Cow Creek Limestone Member | Hammett Shale Member | Sligo Member | Hosston Member |
| **Hydrological Units** | **Middle Trinity** | | | **Lower Trinity** | | |
| **Approximate Range in thickness (feet)** | 175 | 85 | 130 | 140 | 130 | 1,550 |
| **Character of Rocks** | Sand, gravel, conglomerate, sandstone, siltstone, & shale. Grades into sandy limestone and dolomite. | Predominately shale interbedded with sand; however, in the calcareous facies, the unit is composed almost entirely of calcareous sediments. | Massive, often sandy, dolomitic limestone, frequently forming cliffs and waterfalls. Contains gypsum & anhydrite beds. | Shale & clay with some sand, dolomitic limestone & conglomerate. | Limestone, dolomite, occasionally sandy, & shale. Thins to the west. | Basal conglomerate grading upward into a mixture of sand, siltstone, & shale, with some limestone beds. |
| **Water-Bearing Properties** | Yields small to large quantities of fresh to slightly saline water. | | Not known to yield water in the study area. | | Yields moderate to large quantities of fresh to moderately saline water. | |

*Information taken from the Texas Water Development Board's Report 319: Evaluation of Water Resources in Part of Central Texas (January 1990).

The location suggested for these new wells is approximately 1 mile southwest of the city limits, as shown in *Figure 1*. The production capacity of each well was assumed to be 30 gpm at a well depth of 550 feet.

Comparing topographic maps of the area with the water level maps given in the literature resulted in a depth to water of 400 feet. The area's transmissivity was also taken from the literature. This was assumed to be 2,000 gallons per day/foot. Existing wells drilled in the area also have 8-inch diameter screens in the lower 70 feet. Well efficiency was assumed to be 80 percent.

**Figure 1: Goldthwaite Groundwater Supply Option**




Using the assumed aquifer conditions and remaining availability, a system of 8 wells would be sufficient to produce 320 ac-ft/yr of water under average conditions. However, to meet peak demand conditions the number of wells in the well field would have to be expanded to 16. A well field consisting of 16 wells was used for the cost analysis for this strategy.

The overall available groundwater supply from the Trinity aquifer in Mills County remaining after other water management strategies have been considered is only sufficient to meet the projected shortage for the City of Goldthwaite in 2050 and 2060. However, neither the Colorado Basin nor the Brazos Basin Trinity aquifer supply is sufficient to meet the projected shortage alone. The location of the City of Goldthwaite is on the Colorado-Brazos Basin Divide. A well field sited in reasonable proximity to the corporate limits of the City might reasonably be assumed to be capable of producing groundwater from the Trinity aquifer groundwater supplies in both the Colorado and Brazos Basins. Under this assumption, the City of Goldthwaite could avoid the cost of constructing a well field in each basin. In earlier decades, additional strategies are needed to meet the total shortage. Those recommended strategies include drought management, purchasing water from LCRA, and constructing an in-channel dam.

## Groundwater Supply Alternative for the City of Llano

According to the demand projections and water availability analysis, the City of Llano will have a maximum water shortage of approximately 990 ac-ft/yr in 2010 after municipal conservation is applied. To determine groundwater options available for this area, the following resources were consulted: TWDB Report 346 – The Paleozoic and Related Aquifers of Central Texas (March 1996), a general knowledge of the groundwater resources for the area, and conversations with a drilling contractor familiar with the area of interest.

In discussions with the local drilling contractor, it was learned that wells had recently been drilled in the Riley Mountain area. The area is rather rocky, but the wells yield water at 70-100 gpm. These wells are about 600 feet deep, 6 inches in diameter, and producing water from the Ellenburger-San Saba aquifer.

Using this information, it was assumed that additional wells drilled in the Llano area would draw from the Ellenburger-San Saba aquifer as well. *Table 2* gives more information on this hydrologic unit as well as the Hickory aquifer.

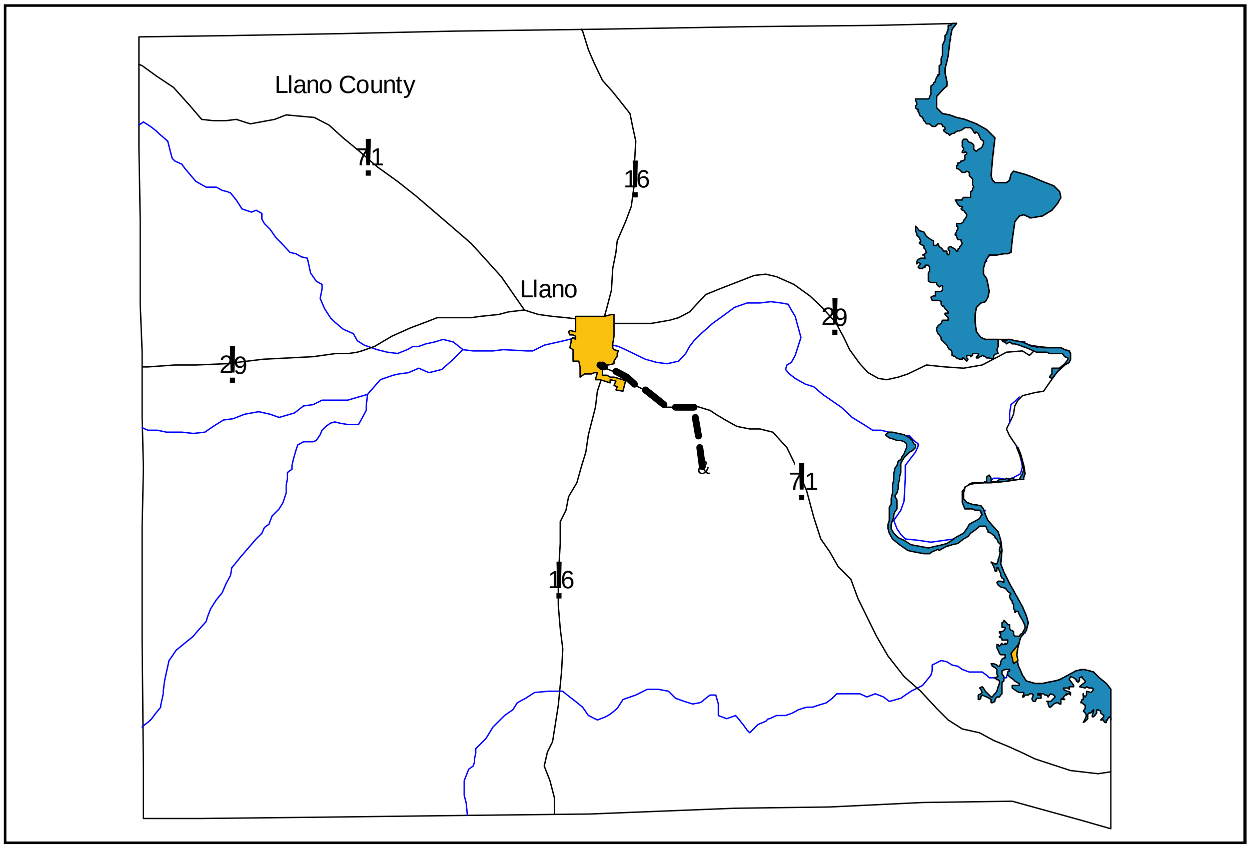
**Table 2: Llano Area Geological and Hydrological Units and Their Water-Bearing Properties***

<table>
<tr><th colspan="7">Geologic Units</th></tr>
<tr><th>Era</th><td colspan="6">Paleozoic</td></tr>
<tr><th>System</th><td colspan="4">Ordovician</td><td colspan="2">Cambrian</td></tr>
<tr><th>Group</th><td colspan="4">Ellenburger Group</td><td colspan="2">Moore Hollow Group</td></tr>
<tr><th>Formation</th><td>Honeycut Formation</td><td>Gorman Formation</td><td colspan="2">Tanyard Formation</td><td>Wilberns Formation</td><td>Riley Formation</td></tr>
<tr><th>Member or Unit</th><td>Not Differentiated</td><td>Not Differentiated</td><td>Staendebach Member</td><td>Threadgill Member</td><td>San Saba Aquifer</td><td>Hickory Sandstone Member</td></tr>
<tr><th>Hydrological Unit</th><td colspan="5">Ellenburger-San Saba Aquifer</td><td>Hickory Aquifer</td></tr>
<tr><th>Character of Rocks</th><td>Thinly to thickly bedded, light-gray, aphanitic limestone and thinly to thickly bedded, fine-grained to microgranular, gray dolomite. Both limestone and dolomite have fossiliferous chert.</td><td>Predominantly aphanitic light gray limestone in upper part and predominantly micro-granular to fine-grained, pink, gray and yellowish-gray dolomite in lower part. Has prominent bed containing fossiliferous chert nodules near middle of formation.</td><td>Thickly to thinly bedded, aphanitic, very light gray, cherty limestone and thickly to thinly bedded, fine to medium grained, gray to brownish gray, cherty dolomite. Chert is fossiliferous.</td><td>Predominantly medium to coarse grained, light gray dolomite which may locally and laterally grade to massive, light gray limestone. Lower part may be Cambrian in age.</td><td>Fine to very fine grained, yellowish to brownish to medium gray, thickly to thinly bedded, slightly cherty dolomite. Upper part may be Ordovician in age.</td><td>Thinly to thickly bedded, almost entirely cross-bedded quartz sandstone, some pebbles of feldspar, isolated quartz pebbles, large amounts of iron, color varies from white to yellow to brown, with the iron-rich beds a red-brown to almost black.</td></tr>
<tr><th>Water-Bearing Properties</th><td colspan="6">Yields very small to very large quantities of fresh to slightly saline water to wells in the Pedernales River Valley in Gillespie and Blanco Counties. Yield of a well is very dependent on the amount and size of fracture openings and cavities encountered by the well bore. Where such openings are encountered, wells may be capable of yielding over 1,000 gallons per minute. Where such openings are not encountered wells may yield less than 5 gallons per minute. Where limestone (calcium carbonate) is encountered well yields may be significantly increased by acidizing. Yields small to very large quantities of fresh water to springs in northwestern Gillespie County and northern Blanco County.</td></tr>
</table>

*Information taken from the Texas Water Development Board's Report 346: The Paleozoic and Related Aquifers of Central Texas (March 1996).

The location suggested for these new wells is approximately 7 miles southeast of the city limits (in the Riley Mountain range), as shown in *Figure 2*. The production capacity of each well was assumed to be 70 gpm at a well depth of 600 feet. Comparing topographic maps of the area with the water level maps given in the literature resulted in a depth to water of 100 feet. The area's transmissivity was also taken from the literature. This was assumed to be 50,000 gallons per day/foot. Six-inch diameter screens in the lower 300 feet were assumed. Well efficiency was assumed to be 80 percent.

**Figure 2: Llano Groundwater Supply Option**




Using the assumed aquifer conditions, a system of 6 wells would be sufficient to produce the amount of water required to meet the maximum remaining availability (478 ac-ft/yr) under average conditions. However, to meet peak demand conditions the number of wells in the well field would have to be expanded to 11. A well field consisting of 11 wells was used for the cost analysis for this strategy.

The maximum projected shortage of water for the City of Llano is 990 ac-ft/yr in 2010. By 2060, the projected shortage is 674 ac-ft/yr, assuming that the municipal conservation goals recommended in this plan have been achieved. This shortage is still greater thanthe remaining available groundwater supply from the Ellenburger-San Saba aquifer in Llano County of 478 ac-ft/yr. Additional groundwater supplies from the Hickory aquifer are available in Llano County within a proximal distance to the proposed Ellenburger-San Saba aquifer. Developing a nearby wellfield in the Hickory aquifer could eliminate the need for a second transmission line.

The production capacity of each well was assumed to be 140 gpm at a well depth of 1,000 feet. Comparing topographic maps of the area with the water level maps given in the literature resulted in a depth to water of 300 feet. The area's transmissivity was also taken from the literature. This was assumed to be 20,000 gallons per day/foot. Six-inch diameter screens in the lower 300 feet were assumed. Well efficiency was assumed to be 80 percent.

Using the assumed aquifer conditions a system of 3 wells would be sufficient to produce the amount of water required to meet the remaining shortage under average conditions. However, to meet peak demand conditions the number of wells in the well field would have to be expanded to 6. A well field consisting of 6 wells was used for the cost analysis for this strategy.

## References

1. CH2M HILL. "Groundwater Supply Alternatives for the Cities of Blanco, Goldthwaite, and Llano Technical Memorandum." Lower Colorado Regional Water Planning Group: 2001 Region K Water Supply Plan, *Appendix 5B*, August 18, 2000.

2. Baker, Bernard, et al. "Evaluation of Water Resources in Part of Central Texas." Texas Water Development Board Report 319. January 1990. Texas Water Development Board: Austin, Texas.

3. TWDB WIID (Water Information Integration & Dissemination) System Water Well Data: TWDB Groundwater Database: http://wiid.twdb.state.tx.us/ims/wwm_drl/viewer.htm

4. Preston, Richard D., et al. "The Paliozoic and Related Aquifers of Central Texas." Texas Water Development Board Report 346. March 1996. Texas Water Development Board: Austin, Texas.

# Enhanced Recharge in Lower Basin: Tech Memo

## Introduction

Enhanced recharge is considered as a potential water management strategy for irrigation shortages in the lower Colorado River Basin. The largest irrigation demands and shortages are in the rice-growing counties in the lower basin: Colorado, Wharton, and Matagorda. Irrigation demands in these counties is met by run-of-river water rights for the LCRA irrigation districts (Garwood, Lakeside, Pierce Ranch, and Gulf Coast) and water wells in the Gulf Coast Aquifer.

Enhanced recharge can be accomplished in a variety of ways: spreading basins, vadose zone injection wells, direct injection wells, and aquifer storage and recovery (ASR) wells. Only spreading basins are considered in this study. Vadose zone injection wells, direct injection wells, and ASR wells were evaluated but not considered viable alternatives given the intended use of the stored water and cost considerations.

This strategy consists of diverting water from the Colorado River, when available, and pumping to one or more recharge basins where the underlying aquifer is artificially recharged by surface spreading. Environmental flow requirements and senior water rights must be satisfied before water can be diverted from the river, resulting in very low reliability as a direct supply. By utilizing surface spreading, water is stored in the aquifer for later use. During drought conditions, when backup surface water supplies are intermittent, additional water stored underground can provide a reliable supply without overdrafting the aquifer.

## Recharge Options

### *Surface Spreading (Preferred Option)*

Surface spreading is the simplest, oldest, and most widely applied method of artificial recharge (Todd, 1980). In this application, water diverted from the Colorado River is pumped into a recharge basin where it infiltrates and percolates through the unsaturated zone into the aquifer. For surface spreading to be feasible there must be available land in areas of suitable soil permeability and an unsaturated zone large enough so that infiltration is not limited by water mounding. The water is treated as it moves through the unsaturated zone and into the aquifer, so there are no issues related to the contamination of supply for domestic users and public water systems near the basin site. Periodic maintenance of the recharge pond is required due to the formation of a clogging layer. There is also an operational consideration in choosing the proper wet-dry cycling schedule to promote the recovery of infiltration rates and reduce the frequency of maintenance needed to scrape away the clogging layer.

This is the preferred option in this case. No infrastructure beyond the diversion facilities and recharge basin are required. Land is available and it is a simple system to operate and maintain. Other options evaluated are discussed below.

*Vadose Zone Injection Wells*

An alternative to spreading basins and direct injection wells is the use of vadose (unsaturated zone) injection wells. These are relatively shallow dry wells that receive a constant feed of water and continuously recharge the aquifer through infiltration. They are essentially boreholes, approximately 3-6 feet in diameter, drilled into the unsaturated zone at depths ranging from 30-160 feet. A single dry well that is 160 ft deep, 5 ft in diameter and is in soil with a hydraulic conductivity of 3 ft/d may have an infiltration rate of 1 million gallons per day (Metcalf & Eddy|AECOM, 2007). At this rate, 9 wells would be required to recharge 10,000 ac-ft/yr. The biggest advantage to this method is that it requires very little land for the wells. One major disadvantage is that this type of injection well clogs relatively quickly and there is no way to reverse flow or effectively redevelop the well. Another serious problem is that diverted water from the Colorado River is only available during times of high flow, and large volumes of water would need to be stored somewhere prior to being fed to the network of injection wells, negating the benefit of the wells having a small footprint. The disadvantages far outweigh the advantages in this case, and this option is not considered feasible.

*Direct Injection Wells*

This type of well injects water directly into the water bearing strata and are constructed like regular pumping wells. The infiltration rates of injection wells are comparable to production wells, particularly if the water is pretreated to avoid clogging over time.

Advantages include:

- May be used in saturated and unsaturated aquifers;
- Can inject into brackish aquifers to form an injected water bubble or "ASR bubble";
- Flow may be reversed to allow for maintenance and cleaning;
- The same well can be used for injection and recovery.

Disadvantages include:

- Expensive to construct and require large amount of energy to create sufficient injection head for the desired infiltration rate;
- TCEQ requires that water injected directly to a producing formation be pretreated to drinking water quality standards. This avoids the clogging problem and the related maintenance, but is expensive in light of the fact that the water will be used for irrigation, where the raw water was acceptable in the first place.

The expense of additional treatment facilities could be avoided if the water could be pretreated, stored, and recovered by an existing public water system, allowing more groundwater to be pumped by irrigators. All of the major utilities in the three lower Region K counties use groundwater, and therefore do not currently have the ability to treat raw surface water from the Colorado River. While there are no technical reasons why direct injection could not be used in this case, the additional cost of deep injection wells and the pretreatment requirement rule this option out.

## Reservoir Siting and Operation

The considerations for reservoir siting include land availability, water availability, hydrogeologic factors, and soil permeability. Land availability is not a major factor since there is abundant farmland. Trial water availability model (WAM) runs were made throughout Wharton and Matagorda Counties, and there is little difference in availability from Northern Wharton County down to Southern Matagorda County. From a hydrogeologic standpoint, the main concern in surface spreading is the lack of a vadose zone. This is generally not a concern in Wharton and Matagorda Counties since unconfined water levels are well below ground level throughout the two counties. Placement of the reservoir should generally be far enough updip of the coast to stay away from highly saline water and to eliminate the possibility of the artificially recharged water flowing into the Gulf of Mexico over long storage times.

From an operational standpoint, soil permeability is the most important consideration. Surface geology of Wharton and Matagorda Counties is shown in Figure 1. Soil permeability of Wharton and Matagorda Counties is shown in Figure 2.

Figure 1. Surface Geology of Wharton and Matagorda Counties

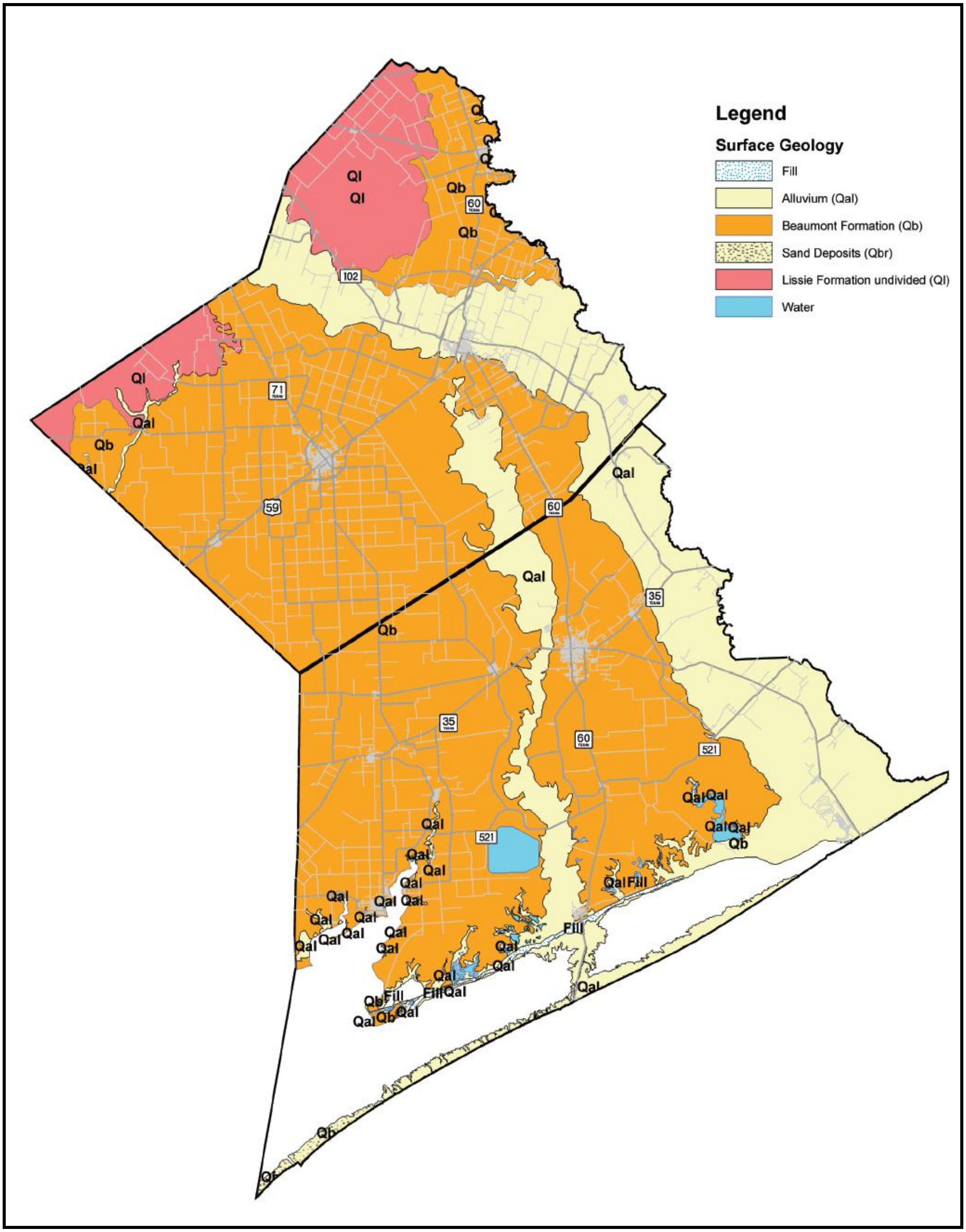
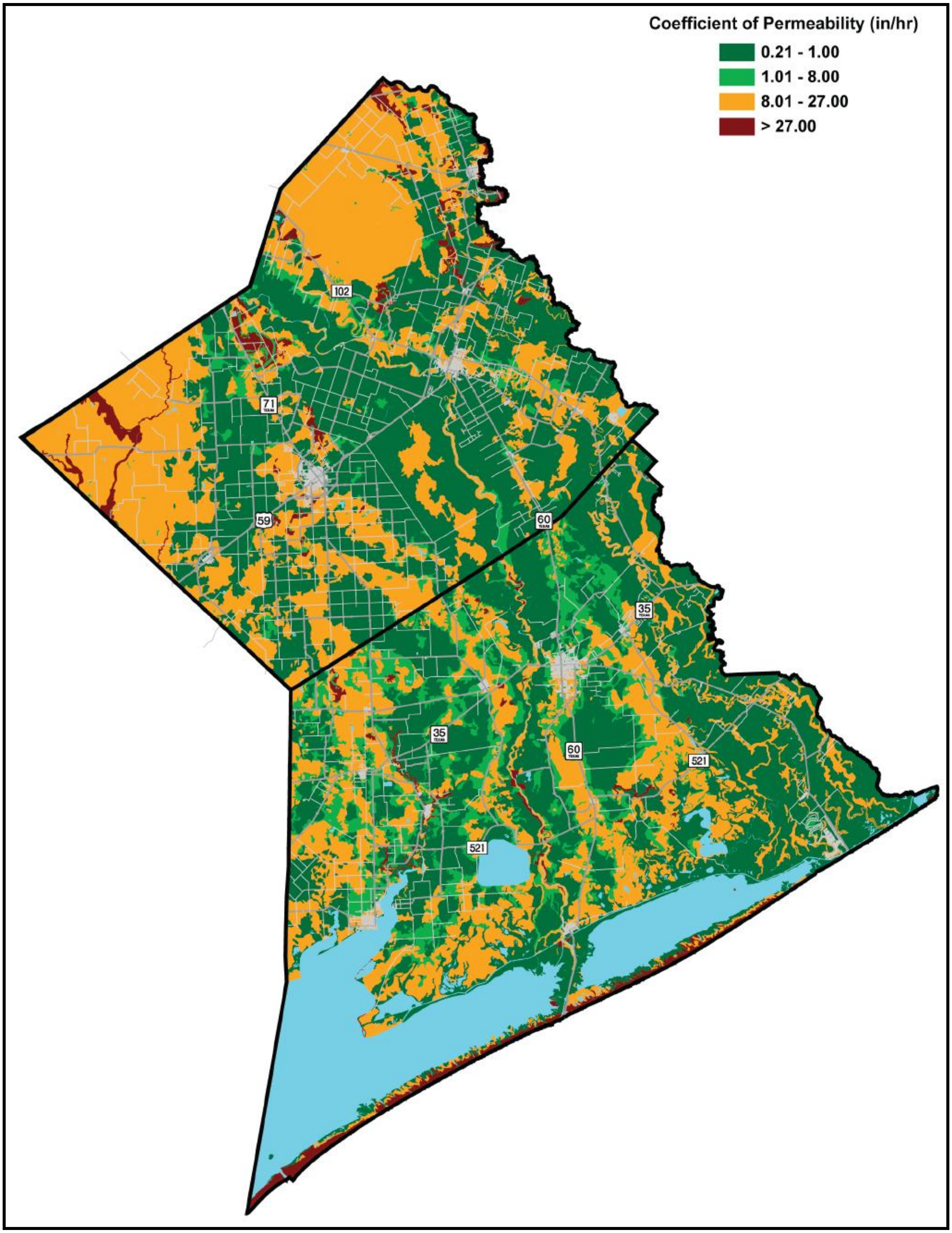


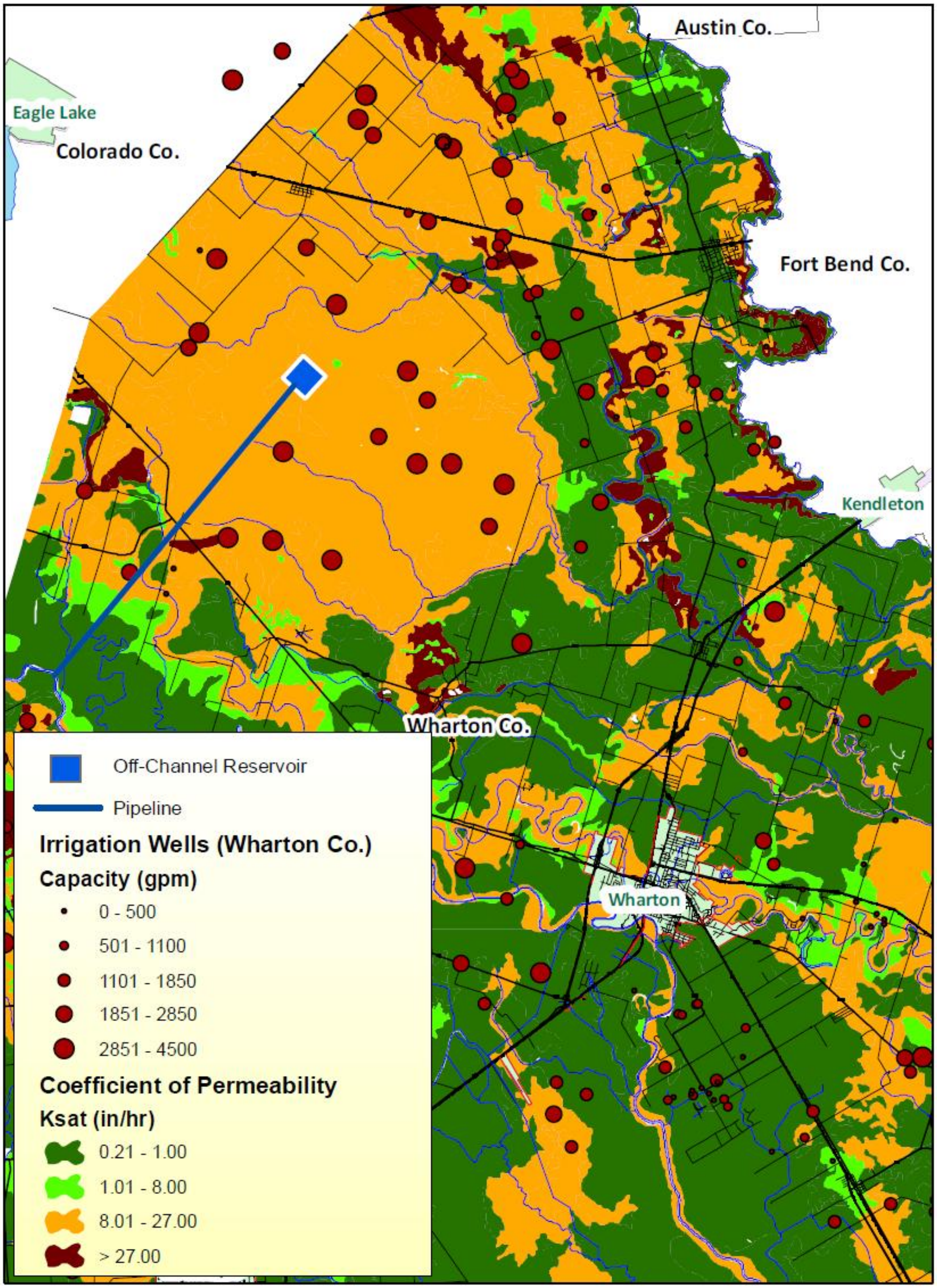
Figure 2. Soil Permeability in Wharton and Matagorda Counties



As seen in Figure 1, the Beaumont Formation (aka Beaumont Clay) outcrops throughout most of the two counties. The Beaumont Clay is composed of clay, silt, and sand, and has a relatively low coefficient of permeability (hydraulic conductivity) due to the tightness of the clay. There are overlying alluvial deposits that result in areas of higher permeability as seen in Figures 1 and 2. The older Lissie Formation underlies the Beaumont Clay and outcrops in the northern part of Wharton County, and like the Beaumont Clay, is composed of sand, silt, and clay, although of different character. As seen in Figure 2, the Lissie Formation has a much higher coefficient of permeability and is better suited for infiltration through surface spreading than the Beaumont Clay. The areas of higher permeability that coincide with the alluvial deposits allow high rates of surface infiltration, but due to the underlying clay, artificially recharged water would primarily contribute to the base flow of the streams and to perched groundwater in the alluvium rather than to recharge of the Gulf Coast Aquifer. From the standpoint of permeability and infiltration rates, the northern part of Wharton County east of the Colorado River in the Brazos-Colorado Basin is the preferred location for an off-channel settling basin.

Figure 3 shows the potential location of the pipeline and off-channel reservoir in northern Wharton County. This is but one potential site, and the pipeline route shown does not take into account rights of way, utility conflicts, soil conditions, or any other factor. This site places the off-channel reservoir in an area of relatively high soil permeability, and is updip of a cluster of existing high-capacity irrigation wells that can be used to pump the stored water. There are other areas in Wharton and Matagorda Counties that are also potentially suitable, but it is beyond the scope of regional planning to locate the optimal site and pipeline routing.

Figure 3. Potential Project Site

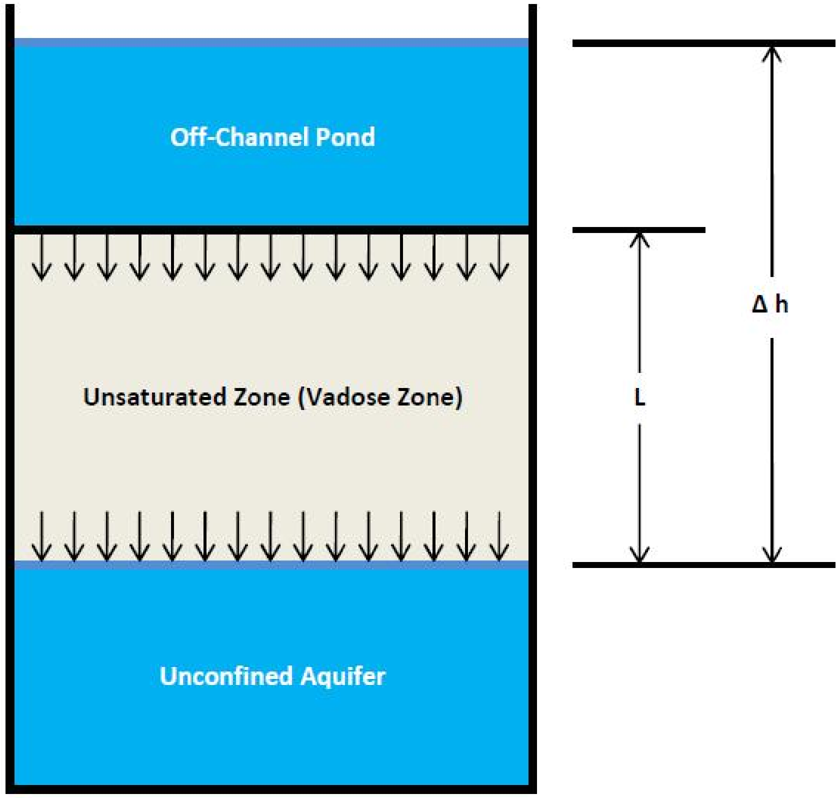



Permeability Source: USDA Natural Resources Conservation Services

The system consists of a ring dike structure for the reservoir, a pump station to divert water from the Colorado River, and a pipeline to convey water to the reservoir. The reservoir volume used in this study is 6,700 ac-ft and the dimensions are 3,940 ft square with 6:1 side slopes, and a total depth of 20 ft. Analysis performed with different pond sizes indicates that as the pond volume increases, the volume of water that can be diverted increases at a slower rate beyond a reservoir volume of approximately 6,000 – 7,000 ac-ft, therefore pond size is limited to minimize the unit cost of recharging the aquifer. Water availability analysis is discussed in more detail in the next section.

The infiltration rate through the pond bottom, given by Darcy's law, is a function of the area of the pond, the hydraulic conductivity of the soil, the total distance from the free surface of the pond to the water bearing strata, and the thickness of the vadose zone (see Figure 4 below).

Figure 4. Darcy's Law (graphic adapted from Marsily, 1986)




$$Q = \frac{KA\Delta h}{L}$$

Q = flow through the pond bottom and into the aquifer
A = Area of pond
K = hydraulic conductivity (coefficient of permeability)
$\Delta$ h = Depth of water in pond + thickness of sandy formation
L = thickness of sandy formation
$\Delta$ h / L = Hydraulic gradient

Without specific soil tests, the coefficients of permeability can be taken from the NRCS values shown in Figure 3. The range for the area of Wharton County containing the proposed reservoir site is 8-27 in/hr. This value represents the saturated hydraulic conductivity ($K_{sat}$). In most applications, the K value in the Darcy equation is approximately one half the $K_{sat}$ (Metcalf & Eddy|AECOM, 2007). The K value used to estimate potential infiltration then is 4 in/hr (8 ft/d). This is half of the low end of the range from Figure 3.

The theoretical maximum infiltration rate is computed as follows:

- K = 8 ft/d
- A = 3940ft x 3940ft = 15,523,600 sq ft
- Δh = 200ft + 20ft = 220 ft (assume 20 ft of pond depth and a 200 ft thick unsaturated zone)
- L = 200ft
- Multiply cubic feet per day by 0.0084 to get ac-ft/yr

$$Q = \frac{8\frac{\text{ft}}{\text{d}} \text{ x } 15523600 \text{ ft}^2 \text{ x } 220 \text{ ft}}{200 \text{ ft}} \text{ x } 0.0084 = 1{,}100{,}000\,\frac{\text{acft}}{\text{yr}}$$

This is a theoretical maximum computed from Darcy's law which depends on a constant feed of water to the reservoir and a constant hydraulic conductivity that was not determined from site-specific soil tests. It also does not take account mounding on the free surface of the aquifer, which would potentially limit the infiltration rate. This equates to a rate of 8.5 ac-ft/ acre/day, which is comparable to data from surface spreading in California where infiltration rates in that range were experienced for coarse-grained deposits of sand, gravel, cobbles, and boulders (Richter, 1956). This same publication suggests that variable textured soils that are predominately sands, silts, and clays have an average infiltration rate on the order of 0.5 ac-ft/ac/day. This type of soil is more similar to the soils found in Wharton County and the 0.5 ac-ft/ac/day is likely a better (albeit conservative) approximation of the actual infiltration rate that could be expected on average.

Using the 0.5 ac-ft/ac/day rate, the infiltration rate would be 65,000 ac-ft/yr. This corresponds to a K value of approximately 0.2 in/hr, and is the value used in the water availability modeling discussed below. As will be seen later, the amount of that can be recharged to the aquifer is limited not by infiltration rate, but by the amount of water that can be diverted from the Colorado River, therefore using a conservative value for the infiltration rate does not affect the overall results.

Even though the limiting factor is not the infiltration rate, it is advisable to locate the off-channel reservoir in an area of relatively high soil permeability. The K values from the soil map assume clean water. In practice, infiltration rates will decline over time as a clogging layer develops due to various solids present in the water. The infiltration rate can be restored by alternating wet-dry periods, but the clogging layer must still be periodically removed by scraping. Placing the reservoir in an area of low permeability will result in a reservoir that does not perform as well as it could, even without the presence of a clogging layer, and may require more frequent scraping to adequately maintain the reservoir.

## Water Availability from the Colorado River

The strategy diverts flow from the Colorado River when available and stores the water in one or more off-channel basins. The strategy is modeled using the WAM Run 3 Cutoff Model version modified for strategy analysis as the baseline model ("baseline model"). A description of this baseline model can be found in the report *Draft LCRWPG 2011 Water Plan First Biennium Studies – Environmental Impacts of Water Management Strategies Study*.

The baseline model was modified to include two new water rights: one to fill an off-channel reservoir at control point K20061 and a water right that diverts from the off-channel storage. Both water rights have a priority date junior to all other rights in the model. Before diversions are made from the river to fill the off-channel reservoir, instream and bay & estuary flow targets, senior to the diversion right, are imposed at control points M10020 and M10000 at the entrance to Matagorda Bay.

The off-channel reservoir has a volume of 6,700 ac-ft. The surface area is 356 acres (3,940 ft square) and the depth is 20 feet. To limit the amount of water that can be diverted from the river, a maximum diversion of 3,790 ac-ft/month, which corresponds to a 4 ft diameter pipe flowing at 5 ft/sec, is imposed.

The diversion target from off-channel storage is dictated by the infiltration rate that could be expected through the pond bottom. As discussed in the previous section, a conservative estimate of the infiltration rate is 65,000 ac-ft/yr. This is at the low end of the permeability range for Matagorda and Wharton Counties.

The historical period of record modeled is from 1940 to 1998. Annual diversion volumes from the river as well as aquifer recharge volumes are shown in Table 1.

Table 1. Annual Diversion and Recharge Volumes During the Historical Period of Record

| Year | River Diversion (ac-ft/yr) | Aquifer Recharge (ac-ft/yr) | Year | River Diversion (ac-ft/yr) | Aquifer Recharge (ac-ft/yr) |
|---|---|---|---|---|---|
| 1940 | 17,206 | 14,845 | 1970 | 14,320 | 16,310 |
| 1941 | 32,593 | 35,031 | 1971 | 7,580 | 3,826 |
| 1942 | 14,342 | 14,269 | 1972 | 0 | 3,846 |
| 1943 | 3,790 | 3,750 | 1973 | 20,791 | 20,913 |
| 1944 | 10,424 | 8,146 | 1974 | 18,091 | 16,401 |
| 1945 | 10,470 | 12,784 | 1975 | 21,938 | 23,479 |
| 1946 | 18,074 | 15,662 | 1976 | 14,245 | 12,283 |
| 1947 | 3,790 | 6,137 | 1977 | 7,580 | 9,588 |
| 1948 | 0 | 0 | 1978 | 3,790 | 3,788 |
| 1949 | 11,370 | 7,569 | 1979 | 18,040 | 17,984 |
| 1950 | 3,790 | 7,576 | 1980 | 0 | 0 |
| 1951 | 0 | 0 | 1981 | 14,262 | 14,276 |
| 1952 | 539 | 0 | 1982 | 3,790 | 3,751 |
| 1953 | 0 | 518 | 1983 | 3,778 | 3,733 |
| 1954 | 0 | 0 | 1984 | 3,790 | 3,845 |
| 1955 | 0 | 0 | 1985 | 13,366 | 10,997 |
| 1956 | 0 | 0 | 1986 | 6,578 | 6,678 |
| 1957 | 21,730 | 20,100 | 1987 | 24,404 | 24,568 |
| 1958 | 22,740 | 24,449 | 1988 | 0 | 1,945 |
| 1959 | 14,276 | 12,342 | 1989 | 0 | 0 |
| 1960 | 27,485 | 27,568 | 1990 | 0 | 0 |
| 1961 | 28,528 | 30,579 | 1991 | 11,370 | 7,664 |
| 1962 | 0 | 0 | 1992 | 28,343 | 30,135 |
| 1963 | 0 | 0 | 1993 | 15,024 | 17,447 |
| 1964 | 0 | 0 | 1994 | 10,518 | 8,497 |
| 1965 | 10,382 | 8,112 | 1995 | 14,320 | 12,417 |
| 1966 | 0 | 2,352 | 1996 | 0 | 3,771 |
| 1967 | 0 | 0 | 1997 | 28,366 | 26,358 |
| 1968 | 25,687 | 21,977 | 1998 | 20,909 | 21,238 |
| 1969 | 17,248 | 18,974 | | | |

The river diversions shown in Table 1 are intermittent due to the junior priority of this right. During the drought of record (DOR, 1947-1957), diversions are zero for four consecutive years, 1953-1956. Twice there are three consecutive years of zero diversions: 1962-1964 and 1988-1990. On average the annual diversions are 10,500 ac-ft/yr. Aquifer recharge is limited by available storage; while the reservoir is capable of recharging 65,000 ac-ft/yr, the annual average recharge from Table 1 is 10,480 ac-ft/yr.

## Firm Yield

From Table 1 the average recharge over the historical period of record is 10,480 ac-ft/yr, but recharge is intermittent during that time. The firm yield depends upon the regulatory structure imposed by the Coastal Bend Groundwater Conservation District (District). The assumption is that the stored water would be banked, and that water could be used as needed with no preset annual limit as long as total usage did not exceed the stored amount, or if it did, could be made up by reducing pumpage after a period of heavy use. Details would need to be worked out, but this study envisions a regulatory framework that sets a limit on average usage over a 50 year period.

The annual average is calculated as follows:

- 10,480 ac-ft/yr x 90% recovery efficiency = 9,430 ac-ft/yr available on average

Assuming that an amount smaller than the annual average is used during non-drought years, more water could be produced during an assumed 10 year drought. Any combination of numbers is possible, but a reasonable scenario is as follows:

- Assume 7,500 ac-ft/yr during non-drought years (i.e. over 40 years)
- (10,480 ac-ft/yr x 50 yrs x 90% recovery – 40 yrs x 7,500 ac-ft/yr) / 10 yrs = 17,160 ac-ft/yr

With the above assumptions, the firm yield is 17,160 ac-ft/yr.

## Irrigation Wells

There is a network of irrigation wells currently in use as part of the rice farmers' conjunctive use operation (see Figure 3). The wells augment the interruptible supply of surface water from LCRA, and are particularly needed during times of drought. This strategy makes more groundwater available during a drought; during planting season, there needs to be a large pumping capacity to produce a large volume of water in a short amount of time. For this analysis, a broad assumption is made that five new 2500 gpm wells are required to provide additional capacity and to ensure full coverage of the well network.

## Cost

Project costs are shown in Tables 2-5. All costs are in September 2008 dollars. Table 2 shows probable construction costs. The project components costed are the 6700 ac-ft spreading basin, transmission pump station and inlet to move water into the basin, five new wells and associated collection lines to augment the existing well network. Total construction cost is estimated to be $41 million. Probable capital costs are shown in Table 3. Capital costs totaling $56 million include construction cost, engineering cost, legal costs, contingencies, land acquisition, environmental studies, and interest accumulated during construction. Engineering, legal, and contingencies varies depending on the facility type, but generally runs 30-35%. The total annual cost of $5.9 million shown in Table 4 is the sum of debt service for the loan, operation and maintenance of the facilities, and electricity cost for pumping.

Table 5 shows the project yield and the annual cost of water on a unit basis. As mentioned previously, the project is anticipated to deliver 17,200 ac-ft annually during a period of drought when surface water delivery is curtailed. Based on annual cost and project yield, the anticipated cost is $340 per ac-ft. This is equivalent to $1.05 per 1,000 gallons.

Table 2. Probable Construction Cost

| Item | Cost |
|---|---|
| Spreading Basin (6,700 ac-ft storage, ring dike construction) | $5,805,000 |
| Transmission Pump Station and River Inlet (1,000 HP) | $13,022,000 |
| Transmission Pipeline (48 in. dia., 8.5 miles) | $18,294,000 |
| Water Wells and Collection Lines (5-2,500 gpm wells, 18 in. casing, 5 mi. 12 in. collection lines) | $3,928,000 |
| TOTAL | $41,049,000 |

Table 3. Probable Capital Cost

| Item | Cost |
|---|---|
| Construction (Capital) Cost | $41,049,000 |
| Engineering, Legal, and Contingencies | $13,058,000 |
| Land Acquisition and Environmental Studies | $1,548,000 |
| Interest During Construction (1 year) | $641,000 |
| TOTAL | $56,296,000 |

Table 4. Annual Cost

| Item | Cost |
|---|---|
| Debt Service (6% over 20 yrs) | $4,909,000 |
| Operation and Maintenance: | |
| Spreading Basin | $88,000 |
| Pump Station, Inlet, Pipeline | $564,000 |
| Water Wells and Collection Lines | $95,000 |
| Pumping Energy Costs | $233,000 |
| TOTAL | $5,889,000 |

Table 5. Project Yield and Unit Cost of Water

| Item | Value |
|---|---|
| Project Yield (ac-ft/yr) | 17,200 |
| Annual Cost Per Ac-Ft | $342 |
| Annual Cost Per 1,000 gallons | $1.05 |

## References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Richter, R.C. (1955) *Geologic Considerations in Artificial Recharge of Ground Water Reservoirs in California*, presented at Geological Society of America meeting, Berkely

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# SUSTAINABILITY AND ADVANCED WATER CONSERVATION ANALYSES

## INTRODUCTION

The purpose of this analysis was to compare and contrast three scenarios of sustainable development as follows:

1. Meet projected population increases by finding new water supplies.
2. Meet projected population increases by requiring decreased per capita use for specific entities, where appropriate.
3. Manage population growth to reduce demands to a level which is consistent with existing supplies.

These three scenarios roughly correspond to **Scenario 1** being the plan as submitted, in which the areas with surpluses were used to provide as much water as possible to meet projected shortages before trying to develop new sources for the remaining areas of shortages; **Scenario 2** corresponds to holding the water supply at its current fixed amount and conserving that supply to cover the population increase by requiring reduced per capita consumption within the general service area; and **Scenario 3** limits population growth to only those areas where growth can be supplied by the existing unused water supplies. These three scenarios are further explained below and the impacts to the region for each are compared.

## SCENARIO 1

The Lower Colorado Regional Water Planning Group (LCRWPG) Water Plan has been prepared along the lines of this scenario, i.e. maximizing the use of existing supplies. Although established water rights for existing entities have not been arbitrarily reduced even if supplies exceed demands, in most cases, Region K entities have needs during the planning horizon for **all** of their water, and in fact are actively looking for additional supplies. Supplies within the LCRWPG Water Plan were shared across basin splits for a number of water user groups (WUGs) that had supply in one basin and demands in another basin. The wholesale water providers, LCRA, and the City of Austin, both provided updated plans to demonstrate how their water needs would be supplied through maximizing the use of existing supplies. In addition, as required by the regional planning requirements of the Texas Water Development Board, every entity with a need and with a per capita use of greater than 140 gallons per capita day (gpcd) was required to use conservation as their first water management strategy. Therefore, conservation in the amount of a 1 percent reduction per year for each year in which the per capita use was above 140 is included as the first strategy for each entity with a shortage. In addition, there is a significant allocation of resources to "County-Other" (municipal) in anticipation of growth of entities in the suburban areas of the planning region. This suburban development currently has no specific entity in charge of their supply, since the entities to be served do not currently exist. Both LCRA and the City of Austin have included the demands of some of these growing areas in their base demands. In addition, some of the supplies allocated to these areas have been shared between and among the various "County-Other" (municipal) basin splits as appropriate, as well as shared with other WUGs which have needs and are in the same area.

For all of the above reasons, Scenario 1 is adequately represented by the LCRWPG Water Plan and information on potential costs, reliability, quantities of water and environmental impacts from this scenario is already available in the LCRWPG Water Plan.

**SCENARIO 2**

Scenario 2 is defined in the scope as "meeting projected population increases, but requiring decreased per capita use." As discussed in Scenario 1 above, the municipal conservation measures in the base plan of the LCRWPG Water Plan are only implemented for WUGs with shortages and with per capita usage above 140 gpcd. Therefore, the analysis for Scenario 2 looked at additional conservation and the potential means to implement such measures.

The first step in this analysis was to assemble data on each of the WUGs in terms of population, per capita use, demand, and available supplies both in terms of current supplies and with contract extensions. These tables were extracted from data in previous chapters. The only information that has not appeared elsewhere is the combination of current supplies with contract extensions. This data was then used to determine the shortage by municipal WUG. The data shows a substantial variation in per capita usage for the WUGs in Region K. Even with the implementation of all likely indoor savings mechanisms for 100 percent of the population, plus the elimination of all outdoor watering through the use of rainwater harvesting, the total demand is reduced to only 150 gpcd for single family residences and to 155 gpcd for multi-family populations based on the average per capita use in Region K as reported in the GDS study referenced elsewhere in this text. Neither of these reductions comes close to reducing per capita usage to the amounts required to eliminate the need for new supplies.

Therefore, additional analysis was needed to consider even more stringent conservation measures and to consider how such measures might be implemented and at what cost.

The measures to be implemented needed to be able to be incorporated as much as possible into new housing, as well as to minimize the disruption of the lifestyle indoors. For those and other reasons, the study focused on the installation of both gray water recycle for toilet flushing and on rainwater harvesting for potential indoor use, as well as requiring minimal residential landscape watering. Minimal in this case is in the range of 6 to 10 gallons per capita per day. These measures were applied to growth primarily in urbanized areas where the highest growth is anticipated to occur. Applying these measures to all of the projected growth, without requiring any retrofit of existing facilities resulted in a savings in 2060 of slightly more than 100,000 acre feet annually. This savings would have to be distributed from those with surpluses to those with shortages in order to meet the demands without requiring new supplies, but it would be possible to do so if sharing of the water saved became a reality.

**SCENARIO 3**

The amount of population growth that can be supplied with the existing supplies is roughly demonstrated by the TWDB Socioeconomic Impact Study which defines the impact of not meeting the water needs, in part, by calculating the population loss that would occur if the needs were not met. Scenario 3 is defined as the limitation of population such that the available supplies are adequate to serve the population already in place. This analysis was included in the TWDB Socioeconomic study that was done for Region K to determine the impact of not meeting the needs. For this analysis, TWDB used a model to determine the impacts on population and a number of other items. This analysis is included as *Appendix C* in Chapter 9. For the purposes of this discussion, the loss of jobs in the TWDB study is equated to a loss in population.

The primary issue in achieving the population limitations assumed from the TWDB study is the lack of availability of water for new growth. However, as noted in Scenario 2 above, there is a need for control of groundwater to the extent that new public water systems and even individual residences could not continue to develop by using groundwater. Where groundwater conservation districts (GCDs) exist there is a potential to control the use of groundwater through permits. However, not all counties in Region K are included in a GCD, and there are limitations on GCD authority that may make it difficult for them to refuse permits. The surface water supplies currently have the appropriate authority to refuse service to those for whom there are not sufficient firm yield water supplies to serve adequately. Effective control of population in an area would require a combination of control of the sources of supply as well as the implementation of strict conservation measures and punitive rates similar to the concepts shown in Scenario 2 above. These measures would tend to move development of both jobs and population to areas which are more favorable to development.

**BACKGROUND DATA FOR SCENARIO 2**

*Table 1* shows the surpluses and shortages by water user group. *Table 2* shows the reductions in acre feet per year that will be required to balance out the supplies with the demand of the increased population. To further quantify the reductions needed, *Table 3* presents the individual per capita reductions that must be achieved in order to accomplish the necessary reductions. As *Table 3* indicates, some of the reductions are in excess of 100 gallons per person per day.

Much of the information and analysis to follow is based on the TWDB study conducted by GDS Associates, "Quantifying the Effectiveness of Various Water Conservation Techniques in Texas." This study examined 10 years worth of population and water usage statistics to develop average usage information for each of the regional water planning areas of the state. This study also looked at incremental amounts of water use through examination of the various data that TWDB had available. Usage was developed for the low use period of December, January, and February which represents primarily indoor water usage, and is called base flow in the GDS study. The study then identified the average daily usage over the year. The difference between the base flow, and the average daily flow is called seasonal use. This increment of use corresponds roughly to the outdoor use of water for ornamental plants and lawns. The third increment of use is an additional amount of water which is used during dry weather conditions. This increment is similarly tied to outdoor water uses. For the Region K area as a whole, the water use for both urban and rural areas comprises a total of 190 gallons per capita per day. The base use is estimated at 137 gpcd for urban areas and 132 gpcd in rural areas. This represents the usage that will be affected by conservation measures such as toilet and showerhead and clothes washer rebates. The seasonal use water and the dry weather use water is that water which will be affected by irrigation audits for single family residences, multi-family residences and commercial businesses, landscaping ordinances, and potentially rainwater harvesting.

The GDS study also looked at various water conservation measures and rated 16 of those measures based on reductions to the gallons per capita per day for single family and multi-family residential measures and also rated commercial savings based on gallons per measure instituted. The analysis included the development of cost information from Year 2002 cost data using 5 percent interest for amortization of capital. No attempt was made to adjust the costs for this portion of the analysis.

This analysis looks at the potential to target specific water conservation measures to each WUG and to determine whether or not there is a likelihood of meeting the needs of the WUGs through conservation efforts. Population growth is expected to continue as identified in the LCRWPG Water Plan, but the management strategies developed in the LCRWPG Water Plan will be discarded and the needs met by contract extension and conservation and/or reuse alone. The analysis will determine the resulting allowable per capita consumption levels of the population and whether or not implementation of each of 16 water saving measures to a level of participation of 80 percent will be sufficient to meet the shortages.

**ASSUMPTIONS FOR SCENARIO 2**

The actual data shows a substantial variation in per capita usage for the WUGs in Region K. As an example, Aqua WSC, with a substantially rural and single family residential population has a per capita use starting at 139 gpcd in 2000, and reducing to 126 gpcd in 2060. Bastrop, which is becoming a more urbanized trade center, with the addition of the Home Depot and other large scale facilities, has a per capita usage above 200 currently, which reduces to 191 by the end of the planning period. As a result, there is likely to be more room for reduction of commercial demand in Bastrop than there is in Aqua WSC. In order to better target the various reductions the following assumptions are made.

1. The indoor average use from the December, January and February period contains some irrigation when the values are at or above 137 gpcd. The percentage of this water that is used for irrigation is assumed to be 10 percent. This accounts for watering of tender vegetation in advance of a freeze, as well as the maintenance of indoor plants in office buildings, malls, and other such facilities.
2. For systems with a per capita use between 120 and 140, the amount of water that is allocated to irrigation use is assumed to be 5 percent.
3. For systems less than 120 gpcd but greater than 100 gpcd, the irrigation use is assumed to be 2 percent.
4. For systems with per capita use less than or equal to 100 gpcd, irrigation use is assumed to be zero, and all usage is assumed to be residential with no irrigation or dry year components. For all other systems, 100 gpcd is assumed to be the level below which measures such as rainwater harvesting and separation of plumbing indoor reuse are required to effect further savings.
5. 25 percent of the year 2000 population in each WUG is assumed to be already converted to water saving fixtures, both toilets and showerheads/aerators. The maximum savings that can be obtained from these programs is then based on the remaining 75 percent of the year 2000 population. All other growth has taken place after the effective date of the plumbing fixture laws.
6. Systems with per capita usage of less than or equal to 100 gpcd are assumed to have no outdoor water usage and will further be assumed to have some mechanism for restricting outdoor watering in the future.
7. 90 percent of the toilets in single and multi-family residential use have an anticipated life of 25 years. 90 percent of the toilets in commercial use have an anticipated life of 15 years.

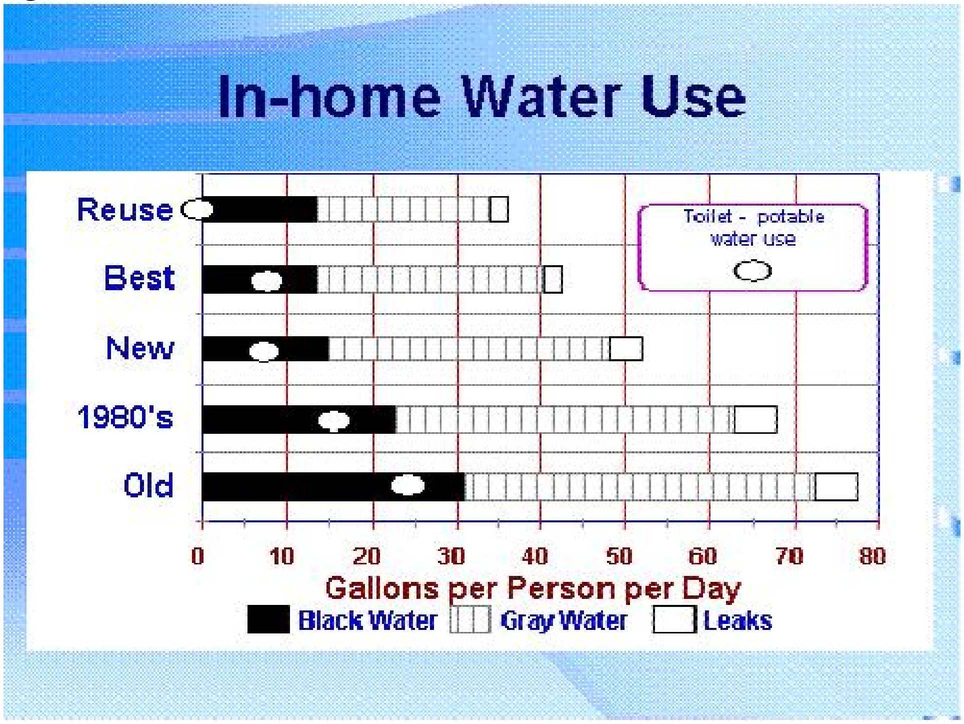
**ANALYSIS OF SCENARIO 2**

Information concerning the per capita consumption:

The GDS report further included tables of the breakdown of single family versus multi-family residences for each county and other data that was used in developing this document. Those tables are included in this *Appendix 4D* as well. The primary mechanisms that were presented in the GDS report for reducing indoor water usage included replacement of higher flow toilets, showerheads and faucet aerators with low flow fixtures, and use of low volume clothes washing machines for single family residential, multi-family residential, and commercial uses. All new toilets and showerheads are currently required to be low usage fixtures in order to be sold in Texas, but clothes washers are still available which use a greater quantity of water. As a result, the savings from toilet replacements will only occur over a 25 year period and after that time, 90 percent or more of those potential savings have been achieved and any further reductions are already programmed into the gpcd values. This analysis holds true for showerheads and aerator replacements as well. Single family savings from the GDS report indicated savings of 10.5 gallons per person per day and costs of $85 for a toilet rebate program. $50 was added to this cost for the toilet program to cover labor for installation of each toilet to determine the total cost of the strategy. On this basis, the cost of water developed under a toilet rebate program is $360 per acre-foot, also assuming a 25 year life for the new toilet. Using a similar analysis for shower heads and faucet aerators, the cost of water from that program is $61 per acre foot. Costs for washing machine programs were determined to be in the $600 per acre foot range, assuming a 13 year life for each machine. These are the three primary savings mechanisms for indoor usage, and the combined savings is approximately 21 gpcd. Savings for multi-family residences are less because of the higher number of users for each washing machine. In any event, the implementation of all of the indoor savings mechanisms for 100 percent of the population, plus the elimination of all outdoor watering through the use of rainwater harvesting only reduces the total gpcd to 150 for single family residences and to 155 gpcd for multi-family populations. Neither of these comes close to reducing per capita usage to the amounts available.

Some alternatives that could potentially be used to further reduce the per capita consumption in the home include dual systems that would recycle shower water for toilet flushing, waterless fixtures, and composting toilets. These conservation measures work best for new construction. Facilities to separate shower water and sink water from toilet water would be extremely expensive to retrofit on a wholesale basis, but can be built into new housing for a small increase in cost. This same holds true for rainwater harvesting. Designing facilities into the house before it is built allows much greater implementation of water saving features. New construction homes with waterless urinals and constructed on vacuum sewer collection systems which also recycle shower and bath water into flushing of low flow toilets offer the best opportunities for reaching the low per capita usages necessary to avoid management strategies for meeting the municipal needs. Garden tubs, spas, hot tubs, pools, and other water using features would by necessity be prohibited by ordinance.

**Figure 1 In-home Water Use**




Note: Chart provided by Bill Hoffman, Water Conservation Specialist, City of Austin.

*Figure 1* presents information on the approximate breakdown of water used in residential situations strictly for indoor uses. As *Figure 1* indicates, the amount of water actually used indoors is significantly less than that normally associated with residential use. One of the reasons for this is the aggregation of commercial demand with residential demand. Another reason is the indoor use of water for watering plants and maintaining landscapes even where there is no watering of lawn and trees.

There is little data available on costs for the more extensive measures noted above. The cost to retrofit an existing house to separate the plumbing, provide a small storage tank and treatment unit, and pumps is probably in the $8,000 to $10,000 range for houses with slabs on grade. According to *Figure 1*, the average usage for toilet flushing in a home with water saving fixtures is somewhere between 14 and 22 gallons per capita per day, as opposed to the 28 gallons per capita per day found in a previous California study. Providing this volume solely from recycled gray water would reduce the need for fresh water supplies by a minimum of 14 gallons per person per day, or 34 gallons per single family residence. Assuming a $10,000 addition to the principal of a house at a 20 year loan and 6 percent interest, the approximate annual payment would be $870 per year with an estimated 2 percent of construction cost for operation and maintenance of pumps and filtration equipment. This yields a total annual cost of $1,070. Annual savings would be approximately 0.04 acre-feet. The cost per acre foot would then be approximately $25,000. In contrast, the cost of retrofitting houses that were of pier and beam or pad and block construction would be in the $1,000 range, with the additional $1,000 for the tank, pump, and filter apparatus. This $2,000 cost amortized over 20 years at 6 percent interest would be $175 per year, with a similar $200 per year operation and maintenance for a $375 per year total cost. Cost of the retrofit is then slightly less than $10,000 per acre foot. It should be noted that these numbers are considerably greater than those numbers included in the GDS report because that report only includes the cost to the utility or provider of the rebate or rebates instead of the cost of implementing the strategy.

The cost picture is similar when including these features in the design of new housing. The cost of separating the plumbing to capture all of the gray water would be less than $1,000 additional. Adding the tank and pump equipment which would be the same as that discussed above would be approximately $1,000. Operation and maintenance would be the same.

The cost to install a rainwater harvesting facility in an existing house and lot is covered in the GDS report, and is reported at $670. To install a 2,000 gallon tank instead of the 1,000 gallon tank would increase the cost to approximately $1,000, with a yield of 46.7 gallons per day. This translates to approximately $6,000 per acre foot, assuming a 15 year life for the facilities and $200 per year for operation and maintenance. The rainwater harvested in this example would be used primarily inside the home instead of for outdoor watering.

At the same time that interiors are made more water efficient, exterior watering would have to be banned almost entirely. All landscaping would be required to be water efficient, and be able to survive extended drought conditions. Outdoor watering would be prohibited by ordinance as well as through punitive water rates that would require high fees for usage above the minimum levels. Enforcement of these rules would be difficult and expensive, but there is little information currently to determine costs.

The measures discussed above are then applied against the population as follows. The indoor water use is taken from the 1980's bar on *Figure 1*, and assumed to average 68 gallons per capita per day. If the reuse bar at the top of *Figure 1* is used for the indoor use after the implementation of the gray water toilet flushing and the rainwater harvesting for shower and irrigation water, with a value of 36 gpcd, then the resultant savings is 32 gpcd. It is further assumed that TCB's experience with master planned communities is applicable to the Austin area, and that the difference between 68 gpcd for indoor use and 130 gpcd for total use is largely irrigation. If it is further assumed that only 10 percent of the outdoor watering is permitted in the future, then there would be a savings of approximately 56 gpcd for all systems with a per capita use above 130, or the difference between the current use and 68 gpcd minus 10 percent of that difference. All indoor savings will be the same. These savings amounts are applied to the population increases between 2010 and 2060 to determine the magnitude of the potential savings. A projected savings in 2050 of slightly more than 100,000 acre feet can be realized in this manner, as compared to the total regional shortage of approximately 78,000 acre feet. These savings are shown in *Table 3*.

## IMPLEMENTATION ISSUES FOR SCENARIO 2

The numbers shown above are a significant departure from the demands that have been projected for this area to continue to grow in the manner that growth has occurred historically. In order to achieve compliance as closely as possible with a severe conservation standard, measures similar to those that are enumerated below will have to be implemented.

1. All new development will have to be closely controlled. The only type of outdoor watering that can potentially be allowed would have to be drip irrigation from either rainwater harvesting or gray water recycle. For the purposes of this discussion, gray water is defined as lavatory, tub, shower, and dish water. A connection could also be made to the clothes washer depending upon whether or not there are diapers routinely processed in the clothes washer. This connection could be valved off and water with heavy bacterial loadings could be sent to the black water or toilet water system instead.

2. All new construction would have to incorporate water saving fixtures as well as dual plumbing system to allow the use of recycled gray water to flush commodes and for limited outside irrigation.
3. All clothes washers would be required to meet high water use efficiency standards, and not just energy efficiency standards.
4. All new dwellings would have to be inspected and approved prior to hooking up the interior plumbing.
5. Punitive rates would have to be implemented to provide incentives for achieving low water use, but to quickly increase to provide disincentives to wasting water. This cannot be the only means of enforcement, since some customers will use all of the water they want regardless of the cost. In addition, since the amount of water used will be related to the number of people in the home, there would have to be an accounting of the number of people present in order to determine whether or not the usage was within standards.
6. Water would have to be shared among communities with those having surpluses being required to provide water for those with shortages.

The six points noted above can generally be implemented by cities with building inspection departments, and utility districts as well. However, information on the number of people in each home is not routinely collected currently. For the unincorporated areas of the counties not served by public water supplies, the control of water use could potentially be through the groundwater districts. The groundwater districts would have to require metering of individual groundwater wells serving residences, which is not currently done. They would also have to require an inspection of the completed dwelling prior to providing service in order to assure that the proper water saving features are in place.

Surface water use would be controlled by the entities that provide treated surface water, since no new connections are anticipated to take place by using raw surface water. Again, this would require new service inspections of all new residences and include the inspection of the dual plumbing systems that would be required and the rainwater harvesting facilities that would be needed to support the new development.

Another feature that would be required to make this scenario a reality is the use of automated metering reading. Remote reading of meters would make possible the identification of residences that were using rates and flows of water from the public system that were in excess of the indoor needs and help identify leaks earlier, as well as to identify those users that were using amounts of irrigation water outside the home.

**POTENTIAL RISKS FOR SCENARIO 2**

The points laid out above represent a significant departure from the current ways by which water is managed by retail utilities. Many of the features are not permitted in current legislation, particularly for the groundwater districts. In the same vein, cities and water districts do not currently have sufficiently strict standards to actually prohibit outdoor watering of landscapes. The potential pitfalls of this approach are as follows:

8. It would require the unanimous cooperation of a large number of governmental bodies all or nearly all with elected officials and boards.

9. If this Central Texas area enacted such rules and municipalities outside the area did not, there is a significant likelihood that development would move outside the boundaries of the controlled area.
10. Livestock would be difficult to include in the control equation. If outdoor watering is banned, would horses and other recreational livestock be banned as well?
11. A similar area of contention would be home gardens and fruit trees. This would be particularly true of rural areas, although Austin has had community garden areas set aside for a number of years, as well as having a flourishing master gardening program. Use of gray water for gardens could lead to some difficulties with buildup of solids in the soil, as well as uptake of copper from the plumbing systems in the plants if the water is not properly stabilized. If water is used from the potable water system to care for home gardens and fruit trees, would the same rules apply and would the homeowners be penalized by the rate?
12. There would need to be a significantly greater reporting requirement for commercial establishments. There are a number of successful programs for reducing usage in retail establishments, but many of these are very specific to the individual usage type. The individual percentages of residential versus commercial use will continue to have an impact on the overall per capita use.
13. There would be a significant expense incurred in monitoring and enforcing the ordinances. In addition, any ordinances enacted would be subject to court challenges, which could invalidate one or more of the necessary features needed to ensure adherence to the low water use standards.
14. Current regulations require that all water that is piped into a dwelling must be potable water. This regulation was enacted to prevent developers from building subdivisions and providing substandard water but escaping from regulation by claiming that they were not serving potable water. Individual residences could use separated plumbing and recycle gray water for toilet flushing, but apartment complexes could not. Similarly, apartment complexes that provided rainwater harvesting facilities and recycled for showers would be classified as potable water systems and would be required to have certified operators and take samples.
15. The use of gray water for toilet flushing will lead to a reduction in return flows over time. If the return flows diminish, then other strategies could have a greater effect and return less flow to the stream than previously anticipated. This interim reuse step will further concentrate dissolved solids in the wastewater being sent to the treatment plants and will be an issue that will have to be dealt with in future treatment technology.
16. Widespread rainwater harvesting will have a negative effect on the downstream run of the river rights since it will reduce the amount of runoff that reaches the river.
17. The extensive use of automated meter reading to determine what is going on in an individual home could be seen as an infringement on personal liberty and lead to significant legal challenges. In the same way, reporting of the number of persons living in a home for the purpose of determining whether or not water is being wasted would be problematic.
18. Those systems that have spent large sums in developing water supplies to serve their area of jurisdiction have been and are reluctant to share those supplies with other communities either less fortunate or less proactive. This is particularly true where there is the potential that once these supplies are provided they cannot be withdrawn in the future when the supplier entity needs that water for their own needs.

Much further work would need to be pursued with the Lower Colorado Regional Water Planning Group to further define the rules and requirements needed to implement savings at the level discussed briefly above. Limitations to this level have never been imposed on a large and diverse metropolitan area before.

The most likely scenario is that areas which decided to impose such limitations would see growth moved to areas which did not have the same limitations and the planned population growth would not occur. The focus on limitations which would have minimal impact on indoor usage is an attempt to mitigate this possibility, but it will still exist.

TABLE 1
SURPLUSES AND SHORTAGES BY WUG (FROM 2006 REGION K PLAN)

| WUG Name | County | River Basin | Supply + Contract Ext - Demand (ac-ft/yr) S2000 | S2010 | S2020 | S2030 | S2040 | S2050 | S2060 |
|---|---|---|---|---|---|---|---|---|---|
| AQUA WSC | BASTROP | COLORADO | (1,786) | (2,632) | (3,755) | (5,035) | (6,585) | (8,534) | (11,067) |
| BASTROP | BASTROP | COLORADO | (666) | (900) | (1,195) | (1,555) | (1,958) | (2,480) | (3,149) |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | 2 | (101) | (233) | (386) | (561) | (789) | (1,075) |
| COUNTY-OTHER | BASTROP | BRAZOS | 936 | 347 | 562 | 786 | 992 | 1,246 | 1,409 |
| COUNTY-OTHER | BASTROP | COLORADO | (1,291) | (2,143) | (3,297) | (4,615) | (6,144) | (8,079) | (10,502) |
| COUNTY-OTHER | BASTROP | GUADALUPE | 2,202 | 2,178 | 2,148 | 2,112 | 2,053 | 2,001 | 1,936 |
| CREEDMOOR-MAHA WSC | BASTROP | COLORADO | 554 | 545 | 534 | 522 | 510 | 495 | 477 |
| ELGIN | BASTROP | COLORADO | 585 | 467 | 302 | 118 | (90) | (357) | (702) |
| LEE COUNTY WSC | BASTROP | BRAZOS | 234 | 216 | 195 | 172 | 146 | 117 | 83 |
| LEE COUNTY WSC | BASTROP | COLORADO | 281 | 266 | 248 | 226 | 200 | 168 | 126 |
| MANVILLE WSC | BASTROP | COLORADO | 6,209 | 6,188 | 6,161 | 6,130 | 6,094 | 6,048 | 5,989 |
| POLONIA WSC | BASTROP | COLORADO | 1,923 | 1,918 | 1,910 | 1,903 | 1,897 | 1,889 | 1,878 |
| SMITHVILLE | BASTROP | COLORADO | 403 | 322 | 216 | 82 | (68) | (265) | (523) |
| **Total Municipal Water Totals** | | | **9,586** | **6,671** | **3,796** | **460** | **(3,514)** | **(8,540)** | **(15,120)** |
| BLANCO | BLANCO | GUADALUPE | 341 | 318 | 290 | 261 | 240 | 212 | 176 |
| CANYON LAKE WSC | BLANCO | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | BLANCO | COLORADO | 1,064 | 1,039 | 1,001 | 964 | 932 | 682 | 627 |
| COUNTY-OTHER | BLANCO | GUADALUPE | (44) | (122) | (169) | (192) | (210) | (233) | (263) |
| JOHNSON CITY | BLANCO | COLORADO | 599 | 567 | 527 | 490 | 458 | 420 | 375 |
| **Total Municipal Water Totals** | | | **1,960** | **1,802** | **1,649** | **1,523** | **1,420** | **1,081** | **915** |
| BERTRAM | BURNET | BRAZOS | (19) | (58) | (105) | (150) | (186) | (221) | (272) |
| BURNET | BURNET | COLORADO | 5,113 | 4,979 | 4,819 | 4,662 | 4,501 | 4,327 | 4,113 |
| CHISHOLM TRAIL SUD | BURNET | BRAZOS | (3) | (18) | (31) | (44) | (58) | (71) | (86) |
| COTTONWOOD SHORES | BURNET | COLORADO | 17 | (9) | (39) | (70) | (101) | (133) | (174) |
| COUNTY-OTHER | BURNET | BRAZOS | 993 | 904 | 794 | 687 | 581 | 468 | 340 |
| COUNTY-OTHER | BURNET | COLORADO | (18) | (266) | (581) | (915) | (1,210) | (1,560) | (1,964) |
| GRANITE SHOALS | BURNET | COLORADO | 503 | 445 | 377 | 305 | 238 | 161 | 67 |
| KEMPNER WSC | BURNET | BRAZOS | 73 | 18 | (39) | (96) | (147) | (196) | (253) |
| KINGSLAND WSC | BURNET | COLORADO | (9) | (10) | (11) | (12) | (13) | (14) | (17) |
| LAKE LBJ MUD | BURNET | COLORADO | 33 | 32 | 33 | 34 | 34 | 30 | 23 |
| MARBLE FALLS | BURNET | COLORADO | 1,384 | 1,205 | 984 | 762 | 548 | 307 | 16 |
| MEADOWLAKES | BURNET | COLORADO | (6) | (201) | (430) | (664) | (886) | (1,132) | (1,417) |
| **Total Municipal Water Totals** | | | **8,061** | **7,021** | **5,771** | **4,499** | **3,301** | **1,966** | **376** |
| COLUMBUS | COLORADO | COLORADO | 341 | 324 | 293 | 283 | 288 | 290 | 302 |
| COUNTY-OTHER | COLORADO | BRAZOS-COLORADO | 9 | 8 | 7 | 8 | 11 | 12 | 13 |

TABLE 1
SURPLUSES AND SHORTAGES BY WUG (FROM 2006 REGION K PLAN)

| | | | Supply + Contract Ext - Demand (ac-ft/yr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **S2000** | **S2010** | **S2020** | **S2030** | **S2040** | **S2050** | **S2060** |
| COUNTY-OTHER | COLORADO | COLORADO | 79 | 76 | 68 | 75 | 93 | 100 | 108 |
| COUNTY-OTHER | COLORADO | LAVACA | (100) | (105) | (109) | (106) | (97) | (93) | (90) |
| EAGLE LAKE | COLORADO | BRAZOS-COLORADO | 269 | 267 | 264 | 264 | 267 | 268 | 270 |
| EAGLE LAKE | COLORADO | COLORADO | 35 | 30 | 25 | 25 | 31 | 33 | 37 |
| WEIMAR | COLORADO | COLORADO | 1,569 | 1,567 | 1,563 | 1,563 | 1,565 | 1,567 | 1,569 |
| WEIMAR | COLORADO | LAVACA | 2,017 | 2,016 | 2,015 | 2,014 | 2,016 | 2,016 | 2,017 |
| **Total Municipal Water Totals** | | | **4,219** | **4,183** | **4,126** | **4,126** | **4,174** | **4,193** | **4,226** |
| AQUA WSC | FAYETTE | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | FAYETTE | COLORADO | (34) | (123) | (120) | (19) | 50 | 94 | 123 |
| COUNTY-OTHER | FAYETTE | GUADALUPE | 113 | 135 | 148 | 155 | 160 | 162 | 164 |
| COUNTY-OTHER | FAYETTE | LAVACA | (29) | 41 | 93 | 28 | (32) | (25) | (16) |
| FAYETTE WSC | FAYETTE | COLORADO | 448 | 111 | (236) | (507) | (719) | (976) | (1,317) |
| FAYETTE WSC | FAYETTE | LAVACA | 39 | 10 | (21) | (45) | (63) | (86) | (116) |
| FLATONIA | FAYETTE | GUADALUPE | 50 | 43 | 36 | 31 | 27 | 22 | 14 |
| FLATONIA | FAYETTE | LAVACA | (12) | (37) | (59) | (79) | (92) | (110) | (137) |
| LA GRANGE | FAYETTE | COLORADO | 1,709 | 1,549 | 1,383 | 1,248 | 1,150 | 1,029 | 856 |
| LEE COUNTY WSC | FAYETTE | COLORADO | 123 | 36 | (48) | (117) | (171) | (232) | (319) |
| SCHULENBURG | FAYETTE | LAVACA | 1,557 | 1,475 | 1,386 | 1,318 | 1,266 | 1,200 | 1,107 |
| **Total Municipal Water Totals** | | | **3,964** | **3,240** | **2,562** | **2,013** | **1,576** | **1,078** | **359** |
| COUNTY-OTHER | GILLESPIE | COLORADO | 649 | 485 | 312 | 280 | 316 | 334 | 334 |
| COUNTY-OTHER | GILLESPIE | GUADALUPE | 1,255 | 1,249 | 1,243 | 1,242 | 1,243 | 1,244 | 1,244 |
| FREDERICKSBURG | GILLESPIE | COLORADO | 1,381 | 1,040 | 683 | 571 | 599 | 613 | 613 |
| **Total Municipal Water Totals** | | | **3,285** | **2,774** | **2,238** | **2,093** | **2,158** | **2,191** | **2,191** |
| BUDA | HAYS | COLORADO | 229 | (638) | (1,514) | (1,989) | (2,474) | (3,052) | (3,526) |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | 0 | (41) | (127) | (220) | (314) | (427) | (520) |
| COUNTY-OTHER | HAYS | COLORADO | 385 | (759) | (2,072) | (3,416) | (4,784) | (6,485) | (7,823) |
| DRIPPING SPRINGS | HAYS | COLORADO | 239 | (520) | (1,296) | (1,737) | (2,185) | (2,740) | (3,176) |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | 23 | (108) | (261) | (420) | (577) | (773) | (926) |
| HILL COUNTRY WSC | HAYS | COLORADO | 783 | 0 | 0 | 0 | 0 | 0 | 0 |
| MOUNTAIN CITY | HAYS | COLORADO | 0 | 14 | 16 | 16 | 17 | 17 | 17 |
| **Total Municipal Water Totals** | | | **1,659** | **(2,052)** | **(5,254)** | **(7,766)** | **(10,317)** | **(13,460)** | **(15,954)** |
| COUNTY-OTHER | LLANO | COLORADO | 1,263 | 1,256 | 1,261 | 1,261 | 1,247 | 1,253 | 1,253 |
| KINGSLAND WSC | LLANO | COLORADO | 9 | 10 | 11 | 18 | 24 | 21 | 14 |

TABLE 1
SURPLUSES AND SHORTAGES BY WUG (FROM 2006 REGION K PLAN)

| WUG Name | County | River Basin | Supply + Contract Ext - Demand (ac-ft/yr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | S2000 | S2010 | S2020 | S2030 | S2040 | S2050 | S2060 |
| LAKE LBJ MUD | LLANO | COLORADO | 221 | 191 | 167 | 150 | 135 | 110 | 74 |
| LLANO | LLANO | COLORADO | (724) | (740) | (738) | (736) | (733) | (735) | (742) |
| SUNRISE BEACH VILLAGE | LLANO | COLORADO | 170 | 170 | 171 | 173 | 175 | 176 | 176 |
| **Total Municipal Water Totals** | | | **939** | **887** | **872** | **866** | **848** | **825** | **775** |
| BAY CITY | MATAGORDA | BRAZOS-COLORADO | 3,119 | 3,019 | 2,868 | 2,810 | 2,814 | 2,849 | 2,880 |
| COUNTY-OTHER | MATAGORDA | BRAZOS-COLORADO | 1,169 | 1,149 | 1,118 | 1,113 | 1,124 | 1,137 | 1,144 |
| COUNTY-OTHER | MATAGORDA | COLORADO | 900 | 896 | 890 | 890 | 892 | 894 | 896 |
| COUNTY-OTHER | MATAGORDA | COLORADO-LAVACA | 3,335 | 3,321 | 3,301 | 3,298 | 3,306 | 3,315 | 3,320 |
| ORBIT SYSTEMS INC | MATAGORDA | COLORADO-LAVACA | (2) | (2) | (2) | (2) | (2) | (2) | (2) |
| PALACIOS | MATAGORDA | COLORADO-LAVACA | 1,436 | 1,407 | 1,375 | 1,365 | 1,363 | 1,372 | 1,379 |
| SOUTHWEST UTILITIES | MATAGORDA | BRAZOS-COLORADO | 61 | 59 | 56 | 55 | 55 | 56 | 57 |
| **Total Municipal Water Totals** | | | **10,018** | **9,849** | **9,606** | **9,529** | **9,552** | **9,621** | **9,674** |
| BROOKSMITH SUD | MILLS | COLORADO | 1,681 | 1,681 | 1,680 | (8) | (8) | (8) | (7) |
| COUNTY-OTHER | MILLS | BRAZOS | 94 | 99 | 93 | 64 | 67 | 29 | 32 |
| COUNTY-OTHER | MILLS | COLORADO | 94 | 101 | 93 | 56 | 60 | 12 | 16 |
| GOLDTHWAITE | MILLS | BRAZOS | (6) | (6) | (6) | (6) | (6) | (5) | (5) |
| GOLDTHWAITE | MILLS | COLORADO | (360) | (351) | (364) | (362) | (360) | (352) | (345) |
| **Total Municipal Water Totals** | | | **1,503** | **1,524** | **1,496** | **(256)** | **(247)** | **(324)** | **(309)** |
| COUNTY-OTHER | SAN SABA | COLORADO | 7,845 | 7,837 | 7,824 | 7,812 | 7,800 | 7,802 | 7,799 |
| RICHLAND SUD | SAN SABA | COLORADO | 25 | 22 | 11 | 3 | (3) | (3) | (5) |
| SAN SABA | SAN SABA | COLORADO | 1,348 | 1,356 | 1,363 | 1,371 | 1,378 | 1,384 | 1,384 |
| **Total Municipal Water Totals** | | | **9,218** | **9,215** | **9,198** | **9,186** | **9,175** | **9,183** | **9,178** |
| ANDERSON MILL MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AQUA WSC | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AUSTIN | TRAVIS | COLORADO | 144,436 | 130,619 | 92,535 | 62,478 | 23,824 | (12,217) | (46,583) |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | (55) | (53) | (50) | (47) | (45) | (43) | (43) |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | (102) | (252) | (453) | (639) | (754) | (877) | (1,004) |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | 117 | 46 | (50) | (139) | (194) | (252) | (314) |
| CEDAR PARK | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | TRAVIS | COLORADO | 15,299 | 15,306 | 15,313 | 14,949 | 13,836 | 13,736 | 13,743 |
| COUNTY-OTHER | TRAVIS | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | 764 | 656 | (280) | (390) | (467) | (544) | (623) |
| CREEDMOOR-MAHA WSC | TRAVIS | GUADALUPE | 20 | 17 | (7) | (10) | (12) | (14) | (16) |
| ELGIN | TRAVIS | COLORADO | 4 | 5 | 6 | 4 | 2 | (1) | (5) |
| GOFORTH WSC | TRAVIS | COLORADO | 8 | (3) | (14) | (23) | (30) | (38) | (43) |

TABLE 1
SURPLUSES AND SHORTAGES BY WUG (FROM 2006 REGION K PLAN)

| | | | Supply + Contract Ext - Demand (ac-ft/yr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **S2000** | **S2010** | **S2020** | **S2030** | **S2040** | **S2050** | **S2060** |
| HILL COUNTRY WSC | TRAVIS | COLORADO | 543 | 0 | 0 | 0 | 0 | 0 | 0 |
| JONESTOWN | TRAVIS | COLORADO | 6 | (29) | (79) | (122) | (149) | (178) | (212) |
| JONESTOWN WSC | TRAVIS | COLORADO | 2 | (13) | (35) | (54) | (67) | (81) | (96) |
| LAGO VISTA | TRAVIS | COLORADO | 5,276 | 4,764 | 4,072 | 3,430 | 3,037 | 2,609 | 2,168 |
| LAKEWAY | TRAVIS | COLORADO | (198) | (1,074) | (2,261) | (3,341) | (4,012) | (4,744) | (5,498) |
| LAKEWAY MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LOOP 360 WSC | TRAVIS | COLORADO | 76 | (357) | (354) | (350) | (347) | (347) | (347) |
| LOST CREEK MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MANOR | TRAVIS | COLORADO | 2,075 | 2,056 | 2,029 | 325 | 310 | 292 | 273 |
| MANVILLE WSC | TRAVIS | COLORADO | 2,016 | 1,573 | 953 | (1,839) | (2,184) | (2,577) | (2,982) |
| MUSTANG RIDGE | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MUSTANG RIDGE | TRAVIS | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NORTH AUSTIN MUD #1 | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PFLUGERVILLE | TRAVIS | COLORADO | 7,978 | 7,168 | 5,012 | 3,025 | 1,826 | 491 | (882) |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | (19) | (570) | (823) | (823) | (817) | (817) | (817) |
| ROLLINGWOOD | TRAVIS | COLORADO | 740 | 743 | 744 | 746 | (372) | (371) | (373) |
| ROUND ROCK | TRAVIS | COLORADO | 79 | (158) | (339) | (528) | (669) | (813) | (957) |
| SHADY HOLLOW MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| THE HILLS | TRAVIS | COLORADO | 1,229 | 1,033 | 867 | 867 | 871 | 871 | 871 |
| TRAVIS COUNTY WCID #17 | TRAVIS | COLORADO | 7,317 | 6,498 | 5,410 | 4,388 | 3,770 | 3,083 | 2,375 |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | 712 | 547 | 325 | 122 | (4) | (135) | (283) |
| TRAVIS COUNTY WCID #19 | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TRAVIS COUNTY WCID #20 | TRAVIS | COLORADO | 731 | 673 | 675 | 678 | 679 | 680 | 680 |
| WELLS BRANCH MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| WEST LAKE HILLS | TRAVIS | COLORADO | 985 | 815 | 587 | (2,049) | (2,178) | (2,320) | (2,471) |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | 2,874 | 1,951 | 1,231 | 527 | 2 | (615) | (1,170) |
| WILLIAMSON-TRAVIS COUNTY MUD #1 | TRAVIS | COLORADO | 338 | 284 | 208 | 138 | 97 | 49 | 0 |
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | 825 | 83 | 18 | (2,201) | (2,180) | (2,180) | (2,180) |
| **Total Municipal Water Totals** | | | **194,076** | **172,328** | **125,240** | **79,122** | **33,773** | **(7,353)** | **(46,789)** |
| COUNTY-OTHER | WHARTON | BRAZOS-COLORADO | 4,554 | 4,531 | 4,496 | 4,491 | 4,509 | 4,523 | 4,537 |
| COUNTY-OTHER | WHARTON | COLORADO | 610 | 601 | 588 | 587 | 593 | 598 | 604 |
| COUNTY-OTHER | WHARTON | COLORADO-LAVACA | 34 | 29 | 22 | 21 | 25 | 27 | 30 |

TABLE 1
SURPLUSES AND SHORTAGES BY WUG (FROM 2006 REGION K PLAN)

| | | | Supply + Contract Ext - Demand (ac-ft/yr) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **S2000** | **S2010** | **S2020** | **S2030** | **S2040** | **S2050** | **S2060** |
| WHARTON | WHARTON | BRAZOS-COLORADO | 4,535 | 4,495 | 4,461 | 4,445 | 4,447 | 4,455 | 4,467 |
| WHARTON | WHARTON | COLORADO | 37 | 18 | 3 | (4) | (4) | 0 | 6 |
| **Total Municipal Water Totals** | | | **9,770** | **9,674** | **9,570** | **9,540** | **9,570** | **9,603** | **9,644** |
| ANDERSON MILL MUD | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AUSTIN | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | WILLIAMSON | BRAZOS | 310 | 314 | 318 | 322 | 323 | 323 | 323 |
| NORTH AUSTIN MUD #1 | WILLIAMSON | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Municipal Water Totals** | | | **310** | **314** | **318** | **322** | **323** | **323** | **323** |

# Potential Drought Management Strategy Amounts (ac-ft/yr)

| | | | Drought Management ( 5% Water Use Reduction) | | | | | | Drought Management ( 10% Water Use Reduction) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WUG Name** | **County** | **River Basin** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| AQUA WSC | BASTROP | COLORADO | 281 | 402 | 480 | 629 | 747 | 898 | 563 | 805 | 960 | 1,257 | 1,494 | 1,796 |
| BASTROP | BASTROP | COLORADO | 92 | 117 | 135 | 165 | 197 | 237 | 185 | 234 | 270 | 329 | 394 | 474 |
| BASTROP COUNTY WCID #2 | BASTROP | COLORADO | 17 | 24 | 31 | 40 | 51 | 66 | 34 | 47 | 63 | 80 | 103 | 132 |
| COUNTY-OTHER | BASTROP | BRAZOS | 5 | 7 | 9 | 11 | 14 | 16 | 10 | 14 | 17 | 23 | 27 | 33 |
| COUNTY-OTHER | BASTROP | COLORADO | 118 | 165 | 209 | 276 | 330 | 397 | 236 | 330 | 418 | 552 | 661 | 794 |
| COUNTY-OTHER | BASTROP | GUADALUPE | 3 | 4 | 6 | 7 | 9 | 11 | 6 | 9 | 11 | 15 | 18 | 21 |
| CREEDMOOR-MAHA WSC | BASTROP | COLORADO | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 4 | 5 | 6 |
| ELGIN | BASTROP | COLORADO | 78 | 110 | 140 | 185 | 220 | 265 | 157 | 220 | 281 | 370 | 440 | 530 |
| LEE COUNTY WSC | BASTROP | BRAZOS | 2 | 4 | 4 | 6 | 7 | 8 | 5 | 7 | 9 | 12 | 14 | 16 |
| LEE COUNTY WSC | BASTROP | COLORADO | 4 | 5 | 7 | 9 | 11 | 13 | 8 | 11 | 14 | 18 | 21 | 25 |
| MANVILLE WSC | BASTROP | COLORADO | 3 | 5 | 6 | 8 | 10 | 13 | 7 | 9 | 13 | 16 | 21 | 27 |
| POLONIA WSC | BASTROP | COLORADO | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 4 | 5 | 6 |
| SMITHVILLE | BASTROP | COLORADO | 44 | 62 | 78 | 101 | 120 | 144 | 88 | 123 | 155 | 202 | 240 | 288 |
| **Total Municipal Water Totals** | | | **664** | **931** | **1,148** | **1,502** | **1,793** | **2,160** | **1,328** | **1,862** | **2,296** | **3,004** | **3,586** | **4,321** |
| BLANCO | BLANCO | GUADALUPE | 20 | 23 | 26 | 29 | 31 | 34 | 41 | 45 | 52 | 58 | 63 | 69 |
| CANYON LAKE WSC | BLANCO | GUADALUPE | 9 | 13 | 17 | 20 | 23 | 27 | 19 | 26 | 33 | 40 | 47 | 55 |
| COUNTY-OTHER | BLANCO | COLORADO | 15 | 16 | 17 | 18 | 20 | 22 | 30 | 32 | 35 | 37 | 40 | 44 |
| COUNTY-OTHER | BLANCO | GUADALUPE | 8 | 9 | 9 | 10 | 11 | 12 | 16 | 17 | 19 | 20 | 22 | 24 |
| JOHNSON CITY | BLANCO | COLORADO | 19 | 22 | 25 | 28 | 30 | 33 | 38 | 45 | 50 | 55 | 60 | 66 |
| **Total Municipal Water Totals** | | | **73** | **86** | **97** | **107** | **118** | **131** | **147** | **171** | **195** | **214** | **236** | **263** |
| BERTRAM | BURNET | BRAZOS | 13 | 15 | 18 | 22 | 24 | 26 | 26 | 31 | 37 | 44 | 48 | 52 |
| BURNET | BURNET | COLORADO | 56 | 71 | 87 | 103 | 112 | 123 | 111 | 142 | 174 | 206 | 225 | 246 |
| CHISHOLM TRAIL SUD | BURNET | BRAZOS | 1 | 2 | 3 | 3 | 4 | 5 | 3 | 4 | 5 | 7 | 8 | 9 |
| COTTONWOOD SHORES | BURNET | COLORADO | 8 | 17 | 26 | 37 | 49 | 63 | 16 | 34 | 52 | 74 | 98 | 127 |
| COUNTY-OTHER | BURNET | BRAZOS | 25 | 31 | 38 | 45 | 49 | 52 | 50 | 61 | 76 | 91 | 98 | 103 |
| COUNTY-OTHER | BURNET | COLORADO | 78 | 96 | 120 | 143 | 154 | 163 | 157 | 192 | 240 | 287 | 308 | 325 |
| GRANITE SHOALS | BURNET | COLORADO | 21 | 27 | 33 | 39 | 42 | 46 | 42 | 54 | 66 | 78 | 84 | 95 |
| KEMPNER WSC | BURNET | BRAZOS | 14 | 16 | 18 | 19 | 20 | 21 | 27 | 32 | 36 | 38 | 40 | 42 |
| KINGSLAND WSC | BURNET | COLORADO | 3 | 3 | 4 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 10 |
| LAKE LBJ MUD | BURNET | COLORADO | 11 | 13 | 15 | 16 | 18 | 20 | 23 | 26 | 29 | 32 | 36 | 40 |
| MARBLE FALLS | BURNET | COLORADO | 115 | 135 | 153 | 165 | 164 | 162 | 230 | 270 | 306 | 330 | 328 | 325 |
| MEADOWLAKES | BURNET | COLORADO | 40 | 47 | 53 | 58 | 57 | 57 | 80 | 94 | 107 | 115 | 114 | 113 |
| **Total Municipal Water Totals** | | | **450** | **572** | **708** | **843** | **931** | **1,028** | **899** | **1,144** | **1,417** | **1,687** | **1,863** | **2,055** |
| COLUMBUS | COLORADO | COLORADO | 51 | 55 | 56 | 56 | 58 | 60 | 103 | 110 | 113 | 111 | 115 | 121 |
| COUNTY-OTHER | COLORADO | BRAZOS-COLORADO | 6 | 6 | 6 | 6 | 6 | 5 | 11 | 12 | 11 | 11 | 11 | 11 |
| COUNTY-OTHER | COLORADO | COLORADO | 36 | 37 | 36 | 35 | 35 | 35 | 72 | 73 | 73 | 71 | 70 | 69 |
| COUNTY-OTHER | COLORADO | LAVACA | 18 | 18 | 18 | 17 | 17 | 17 | 36 | 36 | 36 | 35 | 34 | 34 |
| EAGLE LAKE | COLORADO | BRAZOS-COLORADO | 9 | 9 | 9 | 9 | 9 | 10 | 17 | 18 | 19 | 18 | 19 | 20 |
| EAGLE LAKE | COLORADO | COLORADO | 20 | 21 | 21 | 21 | 22 | 23 | 40 | 42 | 43 | 42 | 43 | 45 |
| WEIMAR | COLORADO | COLORADO | 13 | 13 | 14 | 13 | 14 | 14 | 25 | 27 | 27 | 27 | 28 | 29 |
| WEIMAR | COLORADO | LAVACA | 6 | 6 | 6 | 6 | 6 | 6 | 11 | 12 | 12 | 12 | 12 | 13 |
| **Total Municipal Water Totals** | | | **158** | **165** | **166** | **163** | **166** | **170** | **316** | **329** | **333** | **326** | **332** | **341** |
| AQUA WSC | FAYETTE | COLORADO | 5 | 6 | 7 | 8 | 8 | 10 | 9 | 12 | 14 | 15 | 17 | 19 |
| COUNTY-OTHER | FAYETTE | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COUNTY-OTHER | FAYETTE | COLORADO | 23 | 15 | 10 | 7 | 5 | 3 | 46 | 31 | 21 | 14 | 9 | 6 |
| COUNTY-OTHER | FAYETTE | GUADALUPE | 2 | 1 | 1 | 0 | 0 | 0 | 3 | 2 | 1 | 1 | 0 | 0 |
| COUNTY-OTHER | FAYETTE | LAVACA | 9 | 6 | 3 | 2 | 1 | 1 | 19 | 11 | 7 | 4 | 3 | 2 |

# Potential Drought Management Strategy Amounts (ac-ft/yr)

| WUG Name | County | River Basin | Drought Management ( 5% Water Use Reduction) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 | Drought Management ( 10% Water Use Reduction) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FAYETTE WSC | FAYETTE | COLORADO | 42 | 60 | 73 | 84 | 97 | 114 | 85 | 119 | 146 | 168 | 193 | 227 |
| FAYETTE WSC | FAYETTE | LAVACA | 4 | 5 | 6 | 7 | 9 | 10 | 7 | 11 | 13 | 15 | 17 | 20 |
| FLATONIA | FAYETTE | GUADALUPE | 4 | 4 | 4 | 5 | 5 | 5 | 8 | 8 | 9 | 9 | 10 | 11 |
| FLATONIA | FAYETTE | LAVACA | 13 | 14 | 15 | 16 | 17 | 18 | 26 | 29 | 31 | 32 | 34 | 36 |
| LA GRANGE | FAYETTE | COLORADO | 48 | 56 | 63 | 68 | 74 | 83 | 96 | 113 | 126 | 136 | 148 | 166 |
| LEE COUNTY WSC | FAYETTE | COLORADO | 13 | 17 | 20 | 23 | 26 | 30 | 25 | 34 | 41 | 46 | 52 | 61 |
| SCHULENBURG | FAYETTE | LAVACA | 30 | 31 | 32 | 35 | 38 | 41 | 60 | 63 | 64 | 69 | 75 | 83 |
| **Total Municipal Water Totals** | | | **195** | **221** | **244** | **262** | **288** | **325** | **389** | **442** | **488** | **524** | **575** | **650** |
| COUNTY-OTHER | GILLESPIE | COLORADO | 79 | 88 | 89 | 88 | 87 | 87 | 158 | 175 | 179 | 175 | 173 | 173 |
| COUNTY-OTHER | GILLESPIE | GUADALUPE | 3 | 3 | 3 | 3 | 3 | 3 | 6 | 6 | 6 | 6 | 6 | 6 |
| FREDERICKSBURG | GILLESPIE | COLORADO | 156 | 179 | 190 | 188 | 187 | 187 | 311 | 358 | 380 | 377 | 375 | 375 |
| **Total Municipal Water Totals** | | | **237** | **270** | **282** | **279** | **277** | **277** | **475** | **540** | **565** | **558** | **554** | **554** |
| BUDA | HAYS | COLORADO | 73 | 106 | 130 | 154 | 183 | 207 | 145 | 213 | 260 | 309 | 367 | 414 |
| CIMARRON PARK WATER COMPANY | HAYS | COLORADO | 19 | 24 | 28 | 33 | 39 | 44 | 38 | 47 | 57 | 67 | 78 | 88 |
| COUNTY-OTHER | HAYS | COLORADO | 168 | 243 | 310 | 379 | 464 | 531 | 336 | 486 | 621 | 758 | 928 | 1,062 |
| DRIPPING SPRINGS | HAYS | COLORADO | 50 | 79 | 91 | 110 | 132 | 149 | 100 | 158 | 183 | 220 | 264 | 299 |
| DRIPPING SPRINGS WSC | HAYS | COLORADO | 17 | 25 | 33 | 41 | 51 | 58 | 35 | 50 | 66 | 82 | 101 | 117 |
| HILL COUNTRY WSC | HAYS | COLORADO | 22 | 35 | 49 | 62 | 79 | 92 | 44 | 70 | 98 | 125 | 158 | 184 |
| MOUNTAIN CITY | HAYS | COLORADO | 6 | 6 | 6 | 6 | 6 | 6 | 12 | 12 | 12 | 12 | 12 | 12 |
| **Total Municipal Water Totals** | | | **360** | **533** | **672** | **813** | **987** | **1,125** | **720** | **1,066** | **1,345** | **1,627** | **1,974** | **2,250** |
| COUNTY-OTHER | LLANO | COLORADO | 56 | 55 | 51 | 52 | 53 | 54 | 112 | 109 | 102 | 104 | 106 | 108 |
| KINGSLAND WSC | LLANO | COLORADO | 34 | 37 | 37 | 36 | 37 | 38 | 69 | 73 | 73 | 73 | 74 | 75 |
| LAKE LBJ MUD | LLANO | COLORADO | 77 | 75 | 69 | 64 | 59 | 55 | 153 | 150 | 138 | 127 | 117 | 110 |
| LLANO | LLANO | COLORADO | 54 | 53 | 49 | 45 | 41 | 38 | 108 | 105 | 97 | 90 | 83 | 76 |
| SUNRISE BEACH VILLAGE | LLANO | COLORADO | 10 | 11 | 11 | 11 | 11 | 11 | 20 | 22 | 22 | 22 | 22 | 23 |
| **Total Municipal Water Totals** | | | **286** | **312** | **322** | **332** | **344** | **357** | **572** | **624** | **645** | **665** | **688** | **714** |
| BAY CITY | MATAGORDA | BRAZOS-COLORADO | 162 | 169 | 172 | 172 | 171 | 171 | 324 | 339 | 345 | 344 | 342 | 342 |
| COUNTY-OTHER | MATAGORDA | BRAZOS-COLORADO | 39 | 41 | 41 | 40 | 40 | 40 | 79 | 82 | 82 | 81 | 80 | 80 |
| COUNTY-OTHER | MATAGORDA | COLORADO | 8 | 8 | 8 | 8 | 8 | 8 | 16 | 16 | 16 | 16 | 16 | 16 |
| COUNTY-OTHER | MATAGORDA | COLORADO-LAVACA | 29 | 30 | 30 | 30 | 29 | 29 | 58 | 60 | 60 | 60 | 59 | 59 |
| ORBIT SYSTEMS INC | MATAGORDA | COLORADO-LAVACA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PALACIOS | MATAGORDA | COLORADO-LAVACA | 37 | 39 | 39 | 39 | 39 | 39 | 75 | 78 | 79 | 79 | 78 | 78 |
| SOUTHWEST UTILITIES | MATAGORDA | BRAZOS-COLORADO | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 9 | 9 | 8 | 8 |
| **Total Municipal Water Totals** | | | **280** | **292** | **295** | **294** | **292** | **292** | **559** | **583** | **591** | **588** | **583** | **583** |
| BROOKSMITH SUD | MILLS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| COUNTY-OTHER | MILLS | BRAZOS | 9 | 9 | 9 | 9 | 9 | 10 | 18 | 18 | 19 | 17 | 19 | 20 |
| COUNTY-OTHER | MILLS | COLORADO | 13 | 13 | 14 | 13 | 14 | 14 | 26 | 26 | 27 | 25 | 27 | 29 |
| GOLDTHWAITE | MILLS | BRAZOS | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| GOLDTHWAITE | MILLS | COLORADO | 26 | 26 | 24 | 21 | 19 | 18 | 51 | 51 | 48 | 43 | 39 | 35 |
| **Total Municipal Water Totals** | | | **51** | **54** | **55** | **53** | **54** | **55** | **101** | **107** | **109** | **105** | **109** | **110** |
| COUNTY-OTHER | SAN SABA | COLORADO | 11 | 12 | 13 | 13 | 13 | 13 | 23 | 24 | 25 | 26 | 26 | 27 |
| RICHLAND SUD | SAN SABA | COLORADO | 9 | 9 | 9 | 10 | 10 | 10 | 18 | 18 | 19 | 20 | 20 | 20 |

# Potential Drought Management Strategy Amounts (ac-ft/yr)

| | | | Drought Management ( 5% Water Use Reduction) | | | | | | Drought Management ( 10% Water Use Reduction) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WUG Name | County | River Basin | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
| SAN SABA | SAN SABA | COLORADO | 44 | 44 | 43 | 43 | 43 | 43 | 88 | 88 | 87 | 86 | 86 | 86 |
| **Total Municipal Water Totals** | | | **65** | **66** | **66** | **67** | **67** | **67** | **130** | **132** | **133** | **134** | **133** | **134** |
| ANDERSON MILL MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AQUA WSC | TRAVIS | COLORADO | 71 | 82 | 91 | 97 | 103 | 111 | 142 | 163 | 182 | 194 | 207 | 221 |
| AUSTIN | TRAVIS | COLORADO | 6,830 | 7,441 | 8,631 | 9,866 | 11,168 | 12,137 | 13,660 | 14,881 | 17,262 | 19,731 | 22,336 | 24,273 |
| BARTON CREEK WEST WSC | TRAVIS | COLORADO | 18 | 17 | 15 | 14 | 12 | 11 | 36 | 33 | 30 | 27 | 24 | 23 |
| BEE CAVE VILLAGE | TRAVIS | COLORADO | 54 | 58 | 62 | 63 | 62 | 60 | 107 | 117 | 123 | 126 | 123 | 120 |
| BRIARCLIFF VILLAGE | TRAVIS | COLORADO | 12 | 13 | 14 | 16 | 17 | 19 | 24 | 26 | 28 | 32 | 35 | 37 |
| CEDAR PARK | TRAVIS | COLORADO | 9 | 15 | 19 | 22 | 25 | 29 | 19 | 29 | 38 | 44 | 51 | 57 |
| COUNTY-OTHER | TRAVIS | COLORADO | 263 | 247 | 177 | 132 | 115 | 120 | 526 | 494 | 354 | 264 | 231 | 239 |
| COUNTY-OTHER | TRAVIS | GUADALUPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CREEDMOOR-MAHA WSC | TRAVIS | COLORADO | 31 | 36 | 41 | 44 | 48 | 52 | 61 | 72 | 82 | 88 | 95 | 103 |
| CREEDMOOR-MAHA WSC | TRAVIS | GUADALUPE | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 |
| ELGIN | TRAVIS | COLORADO | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 |
| GOFORTH WSC | TRAVIS | COLORADO | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 5 | 5 | 6 | 6 |
| HILL COUNTRY WSC | TRAVIS | COLORADO | 12 | 18 | 24 | 28 | 32 | 36 | 24 | 36 | 48 | 56 | 63 | 71 |
| JONESTOWN | TRAVIS | COLORADO | 23 | 27 | 31 | 35 | 38 | 40 | 47 | 55 | 63 | 70 | 75 | 81 |
| JONESTOWN WSC | TRAVIS | COLORADO | 6 | 7 | 8 | 9 | 10 | 10 | 12 | 15 | 16 | 18 | 19 | 21 |
| LAGO VISTA | TRAVIS | COLORADO | 113 | 135 | 157 | 177 | 192 | 206 | 226 | 270 | 314 | 354 | 383 | 412 |
| LAKEWAY | TRAVIS | COLORADO | 218 | 237 | 250 | 256 | 250 | 244 | 435 | 474 | 500 | 511 | 501 | 488 |
| LAKEWAY MUD | TRAVIS | COLORADO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LOOP 360 WSC | TRAVIS | COLORADO | 61 | 61 | 61 | 61 | 61 | 61 | 123 | 123 | 122 | 122 | 122 | 122 |
| LOST CREEK MUD | TRAVIS | COLORADO | 47 | 46 | 45 | 45 | 44 | 44 | 94 | 92 | 91 | 89 | 88 | 88 |
| MANOR | TRAVIS | COLORADO | 63 | 68 | 72 | 78 | 85 | 91 | 125 | 137 | 144 | 156 | 169 | 182 |
| MANVILLE WSC | TRAVIS | COLORADO | 87 | 118 | 145 | 162 | 181 | 201 | 173 | 235 | 290 | 324 | 362 | 402 |
| MUSTANG RIDGE | TRAVIS | COLORADO | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 11 | 13 | 14 | 15 | 16 |
| MUSTANG RIDGE | TRAVIS | GUADALUPE | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 |
| NORTH AUSTIN MUD #1 | TRAVIS | COLORADO | 5 | 5 | 5 | 5 | 5 | 5 | 11 | 11 | 11 | 10 | 10 | 10 |
| NORTH TRAVIS COUNTY MUD #5 | TRAVIS | COLORADO | 26 | 40 | 52 | 60 | 68 | 77 | 51 | 79 | 105 | 120 | 137 | 154 |
| PFLUGERVILLE | TRAVIS | COLORADO | 318 | 373 | 435 | 491 | 532 | 573 | 636 | 746 | 870 | 982 | 1,064 | 1,146 |
| RIVER PLACE ON LAKE AUSTIN | TRAVIS | COLORADO | 67 | 71 | 65 | 58 | 53 | 48 | 134 | 143 | 129 | 117 | 106 | 96 |
| ROLLINGWOOD | TRAVIS | COLORADO | 17 | 16 | 14 | 13 | 12 | 12 | 35 | 32 | 29 | 26 | 24 | 23 |
| ROUND ROCK | TRAVIS | COLORADO | 18 | 26 | 31 | 33 | 38 | 43 | 37 | 51 | 61 | 67 | 76 | 86 |
| SAN LEANNA | TRAVIS | COLORADO | 5 | 6 | 7 | 8 | 9 | 9 | 10 | 12 | 14 | 16 | 17 | 18 |
| SHADY HOLLOW MUD | TRAVIS | COLORADO | 37 | 37 | 36 | 35 | 35 | 35 | 75 | 73 | 72 | 70 | 69 | 69 |
| THE HILLS | TRAVIS | COLORADO | 28 | 37 | 37 | 36 | 36 | 36 | 57 | 73 | 73 | 73 | 73 | 73 |
| TRAVIS COUNTY WCID #17 | TRAVIS | COLORADO | 236 | 288 | 317 | 350 | 367 | 389 | 471 | 575 | 633 | 699 | 734 | 778 |
| TRAVIS COUNTY WCID #18 | TRAVIS | COLORADO | 43 | 54 | 64 | 70 | 77 | 84 | 85 | 108 | 128 | 140 | 154 | 168 |
| TRAVIS COUNTY WCID #19 | TRAVIS | COLORADO | 19 | 19 | 19 | 19 | 19 | 19 | 38 | 37 | 37 | 37 | 37 | 37 |
| TRAVIS COUNTY WCID #20 | TRAVIS | COLORADO | 23 | 23 | 23 | 23 | 23 | 23 | 46 | 46 | 46 | 46 | 46 | 46 |
| WELLS BRANCH MUD | TRAVIS | COLORADO | 75 | 75 | 74 | 72 | 72 | 72 | 151 | 149 | 147 | 144 | 144 | 144 |
| WEST LAKE HILLS | TRAVIS | COLORADO | 73 | 77 | 78 | 75 | 73 | 70 | 147 | 153 | 155 | 150 | 145 | 140 |
| WEST TRAVIS COUNTY REGIONAL WS | TRAVIS | COLORADO | 38 | 55 | 71 | 80 | 91 | 101 | 77 | 111 | 142 | 161 | 181 | 202 |
| WILLIAMSON-TRAVIS COUNTY MUD #1 | TRAVIS | COLORADO | 10 | 14 | 17 | 19 | 22 | 24 | 20 | 27 | 34 | 39 | 43 | 48 |

## Potential Drought Management Strategy Amounts (ac-ft/yr)

| WUG Name | County | River Basin | Drought Management ( 5% Water Use Reduction) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 | Drought Management ( 10% Water Use Reduction) 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WINDERMERE UTILITY COMPANY | TRAVIS | COLORADO | 108 | 111 | 110 | 109 | 109 | 109 | 216 | 222 | 220 | 218 | 218 | 218 |
| **Total Municipal Water Totals** | | | **9,984** | **11,851** | **13,731** | **15,411** | **17,143** | **18,486** | **19,968** | **23,701** | **27,461** | **30,823** | **34,287** | **36,972** |
| COUNTY-OTHER | WHARTON | BRAZOS-COLORADO | 58 | 60 | 60 | 59 | 59 | 58 | 116 | 119 | 120 | 118 | 117 | 116 |
| COUNTY-OTHER | WHARTON | COLORADO | 22 | 23 | 23 | 22 | 22 | 22 | 44 | 45 | 45 | 45 | 44 | 44 |
| COUNTY-OTHER | WHARTON | COLORADO-LAVACA | 12 | 12 | 12 | 12 | 12 | 12 | 24 | 24 | 24 | 24 | 24 | 23 |
| EAST BERNARD | WHARTON | BRAZOS-COLORADO | 14 | 14 | 14 | 14 | 14 | 14 | 28 | 29 | 29 | 28 | 28 | 28 |
| WHARTON | WHARTON | BRAZOS-COLORADO | 57 | 59 | 60 | 59 | 59 | 58 | 114 | 118 | 119 | 119 | 118 | 117 |
| WHARTON | WHARTON | COLORADO | 24 | 25 | 26 | 27 | 27 | 27 | 48 | 51 | 53 | 54 | 54 | 53 |
| **Total Municipal Water Totals** | | | **189** | **194** | **196** | **194** | **192** | **190** | **378** | **388** | **391** | **388** | **385** | **381** |
| ANDERSON MILL MUD | WILLIAMSON | BRAZOS | | | | | | | | | | | | |
| AUSTIN | WILLIAMSON | BRAZOS | 273 | 370 | 485 | 608 | 742 | 885 | 546 | 740 | 969 | 1,216 | 1,483 | 1,769 |
| COUNTY-OTHER | WILLIAMSON | BRAZOS | 120 | 136 | 156 | 177 | 199 | 223 | 240 | 273 | 312 | 354 | 399 | 447 |
| NORTH AUSTIN MUD #1 | WILLIAMSON | BRAZOS | 49 | 48 | 48 | 46 | 46 | 46 | 98 | 97 | 95 | 93 | 92 | 92 |
| **Total Municipal Water Totals** | | | 442 | 555 | 688 | 831 | 987 | 1,154 | 562 | 695 | 839 | 995 | 1,161 | 7 |
| **REGION K TOTALS** | | | **12,375** | **13,978** | **15,917** | **17,991** | **20,091** | **21,950** | **24,757** | **27,951** | **31,844** | **35,992** | **40,178** | **43,905** |

Only strategy needed to take care of shortage

# DRY YEAR OPTION ANALYSIS

## INTRODUCTION

The Dry Year Option Analysis had its beginnings in the last planning round and was carried over into this planning round because funds were not available to analyze the impacts of such a management strategy at that time. This strategy is an outgrowth of concern on the part of the rice growers in the lower basin about priorities for surface water use. It was not the intention of the rice growers to try to suggest more ways to divert water from agricultural to municipal uses, but rather a way to try to find some means of compensation if water was going to be diverted to other uses anyway.

## BACKGROUND

Current methods of culturing rice in the lower three counties of the Region, Colorado, Matagorda, and Wharton (partial) include the growth of a first crop of rice that involves complete preparation of the land, seeding of the rice, and flooding of the fields for weed control. Fields are kept flooded throughout the growing season, and then drained in time for them to dry out prior to harvest. A percentage of the farmers who grow a first crop also grow a second crop from the stubble of the first crop. This second, or ratoon, crop does not involve the expense of seedbed preparation or seed so there are fewer expenses. At the same time, however, the yield is also less per acre than the first crop yield. This second crop requires additional water during what is historically one of the driest times of the year. The purpose of this analysis is to determine whether or not water could be made available for other uses if farmers were paid a payment that would induce them not to grow a second crop of rice so that water could be made available for other uses.

## DATA COLLECTION

Some of the data that was instrumental in determining the potential availability of water under a Dry Year Option was collected as a part of the process for determining the water demands of the rice industry. Meetings were held with rice growing interests in each of the counties, as well as a joint meeting with rice growing interests in Region H to the east and Region P to the west. The meetings with Region P were especially important considering that Wharton County is split between the two regions, with Region K using predominantly surface water and Region P using predominantly groundwater for irrigation of rice. Regional Water Planning Group (RWPG) members representing agriculture and small business with ties to the rice industry were asked to provide lists of contacts in their counties who would be information resources in determining the current practices for their areas. These individuals were contacted and asked to participate in a meeting to discuss rice irrigation habits and customs related to water usage. The groups included local rice farmers, county agricultural extension agents, local officials, and others as needed.

In each case the meetings noted above gathered together individuals who were familiar with the county and with the farmers operating in that county, to the extent of knowing who farmed what property and how many acres were farmed in many cases. *Table 1* was the product of those discussions. Individual discussions were held for each of the three counties. As a result of these discussions, the RWPGs were presented information on a variety of ways to determine the proposed revisions to the irrigation demands in their respective areas. Region P chose to use the spreadsheet as shown while Region K elected to use values derived from Texas Water Development Board (TWDB) data from 1995 forward on acreages irrigated. The primary reason for the difference in selected methodologies is the fact that Region K uses predominantly surface water, the vast majority of which is supplied by Lower Colorado Regional

Authority (LCRA) through its canal systems. As a result, Region K had better information on acres planted already represented in the TWDB numbers. Region P, on the other hand, relies more heavily on groundwater and the planning group felt that their demands were underrepresented in the TWDB data. As *Table 1* shows, the local representatives established the numbers of acres planted, broken down by surface water or groundwater for irrigation. They agreed on the amount of water diverted for a first crop of rice, the estimated losses in delivering that water to the rice fields, and the estimated on-farm usage. The anticipated return flow from the rice fields to the drainage basin was developed in a later task. The next piece of information that was assembled was the percent of first crop acreage that was second cropped, as well as the water usage per acre for the second cropping operations. This data formed the initial estimate of the amount of water that could potentially be available in the Dry Year Option.

Members of the RWPG with knowledge and information on economics in the rice industry were queried by telephone and during RWPG meetings concerning the financial incentive that would be needed to cause the second crop farmers to forego the second crop entirely. These discussions were held later in the planning process because of the timing of the funding of the supplemental projects. The consensus of the three individuals queried was that payments of between $20 and $50 per acre would be sufficient to induce farmers to forego the second crop and make that water available for other uses. The data in *Table 1* was then used to determine the number of acre-feet of water that would have been used per acre and the cost of the buyout was spread out over that number of acre-feet. In addition, it was assumed that the water to be sold would be sold at the firm yield system price of $105 per acre-foot. This information was then used to determine the cost per acre-foot of the strategy by county. The variations in cost are due to the variation in the amount of water used per acre in each of the three lower counties.

Once the initial amounts of water to be potentially available were established, members of the consultant team met with LCRA staff and Bob Brandes with RJB Company to discuss the issue of how much of the second crop water was going to still be potentially available after other conservation measures were implemented. The LCRA-SAWS Water Project (LSWP) 2004 Project Viability Assessment (PVA) was used to come up with the anticipated implementation rate of the new rice variety. The new rice variety development is anticipated to provide a variety that will produce a higher yield but that yield will be produced over a longer growing season. As a result, farmers will not have enough time to plant a ratoon crop and most of the water from the second crop culture could be saved. The longer growing season for the first crop rice does increase the water use for the first crop by approximately 8 to 10 percent.

The 2004 PVA shows anticipated rates of conversion to the new rice variety by planted rice acreage. The most optimistic projection is that 100 percent of the rice crop areas convert to the new variety. The average adoption rate is anticipated to be 75 percent, and the pessimistic adoption rate is anticipated to be 50 percent. *Table 2* below contains estimated water available and estimated cost for this strategy based on the degree of conversion to the new rice variety.

**Table 2 Supply Quantity and Costs**

| County | Percent Conversion to New Rice Variety* | | | |
|---|---|---|---|---|
| | 100% | 75% | 50% | 0% |
| | ac-ft/yr | ac-ft/yr | ac-ft/yr | ac-ft/yr |
| Colorado | 0 | 13,718 | 27,436 | 54,878 |
| Matagorda | 0 | 7,269 | 14,538 | 27,077 |
| Eastern Wharton | 0 | 7,619 | 15,237 | 30,475 |

* See explanation in Issues and Considerations Section.

| County | 2nd Crop Usage ac-ft/yr | Payment $/acre | LCRA Water Cost $/ac-ft | Strategy Cost $/ac-ft* |
|---|---|---|---|---|
| Colorado | 2.47 | $50 | $115 | $135 |
| Matagorda | 2.77 | $50 | $115 | $133 |
| Eastern Wharton | 1.94 | $50 | $115 | $141 |

* Costs calculated based on the estimated usage per acre including conveyance losses, $115 per acre-foot for LCRA system water, and $50 per acre payment.

The discussions with LCRA staff and Bob Brandes determined that the modeling that was done in determining the availability of system yield water for the Lower Colorado River Basin under the LCRA management plan assumed that the conversion to the new rice variety was 100 percent. If that were the case, then no water would be available as a Dry Year Option strategy.

A key feature of the Dry Year Option is that it would not unduly cripple the rice industry, along with its supporting infrastructure. Many other facets of the agricultural economy, including the rice mills, railroads, and trucking industry rely upon the rice harvest for support. By diverting only the second crop portion, the supporting industry would still have the main crop to provide employment and cash flow from.

A second feature that could be of considerable interest is the ability of this strategy to provide environmental water during times of low flows in the river. Use of this water for environmental flow needs, including both instream flows and bay and estuary needs would not require the modification of any permits or adjustment to the amounts diverted. If sufficient funds were available to pay the cost of the per acre payments to the farmers plus the cost of the water from the LCRA, then the flows could be released during the driest period of time from August through September and still be within the normal flow times for agricultural demands. In addition, if the water were termed interruptible water by LCRA, the cost would be significantly less than the amount calculated in the table.

Water could be made available through this strategy by providing an opportunity for the rice industry to provide bids to LCRA for water purchase. LCRA could then solicit users to determine whether or not there was interest in the amounts available and the timing of those amounts. Farmers would have to demonstrate a consistent record of growing a second crop, with proof of growth for the past three years being a potential benchmark. Once a bid is accepted, then the potential user would negotiate with LCRA for release of the water and any potential issues related to the relocation of the diversion point.

It was noted during discussions at one or more Region K planning group meetings that LCRA has no plans and no mechanism to begin a strategy to purchase water under a Dry Year Option. This strategy is being reviewed for informational purposes only; there is no obligation on the part of LCRA to implement any purchases until and unless there is a clear expression of interest on the part of a potential buyer of this water, and there is no other water available under the current management plan.

**ISSUES AND CONSIDERATIONS**

The strategy above provides benefits to the agricultural community as noted through keeping some amount of business for the ancillary industries with the first crop growth. It provides potential benefits to the environmental community as a source of water to augment both instream and bay and estuary flows when the conditions warrant, if funds can be accumulated to make the necessary payments and if the rainfall conditions can be accurately predicted in the winter for the following summer. The reservation for the water would have to occur early in the spring in order for the farmers to properly schedule those times where ratoon crops would not be grown. This water could be long-term water that could be reserved only for those times when environmental flows are the most critical without the cost of trying to acquire rights.

It is noted that the some of the firm yield LCRA irrigation rights are being converted to municipal and manufacturing uses. Agricultural needs will be met with water from the LCRA management plan yield, and this water will include interruptible supplies. This water would still potentially benefit the environment if it was purchased for that purpose, but it would have limited effect upon users relying on firm yield water.

Another issue that can potentially reduce the amount of water available for this strategy is the inclusion of canal losses. The numbers used for the calculation above include an amount of canal losses, and represent total water diverted to the farmers for the second crop. Another facet of the LSWP is the reconstruction of the canal delivery system to reduce losses in the delivery process. These improvements will reduce the amount of water diverted per acre for the second crop and reduce the total amount of water available for redirection. The price will vary somewhat as the $50 payment per acre will be averaged over fewer acre-feet to determine the total cost per acre-foot.

The uncertainties noted above make this strategy unlikely to be implemented, unless drought of record conditions occur in the very near future. It is more likely that this potential strategy will be looked at in greater detail once the improved rice varieties being anticipated are developed and tested. If the new rice varieties have sufficient appeal to see widespread adoption, then no water will be available under this strategy.

Another consideration that would have to be accounted for is the entry into the pool of available water sellers. As a minimum, it is recommended that farmers have a past history of growing a second crop for 3 of the last 4 years. Otherwise, there would likely be a number of farmers wanting to sign up for the payments and no real ability to decide how much water would be saved. There would then be the difficulty of determining whether a year signed up not planting a second crop would constitute a year of not planting and potentially take that farmer out of the available pool for the following year. The difficulty in administering such a program makes it a less likely candidate for implementation. It could work reasonably well for one year, but in a prolonged drought, it would be difficult to manage over multiple years.

**QUANTITATIVE ENVIRONMENTAL IMPACT ANALYSIS**

The strategy noted may have differing environmental impacts based on the assumption of the percent of growers that convert to the new rice variety. If 100 percent conversion to the new rice variety is assumed, then the environmental impact will be a delay in the release of return flows from the first crop water by the length of the addition to the growing season. Instream flows in the river may be reduced, depending upon whether or not any of the second crop water would have been released from storage upstream.

If water is bid for and purchased by environmental groups, and is available for use, then the instream and bay an estuary flows could benefit by whatever amount is purchased, up to and including the amounts shown in *Table 2* for the various new rice variety adoption assumptions.

As an example, currently the water being released as tail water is released two times during the harvest season. The first release is after the completion of the growing season of the first crop, and the second release is after the completion of the growing season of the second crop. The second release normally occurs sometime in October. The release is estimated at approximately 2 to 3 inches per acre for the entire acreage being second cropped for rice. Using the spreadsheet numbers, the number of acres using surface water for a second rice crop is 22,418 acres for Colorado County, 9,775 acres for Matagorda County, and 15,709 acres for eastern Wharton County. At a per acre amount of 2 to 3 inches of flood that is released as return flows, the amount of water that will not be released to the drainage area from the second crop is 3,736 to 5,604 acre-feet in Colorado County, 1,629 to 2,444 acre-feet in Matagorda County, and 2,618 to 3,927 acre-feet in Wharton County. It is noted however, that if the new rice variety sees a 100 percent implementation, these return flows will be eliminated in that event also. These return flows currently take place generally in the month of October.

In addition to the impacts noted above, the three counties and their rice growing areas are important to migratory waterfowl. The waterfowl come to feed on the fields and pick up rice that was left at the harvest. The change in timing of the last flooding of the rice fields may have an impact on these migratory birds, but there is not sufficient data at this point to estimate what those impacts might be. This is called out as a need for additional investigation in the next plan update.

**IMPACT ON AGRICULTURAL RESOURCES**

As noted above, the impact of reducing production of the second crop has the impact of reducing the length of time over which jobs are maintained in the area. With the second crop culture, more essentially the same amount of rice is produced, but it impacts the milling and trucking and other ancillary businesses over a longer period of time. Production of the same amount of rice in a single crop will create more competition for those resources, but the harvest will be over more quickly. The overall impact is to conserve the milling and ancillary businesses by continuing to have first crop rice production as opposed to paying farmers not to plant at all, or of simply not having the water for them to use to plant. If rice production ceases entirely for one or more years, the mills and other ancillary businesses may close and move away, which will result in further impediments to future rice production when adequate water is available.

Many rice farmers are currently involved in game management on their farms, particularly with regard to migratory waterfowl. These farmers may derive significant income from these activities, and if the cessation of the second crop impacts this industry, then there could be an adverse effect on agricultural resources.

# Table 1 Year 2000 Irrigation Statistics

WHARTON COUNTY (Region K)

| | Year 2000 NASS Acres | Total Acres in Region K | % Crop Irrigated | 1st Crop (acres) | 1st Crop water use (in/acre) | 1st Crop water use (ac-ft/ac) | % Conduit Loss (%/acre) | Conduit Loss (ac-ft/ac) | Total 1st Crop (ac ft/ac) | Total 1st Crop (ac-ft) | % Acreage 2nd Crop | 2nd Crop (acres) | 2nd Crop water use (% of 1st crop) | 2nd Crop water use (ac-ft/ac) | TOTAL 2ND CROP (ac-ft) | TOTAL (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RICE** | **53,000** | 57% | **%** | **30,210** | | | | | | | | | | | | |
| GROUND | | | 20% | 6,042 | 28 | 2.33 | 20% | 0.47 | 2.80 | 16,918 | 70% | 4,229 | 60% | 1.68 | 7,105 | 24,023 |
| SURFACE | | | 80% | 24,168 | 32 | 2.67 | 35% | 0.93 | 3.60 | 87,005 | 65% | 15,709 | 54% | 1.94 | 30,539 | 117,543 |
| | | | | | | | | | | | | | | | | |
| **COTTON** | **86,500** | 71% | | 61,415 | | | | | | | | | | | | |
| irrigated | | | 20% | **12,283** | 12 | 1.00 | | | 1.00 | 12,283 | | | | | | 12,283 |
| **CORN** | **34,200** | 81% | | 27,702 | | | | | | | | | | | | |
| irrigated | | | 35% | **9,696** | 12 | 1.00 | | | 1.00 | 9,696 | | | | | | 9,696 |
| **MILO** | **66,100** | 48% | | 31,728 | | | | | | | | | | | | |
| irrigated | | | 10% | **3,173** | 6 | 0.50 | | | 0.50 | 1,586 | | | | | | 1,586 |
| **SOYBEANS** | **13,300** | 81% | | 10,773 | | | | | | | | | | | | |
| irrigated | | | 25% | **2,693** | 12 | 1.00 | | | 1.00 | 2,693 | | | | | | 2,693 |
| **TURFGRASS** | | | | **8,000** | 60 | 5.00 | | | 5.00 | 40,000 | | | | | | 40,000 |
| **TOTAL IRRIGATION** | | | | **66,055** | | | | | | | | | | | | **207,825** |
| | | | | | | | | | | | | | | | | |
| **WATERFOWL HABITAT** | | | 3% | **6,000** | 18 | 1.50 | | | 1.50 | 9,000 | | | | | | **9,000** |
| **AQUACULTURE** | | | | **1,200** | 50 | 4.17 | | | 4.17 | 5,000 | | | | | | **5,000** |
| **LIVESTOCK (head)** | | | | **26,000** | | 0.028 | 10% | 0.003 | 0.03 | 801 | | | | | | **801** |
| **25gl. * 365 / 325,851** | | | | | | | | | | | | | | | | |
| **MUNICIPAL** | | | | | | | | | | | | | | | | **4,163** |
| **MANUFACTURING** | | | | | | | | | | | | | | | | **369** |
| **POWER COOLING** | | | | | | | | | | | | | | | BOLING | **120** |
| **MINING** | | | | | | | | | | | | | | | | **2,370** |
| **TOTALS** | | | | | | | | | | | | | | | | **229,648** |

***Total ac-ft per acre used (1st + 2nd Crop)***
***4.48 groundwater***
***5.54 surface water***

## Table 1  Year 2000 Irrigation Statistics

MATAGORDA COUNTY (Region K)

| | Year 2000 NASS Acres | | % Crop Irrigated | 1st Crop (acres) | 1st Crop water use (in/acre) | 1st Crop water use (ac-ft/ac) | % Conduit Loss (%/acre) | Conduit Loss (ac-ft/ac) | Total 1st Crop (ac-ft/ac) | Total 1st Crop (ac-ft) | % Acreage 2nd Crop | 2nd Crop (acres) | 2nd Crop water use (% of 1st crop) | 2nd Crop water use (ac-ft/ac) | TOTAL 2ND CROP (ac-ft) | TOTAL (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RICE** | **23,000** | | **%** | | | | | | | | | | | | | |
| GROUND | | | **15%** | 3,450 | **35** | 2.92 | 20% | 0.58 | 3.50 | 12,075 | 25% | 863 | 60% | 2.10 | 1,811 | 13,886 |
| SURFACE | | | **85%** | 19,550 | **41** | 3.42 | 35% | 1.20 | 4.61 | 90,174 | 50% | 9,775 | 60% | 2.77 | 27,052 | 117,227 |
| | | | | | | | | | | | | | | | | |
| **COTTON** | | | | | | | | | | | | | | | | |
| irrigated | | | 5% | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **CORN** | | | | | | | | | | | | | | | | |
| irrigated | | | 5% | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **MILO** | | | | | | | | | | | | | | | | |
| irrigated | | | **5%** | | 10 | 0.83 | | | 0.83 | | | | | | | |
| **SOYBEANS** | | | | | | | | | | | | | | | | |
| irrigated | | | 20% | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **TURFGRASS** | | | | | 60 | 5.00 | | | 5.00 | | | | | | | |
| **TOTAL IRRIGATION** | | | | | | | | | | | | | | | | **131,113** |
| | | | | | | | | | | | | | | | | |
| **WATERFOWL HABITAT** | | | 2% | **2,000** | 12 | 1.00 | | | 1.00 | 2,000 | | | | | | **2,000** |
| **AQUACULTURE** | | | | **1,600** | 50 | 4.20 | | | 4.20 | 6,720 | | | | | | **6,720** |
| **LIVESTOCK (head)** | | | | | | 0.028 | 10% | 0.003 | 0.03 | | | | | | | |
| **25gl. * 365 / 325,851** | | | | | | | | | | | | | | | | |
| **MUNICIPAL** | | | | | | | | | | | | | | | | |
| **MANUFACTURING** | | | | | | | | | | | | | | | | |
| **POWER COOLING** | | | | | | | | | | | | | | | | |
| **MINING** | | | | | | | | | | | | | | | | |
| **TOTALS** | | | | | | | | | | | | | | | | **139,833** |

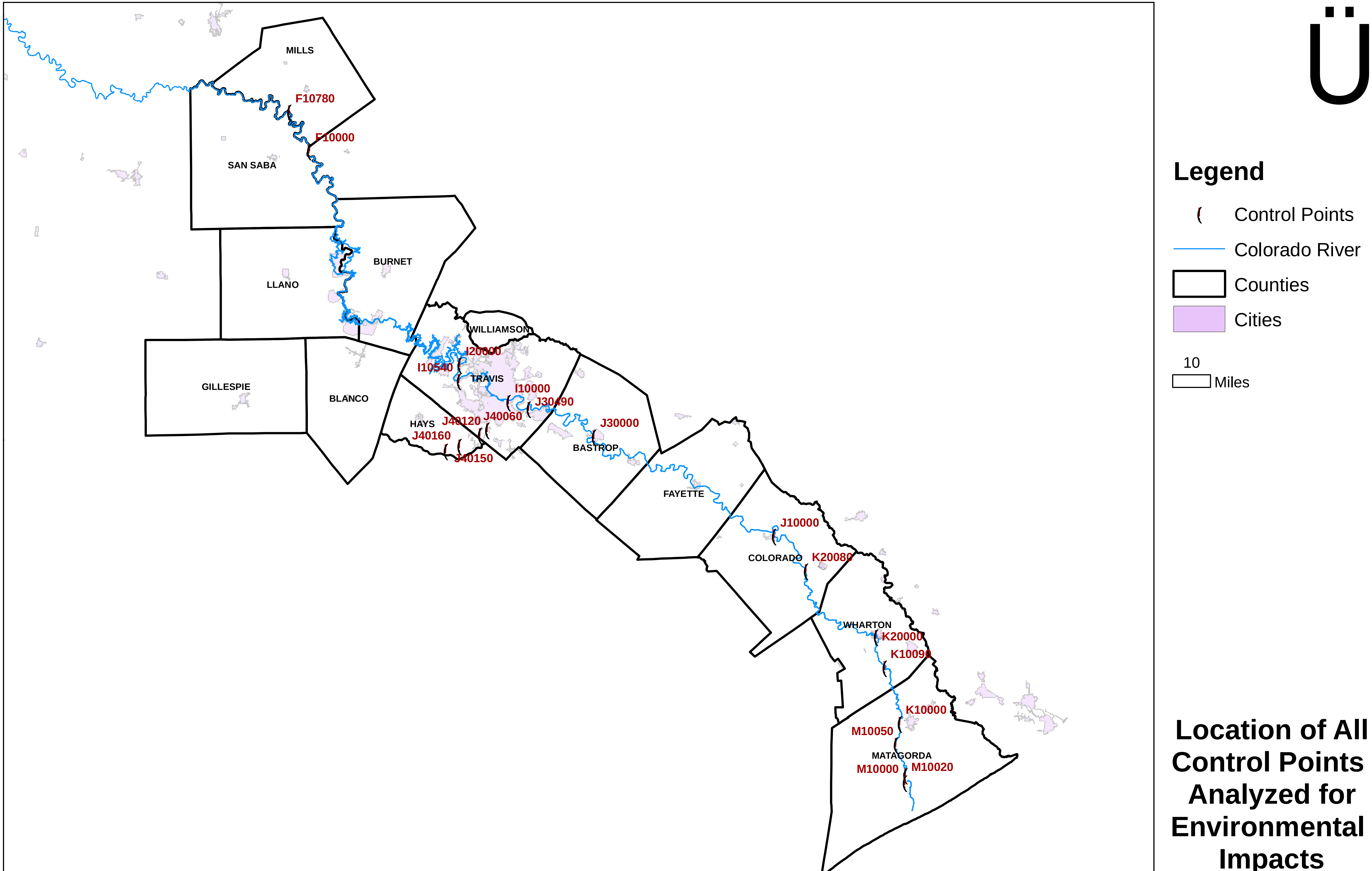
***Total ac-ft per acre used (1st + 2nd Crop)***
***5.60 groundwater***
***7.38 surface water***

## Table 1  Year 2000 Irrigation Statistics

**COLORADO  COUNTY  (Region K)**

| | Year 2000 NASS Acres | | % Crop Irrigated | 1st Crop (acres) | 1st Crop water use (in/acre) | 1st Crop water use (ac-ft/ac) | % Conduit Loss (%/acre) | Conduit Loss (ac-ft/ac) | Total 1st Crop (ac-ft/ac) | Total 1st Crop (ac-ft) | % Acreage 2nd Crop | 2nd Crop (acres) | 2nd Crop water use (% of 1st crop) | 2nd Crop water use (ac-ft/ac) | TOTAL 2ND CROP (ac-ft) | TOTAL (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RICE** | **31,136** | | % | | | | | | | | | | | | | |
| GROUND | | | 4% | 1,245 | 30 | 2.50 | 20% | 0.50 | 3.00 | 3,736 | 80% | 996 | 80% | 2.40 | 2,391 | 6,128 |
| SURFACE | | | 96% | 29,891 | 34 | 2.83 | 35% | 0.99 | 3.83 | 114,331 | 75% | 22,418 | 65% | 2.49 | 55,737 | 170,068 |
| | | | | | | | | | | | | | | | | |
| **COTTON** | | | | | | | | | | | | | | | | |
| irrigated | | | 30% | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **CORN** | | | | | | | | | | | | | | | | |
| irrigated | | | 50% | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **MILO** | | | | | | | | | | | | | | | | |
| irrigated | | | **30%** | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **SOYBEANS** | | | | | | | | | | | | | | | | |
| irrigated | | | 80% | | 12 | 1.00 | | | 1.00 | | | | | | | |
| **TURFGRASS** | | | | **25** | 60 | 5.00 | | | 5.00 | 125 | | | | | | 125 |
| **TOTAL IRRIGATION** | | | | **25** | | | | | | | | | | | | **176,321** |
| | | | | | | | | | | | | | | | | |
| **WATERFOWL HABITAT** | | | 3% | **5,000** | 15 | 1.25 | | | 1.25 | 6,250 | | | | | | **6,250** |
| **AQUACULTURE** | | | | | 50 | 4.20 | | | 4.20 | | | | | | | |
| **LIVESTOCK  (head)** | | | | | | 0.028 | 10% | 0.003 | 0.03 | | | | | | | |
| **25gl. * 365 / 325,851** | | | | | | | | | | | | | | | | |
| **MUNICIPAL** | | | | | | | | | | | | | | | | **3,115** |
| **MANUFACTURING** | | | | | | | | | | | | | | | | **318** |
| **POWER COOLING** | | | | | | | | | | | | | | | | |
| **MINING** | | | | | | | | | | | | | | | | **57** |
| **TOTALS** | | | | | | | | | | | | | | | | **186,061** |

***Total ac-ft per acre used (1st + 2nd Crop)***
***5.40  groundwater***
***6.31 surface water***




# Location of All Control Points Analyzed for Environmental Impacts

# Construct Goldthwaite Channel Dam

Table numbers reference those in the *LCRWPG 2011 Water Plan First Biennium Studies, Environmental Impacts of Water Managements Strategies Study*

**Construct Goldthwaite channel dam**

This strategy consists of the construction of a channel dam that would allow additional storage during periods of high flows, and would allow greater amounts of pumping during these times that would help extend the length of time the City of Goldthwaite could provide service. Because the strategy assumes that the $10^{th}$ percentile naturalized flows are passed through, the impacts to the $10^{th}$ percentile instream flows and freshwater inflows should be negligible. For the analysis, the Region K WAM Run 3 Cutoff Model, which inherently contains Strategy 1 (Expand Contract) and Strategy 7 (HB 1437), was used for the base condition.

Impacts are compared at Control Points F10000, I10000, J10000, K20000, K10000, and M10000. *Table 3.4A* shows the comparison at Control Point F10000. *Table 3.4B* shows the comparison at Control Point I10000. *Table 3.4C* shows the comparison at Control Point J10000. *Table 3.4D* shows the comparison at Control Point K20000. *Table 3.4E* shows the comparison at Control Point K10000. *Table 3.4F* shows the comparison at Control Point M10000. See *Figure 3.1* for control point locations.

**Table 3.4A Gold Channel Dam Comparison of $10^{th}$ Percentile Flows at CP F10000 (San Saba County) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 2,317 | 5,037 | 5,037 | 0.0 | 5,077 | 5,077 | 0.0 |
| FEB | 2,317 | 5,074 | 5,074 | 0.0 | 4,979 | 4,979 | 0.0 |
| MAR | 2,317 | 4,028 | 4,028 | 0.0 | 4,286 | 4,286 | 0.0 |
| APR | 2,317 | 5,657 | 5,657 | 0.0 | 6,281 | 6,281 | 0.0 |
| MAY | 2,317 | 6,077 | 6,077 | 0.0 | 6,384 | 6,384 | 0.0 |
| JUN | 2,317 | 9,318 | 9,318 | 0.0 | 9,278 | 9,278 | 0.0 |
| JUL | 2,317 | 4,711 | 4,711 | 0.0 | 4,675 | 4,675 | 0.0 |
| AUG | 2,317 | 4,043 | 4,043 | 0.0 | 4,490 | 4,490 | 0.0 |
| SEP | 2,317 | 3,486 | 3,486 | 0.0 | 3,085 | 3,085 | 0.0 |
| OCT | 2,317 | 3,806 | 3,806 | 0.0 | 3,706 | 3,706 | 0.0 |
| NOV | 2,317 | 4,046 | 4,046 | 0.0 | 3,990 | 3,990 | 0.0 |
| DEC | 2,317 | 4,628 | 4,628 | 0.0 | 4,902 | 4,902 | 0.0 |
| Annual | 27,804 | 59,910 | 59,910 | 0.0 | 61,133 | 61,133 | 0.0 |

**Table 3.4B Gold Channel Dam Comparison of 10th Percentile Flows at CP I10000 (Austin) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 11,547 | 10,073 | 10,073 | 0.0 | 8,785 | 8,835 | 0.6 |
| FEB | 11,547 | 8,188 | 8,188 | 0.0 | 8,886 | 8,886 | 0.0 |
| MAR | 11,547 | 22,124 | 22,124 | 0.0 | 17,696 | 17,696 | 0.0 |
| APR | 11,547 | 22,119 | 22,119 | 0.0 | 19,782 | 19,782 | 0.0 |
| MAY | 11,547 | 32,388 | 32,388 | 0.0 | 31,805 | 31,805 | 0.0 |
| JUN | 11,547 | 36,552 | 36,552 | 0.0 | 26,996 | 26,996 | 0.0 |
| JUL | 11,547 | 33,454 | 33,525 | 0.2 | 20,204 | 20,204 | 0.0 |
| AUG | 11,547 | 37,812 | 38,119 | 0.8 | 27,245 | 27,245 | 0.0 |
| SEP | 11,547 | 18,060 | 18,060 | 0.0 | 17,181 | 17,181 | 0.0 |
| OCT | 11,547 | 13,673 | 13,673 | 0.0 | 12,000 | 12,000 | 0.0 |
| NOV | 11,547 | 11,197 | 11,197 | 0.0 | 9,409 | 9,409 | 0.0 |
| DEC | 11,547 | 10,672 | 10,672 | 0.0 | 10,382 | 10,382 | 0.0 |
| Annual | 138,564 | 256,314 | 256,691 | 0.1 | 210,371 | 210,421 | 0.0 |

**Table 3.4C Gold Channel Dam Comparison of 10th Percentile Flows at CP J10000 (Colorado County) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 18,081 | 17,518 | 17,518 | 0.0 | 12,916 | 12,916 | 0.0 |
| FEB | 18,081 | 14,691 | 14,691 | 0.0 | 12,901 | 12,901 | 0.0 |
| MAR | 18,081 | 30,275 | 30,275 | 0.0 | 32,006 | 32,006 | 0.0 |
| APR | 18,081 | 31,476 | 31,476 | 0.0 | 30,281 | 30,281 | 0.0 |
| MAY | 18,081 | 60,646 | 60,646 | 0.0 | 51,525 | 51,522 | 0.0 |
| JUN | 18,081 | 70,621 | 70,621 | 0.0 | 53,258 | 53,256 | 0.0 |
| JUL | 18,081 | 52,845 | 52,845 | 0.0 | 36,001 | 36,000 | 0.0 |
| AUG | 18,081 | 40,628 | 40,628 | 0.0 | 27,029 | 27,029 | 0.0 |
| SEP | 18,081 | 37,639 | 37,639 | 0.0 | 29,694 | 29,802 | 0.4 |
| OCT | 18,081 | 22,361 | 22,361 | 0.0 | 16,942 | 16,942 | 0.0 |
| NOV | 18,081 | 14,588 | 14,588 | 0.0 | 13,672 | 13,834 | 1.2 |
| DEC | 18,081 | 17,822 | 17,822 | 0.0 | 16,264 | 16,264 | 0.0 |
| Annual | 216,972 | 411,110 | 411,110 | 0.0 | 332,488 | 332,753 | 0.1 |

**Table 3.4D Gold Channel Dam Comparison of 10th Percentile Flows at CP K20000 (Wharton County) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 23,613 | 20,996 | 20,996 | 0.0 | 14,599 | 14,610 | 0.1 |
| FEB | 23,613 | 19,465 | 19,465 | 0.0 | 17,368 | 17,368 | 0.0 |
| MAR | 23,613 | 30,746 | 30,746 | 0.0 | 33,690 | 33,691 | 0.0 |
| APR | 23,613 | 18,450 | 18,450 | 0.0 | 21,167 | 21,175 | 0.0 |
| MAY | 23,613 | 30,092 | 30,092 | 0.0 | 27,977 | 27,976 | 0.0 |
| JUN | 23,613 | 28,298 | 28,301 | 0.0 | 20,518 | 20,505 | -0.1 |
| JUL | 23,613 | 22,939 | 22,986 | 0.2 | 15,053 | 15,124 | 0.5 |
| AUG | 23,613 | 16,170 | 16,170 | 0.0 | 11,617 | 11,617 | 0.0 |
| SEP | 23,613 | 13,945 | 13,945 | 0.0 | 11,875 | 12,046 | 1.4 |
| OCT | 23,613 | 12,302 | 12,302 | 0.0 | 9,708 | 9,708 | 0.0 |
| NOV | 23,613 | 19,736 | 19,736 | 0.0 | 16,617 | 16,617 | 0.0 |
| DEC | 23,613 | 20,704 | 20,704 | 0.0 | 17,041 | 17,041 | 0.0 |
| Annual | 283,356 | 253,844 | 253,893 | 0.0 | 217,230 | 217,478 | 0.1 |

**Table 3.4E Gold Channel Dam Comparison of 10th Percentile Flows at CP K10000 (Matagorda County) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 12,374 | 20,205 | 20,205 | 0.0 | 15,015 | 15,186 | 1.1 |
| FEB | 12,374 | 21,826 | 21,826 | 0.0 | 18,782 | 18,782 | 0.0 |
| MAR | 12,374 | 28,665 | 28,665 | 0.0 | 32,712 | 32,551 | -0.5 |
| APR | 12,374 | 9,294 | 9,294 | 0.0 | 12,388 | 12,407 | 0.1 |
| MAY | 12,374 | 11,743 | 11,743 | 0.0 | 10,349 | 10,349 | 0.0 |
| JUN | 12,374 | 8,204 | 8,234 | 0.4 | 6,701 | 6,701 | 0.0 |
| JUL | 12,374 | 6,264 | 6,341 | 1.2 | 4,063 | 4,058 | -0.1 |
| AUG | 12,374 | 4,846 | 4,978 | 2.7 | 4,205 | 4,205 | 0.0 |
| SEP | 12,374 | 2,985 | 2,985 | 0.0 | 2,694 | 2,694 | 0.0 |
| OCT | 12,374 | 7,867 | 7,867 | 0.0 | 11,468 | 11,468 | 0.0 |
| NOV | 12,374 | 19,396 | 19,396 | 0.0 | 16,617 | 16,617 | 0.0 |
| DEC | 12,374 | 21,105 | 21,105 | 0.0 | 18,127 | 18,127 | 0.0 |
| Annual | 148,488 | 162,401 | 162,640 | 0.1 | 153,121 | 153,145 | 0.0 |

**Table 3.4F Gold Channel Dam Comparison of 10th Percentile Flows at CP M10000 (Entrance to Matagorda Bay) for 2010 and 2060**

| Month | Target B&E | Critical B&E | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 205,600 | 36,000 | 16,939 | 16,938 | 0.0 | 12,939 | 13,088 | 1.2 |
| FEB | 194,500 | 36,000 | 19,941 | 19,941 | 0.0 | 14,988 | 14,988 | 0.0 |
| MAR | 63,200 | 36,000 | 23,842 | 23,842 | 0.0 | 26,337 | 26,337 | 0.0 |
| APR | 60,400 | 36,000 | 6,947 | 6,947 | 0.0 | 8,192 | 8,196 | 0.1 |
| MAY | 255,400 | 36,000 | 10,971 | 10,971 | 0.0 | 6,375 | 6,375 | 0.0 |
| JUN | 210,500 | 36,000 | 6,223 | 6,223 | 0.0 | 1,582 | 1,581 | -0.1 |
| JUL | 108,400 | 36,000 | 3,476 | 3,526 | 1.4 | 1,122 | 1,121 | -0.1 |
| AUG | 62,000 | 36,000 | 3,259 | 3,259 | 0.0 | 951 | 951 | 0.0 |
| SEP | 61,900 | 36,000 | 1,048 | 1,048 | 0.0 | 15 | 15 | 0.0 |
| OCT | 71,300 | 36,000 | 2,210 | 2,210 | 0.0 | 1,334 | 1,334 | 0.0 |
| NOV | 66,500 | 36,000 | 17,501 | 17,501 | 0.0 | 11,010 | 11,136 | 1.1 |
| DEC | 68,000 | 36,000 | 18,829 | 18,829 | 0.0 | 14,181 | 14,181 | 0.0 |
| Annual | 1,427,700 | 432,000 | 131,186 | 131,235 | 0.0 | 99,028 | 99,304 | 0.3 |

Overall, the impacts of the Goldthwaite channel dam strategy are negligible, due mainly to the junior priority date combined with the passing of low-flow events. This strategy is not assumed to provide the necessary shortage makeup during periods of drought, but rather to help extend the length of time the City can continue to provide service once flow in the river slows or ceases.

*Figure 3.7* below shows a bar graph of the median flows, as well as lines showing the range of 10th percentile to 90th percentile flows both with and without Strategy 5 at CP M10000 for 2010, along with the target and critical bay and estuary freshwater inflows. *Figure 3.8* shows a similar comparison for 2060.

**Figure 3.7 Gold Channel Dam 2010 Comparison of Freshwater Inflow Results at CP M10000 (Entrance to Matagorda Bay)**

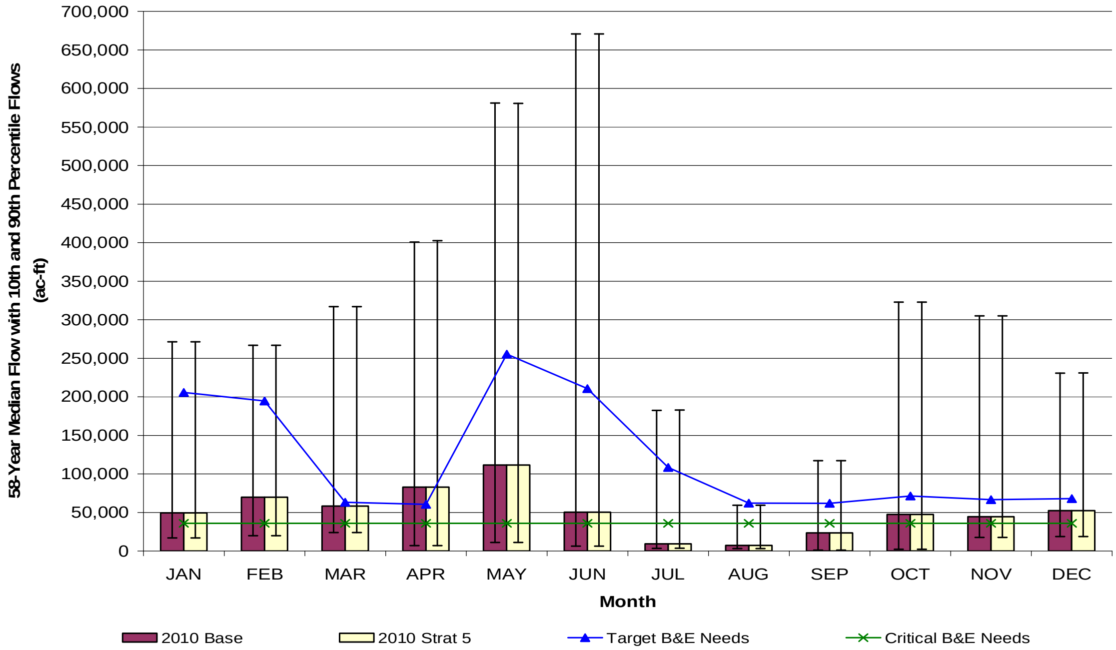



**Figure 3.8 Gold Channel Dam 2060 Comparison of Freshwater Inflow Results at CP M10000 (Entrance to Matagorda Bay)**

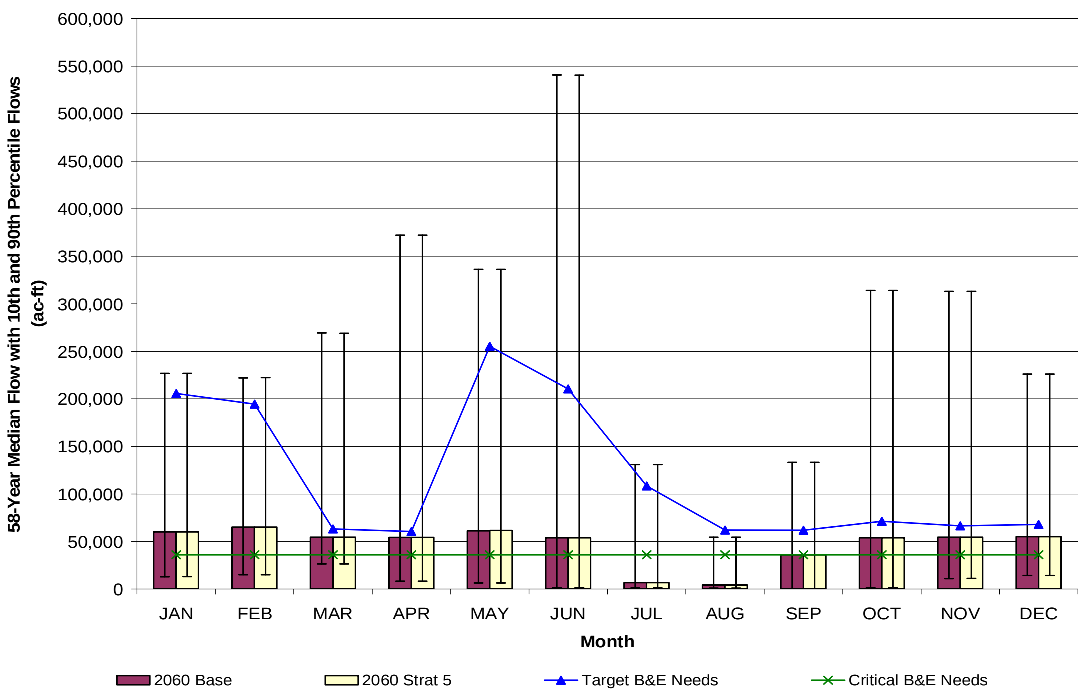


**Table 3.4G Gold Channel Dam Frequency of Meeting Target and Critical Needs for 2060**

| Month | Gold Channel Dam Strategy at CP J10000 (Colorado County) | | | | | | Gold Channel Dam Strategy at CP M10000 (Matagorda Bay) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % of Time Flow Meets or Exceeds **Target Needs** | | | % of Time Flow Meets or Exceeds **Critical Needs** | | | % of Time Flow Meets or Exceeds **Target Needs** | | | % of Time Flow Meets or Exceeds **Critical Needs** | | |
| | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference |
| JAN | 81.4% | 81.4% | 0.0% | 98.3% | 98.3% | 0.0% | 18.6% | 18.6% | 0.0% | 71.2% | 71.2% | 0.0% |
| FEB | 84.7% | 84.7% | 0.0% | 100.0% | 100.0% | 0.0% | 18.6% | 18.6% | 0.0% | 76.3% | 76.3% | 0.0% |
| MAR | 93.2% | 93.2% | 0.0% | 93.2% | 93.2% | 0.0% | 42.4% | 42.4% | 0.0% | 76.3% | 76.3% | 0.0% |
| APR | 100.0% | 100.0% | 0.0% | 100.0% | 100.0% | 0.0% | 45.8% | 44.1% | -1.7% | 62.7% | 62.7% | 0.0% |
| MAY | 89.8% | 89.8% | 0.0% | 100.0% | 100.0% | 0.0% | 22.0% | 22.0% | 0.0% | 78.0% | 78.0% | 0.0% |
| JUN | 96.6% | 96.6% | 0.0% | 100.0% | 100.0% | 0.0% | 30.5% | 30.5% | 0.0% | 64.4% | 64.4% | 0.0% |
| JUL | 98.3% | 98.3% | 0.0% | 100.0% | 100.0% | 0.0% | 13.6% | 15.3% | 1.7% | 39.0% | 39.0% | 0.0% |
| AUG | 98.3% | 98.3% | 0.0% | 100.0% | 100.0% | 0.0% | 8.5% | 5.1% | -3.4% | 23.7% | 23.7% | 0.0% |
| SEP | 98.3% | 98.3% | 0.0% | 100.0% | 100.0% | 0.0% | 25.4% | 23.7% | -1.7% | 59.3% | 59.3% | 0.0% |
| OCT | 74.6% | 74.6% | 0.0% | 100.0% | 100.0% | 0.0% | 32.2% | 32.2% | 0.0% | 66.1% | 66.1% | 0.0% |
| NOV | 84.7% | 84.7% | 0.0% | 100.0% | 100.0% | 0.0% | 39.0% | 39.0% | 0.0% | 67.8% | 67.8% | 0.0% |
| DEC | 84.7% | 84.7% | 0.0% | 98.3% | 98.3% | 0.0% | 45.8% | 42.4% | -3.4% | 72.9% | 72.9% | 0.0% |
| Annual | 100.0% | 100.0% | 0.0% | 100.0% | 100.0% | 0.0% | 39.0% | 39.0% | 0.0% | 76.3% | 76.3% | 0.0% |

*Table 3.4G* above shows that the Goldthwaite Channel Dam Strategy only impacts the frequency that the target needs are met at the Matagorda Bay control point. The critical needs are not impacted by implementation of the strategy. The impacts are less than four percent, although the impacts in the month of August are significant because the frequency of meeting the target needs during that month without the strategy is already so low. The strategy does not have annual impacts, only monthly.

**Table 3.4H Gold Channel Dam Flow Duration Below Target and Critical Needs for 2060**

| Condition | Gold Channel Dam Strategy at CP J10000 (Colorado County) | | | Gold Channel Dam Strategy at CP M10000 (Matagorda Bay) | | |
|---|---|---|---|---|---|---|
| | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference |
| Number of Times Flow Falls Below **Target** Level | 38 | 38 | 0 | 85 | 85 | 0 |
| Maximum Duration Below **Target** Level (months) | 6 | 6 | 0 | 51 | 51 | 0 |
| Total Duration Below **Target** Level (months) | 68 | 68 | 0 | 506 | 511 | 5 |
| Average Duration Below **Target** Level (months) | 2 | 2 | 0 | 6 | 6 | 0 |
| Average Volume of Flow Per Event Below **Target** Level (Ac-Ft) | 10,659 | 10,618 | -42 | 504,744 | 504,964 | 220 |
| Number of Times Flow Falls Below **Critical** Level | 6 | 6 | 0 | 93 | 93 | 0 |
| Maximum Duration Below **Critical** Level (months) | 1 | 1 | 0 | 11 | 11 | 0 |
| Total Duration Below **Critical** Level (months) | 6 | 6 | 0 | 261 | 261 | 0 |
| Average Duration Below **Critical** Level (months) | 1 | 1 | 0 | 3 | 3 | 0 |
| Average Volume of Flow Per Event Below **Critical** Level (Ac-Ft) | 5,068 | 5,068 | 0 | 66,999 | 67,014 | 15 |

*Table 3.4H* above shows small impacts to the total duration below target level for the freshwater inflows, and reasonably negligible impacts to the average volume of flow per event below target/critical levels.

# HB 1437

**HB 1437**

The HB 1437 strategy is a Region G strategy that provides a transfer of up to an additional 25,000 ac-ft/yr from the Colorado River Basin to new customers within the Brazos River Basin in Williamson County. The strategy is a conservation strategy in which improvements are made in farms and in the irrigation districts that reduce agricultural use of the surface water. As a result, no impacts to the instream flows and freshwater inflows are expected from this strategy. The base model (Region K WAM Run 3) inherently contains both Strategy 1 (Expand Contract) and Strategy 7 (HB 1437), so for this analysis, Strategy 7 had to be removed from the base model in order to show the "without strategy" condition. See page 2-6 for more explanation.

Impacts are compared at Control Points I10000, J10000, K20000, K10000, and M10000. *Table 3.6A* shows the comparison at Control Point I10000. *Table 3.6B* shows the comparison at Control Point J10000. *Table 3.6C* shows the comparison at Control Point K20000. *Table 3.6D* shows the comparison at Control Point K10000. *Table 3.6E* shows the comparison at Control Point M10000. See *Figure 3.1* for control point locations.

**Table 3.6A HB 1437 Comparison of 10th Percentile Flows at CP I10000 (Austin) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 11,547 | 10,073 | 10,073 | 0.0 | 8,785 | 8,785 | 0.0 |
| FEB | 11,547 | 8,188 | 8,188 | 0.0 | 8,886 | 8,886 | 0.0 |
| MAR | 11,547 | 22,124 | 22,124 | 0.0 | 17,696 | 17,696 | 0.0 |
| APR | 11,547 | 22,119 | 22,119 | 0.0 | 19,782 | 19,782 | 0.0 |
| MAY | 11,547 | 32,388 | 32,388 | 0.0 | 31,805 | 31,805 | 0.0 |
| JUN | 11,547 | 36,552 | 36,552 | 0.0 | 26,996 | 26,996 | 0.0 |
| JUL | 11,547 | 33,454 | 33,454 | 0.0 | 20,204 | 20,204 | 0.0 |
| AUG | 11,547 | 37,812 | 37,812 | 0.0 | 27,245 | 27,245 | 0.0 |
| SEP | 11,547 | 18,060 | 18,060 | 0.0 | 17,181 | 17,181 | 0.0 |
| OCT | 11,547 | 13,673 | 13,673 | 0.0 | 12,000 | 12,000 | 0.0 |
| NOV | 11,547 | 11,197 | 11,197 | 0.0 | 9,409 | 9,409 | 0.0 |
| DEC | 11,547 | 10,672 | 10,672 | 0.0 | 10,382 | 10,382 | 0.0 |
| Annual | 138,564 | 256,314 | 256,314 | 0.0 | 210,371 | 210,371 | 0.0 |

**Table 3.6B HB 1437 Comparison of 10th Percentile Flows at CP J10000 (Colorado County) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 18,081 | 17,518 | 17,518 | 0.0 | 12,916 | 12,916 | 0.0 |
| FEB | 18,081 | 14,691 | 14,691 | 0.0 | 12,901 | 12,901 | 0.0 |
| MAR | 18,081 | 30,275 | 30,275 | 0.0 | 32,006 | 32,006 | 0.0 |
| APR | 18,081 | 31,476 | 31,476 | 0.0 | 30,281 | 30,281 | 0.0 |
| MAY | 18,081 | 60,646 | 60,646 | 0.0 | 51,522 | 51,525 | 0.0 |
| JUN | 18,081 | 70,621 | 70,621 | 0.0 | 53,256 | 53,258 | 0.0 |
| JUL | 18,081 | 52,989 | 52,845 | -0.3 | 36,000 | 36,001 | 0.0 |
| AUG | 18,081 | 40,767 | 40,628 | -0.3 | 27,029 | 27,029 | 0.0 |
| SEP | 18,081 | 37,639 | 37,639 | 0.0 | 29,694 | 29,694 | 0.0 |
| OCT | 18,081 | 22,361 | 22,361 | 0.0 | 16,942 | 16,942 | 0.0 |
| NOV | 18,081 | 14,588 | 14,588 | 0.0 | 13,783 | 13,672 | -0.8 |
| DEC | 18,081 | 17,822 | 17,822 | 0.0 | 16,264 | 16,264 | 0.0 |
| Annual | 216,972 | 411,394 | 411,110 | -0.1 | 332,594 | 332,488 | 0.0 |

**Table 3.6C HB 1437 Comparison of 10th Percentile Flows at CP K20000 (Wharton County) for 2010 and 2060**

| Month | 7Q2 Flow | 2010 | | | 2060 | | |
|---|---|---|---|---|---|---|---|
| | | Base Model | Strategy | % Change | Base Model | Strategy | % Change |
| | ac-ft | ac-ft | ac-ft | | ac-ft | ac-ft | |
| JAN | 23,613 | 20,996 | 20,996 | 0.0 | 14,599 | 14,599 | 0.0 |
| FEB | 23,613 | 19,465 | 19,465 | 0.0 | 17,368 | 17,368 | 0.0 |
| MAR | 23,613 | 30,746 | 30,746 | 0.0 | 33,691 | 33,690 | 0.0 |
| APR | 23,613 | 18,450 | 18,450 | 0.0 | 21,179 | 21,167 | -0.1 |
| MAY | 23,613 | 30,092 | 30,092 | 0.0 | 27,976 | 27,977 | 0.0 |
| JUN | 23,613 | 28,298 | 28,298 | 0.0 | 20,505 | 20,518 | 0.1 |
| JUL | 23,613 | 22,939 | 22,939 | 0.0 | 15,053 | 15,053 | 0.0 |
| AUG | 23,613 | 16,170 | 16,170 | 0.0 | 11,617 | 11,617 | 0.0 |
| SEP | 23,613 | 13,945 | 13,945 | 0.0 | 11,938 | 11,875 | -0.5 |
| OCT | 23,613 | 12,302 | 12,302 | 0.0 | 9,708 | 9,708 | 0.0 |
| NOV | 23,613 | 19,736 | 19,736 | 0.0 | 16,617 | 16,617 | 0.0 |
| DEC | 23,613 | 20,704 | 20,704 | 0.0 | 17,041 | 17,041 | 0.0 |
| Annual | 283,356 | 253,844 | 253,844 | 0.0 | 217,292 | 217,230 | 0.0 |

**Table 3.6D HB 1437 Comparison of 10th Percentile Flows at CP K10000 (Matagorda County) for 2010 and 2060**

| Month | 7Q2 Flow ac-ft | 2010 Base Model ac-ft | 2010 Strategy ac-ft | 2010 % Change | 2060 Base Model ac-ft | 2060 Strategy ac-ft | 2060 % Change |
|---|---|---|---|---|---|---|---|
| JAN | 12,374 | 20,205 | 20,205 | 0.0 | 15,015 | 15,015 | 0.0 |
| FEB | 12,374 | 21,826 | 21,826 | 0.0 | 18,782 | 18,782 | 0.0 |
| MAR | 12,374 | 28,665 | 28,665 | 0.0 | 32,551 | 32,712 | 0.5 |
| APR | 12,374 | 9,294 | 9,294 | 0.0 | 12,407 | 12,388 | -0.1 |
| MAY | 12,374 | 11,743 | 11,743 | 0.0 | 10,349 | 10,349 | 0.0 |
| JUN | 12,374 | 8,204 | 8,204 | 0.0 | 6,701 | 6,701 | 0.0 |
| JUL | 12,374 | 6,264 | 6,264 | 0.0 | 4,058 | 4,063 | 0.1 |
| AUG | 12,374 | 4,846 | 4,846 | 0.0 | 4,205 | 4,205 | 0.0 |
| SEP | 12,374 | 2,985 | 2,985 | 0.0 | 2,694 | 2,694 | 0.0 |
| OCT | 12,374 | 7,867 | 7,867 | 0.0 | 11,468 | 11,468 | 0.0 |
| NOV | 12,374 | 19,396 | 19,396 | 0.0 | 16,617 | 16,617 | 0.0 |
| DEC | 12,374 | 21,105 | 21,105 | 0.0 | 18,127 | 18,127 | 0.0 |
| Annual | 148,488 | 162,401 | 162,401 | 0.0 | 152,973 | 153,121 | 0.1 |

**Table 3.6E HB 1437 Comparison of 10th Percentile Flows at CP M10000 (Entrance to Matagorda Bay) for 2010 and 2060**

| Month | Target B&E ac-ft | Critical B&E ac-ft | 2010 Base Model ac-ft | 2010 Strategy ac-ft | 2010 % Change | 2060 Base Model ac-ft | 2060 Strategy ac-ft | 2060 % Change |
|---|---|---|---|---|---|---|---|---|
| JAN | 205,600 | 36,000 | 16,939 | 16,939 | 0.0 | 12,939 | 12,939 | 0.0 |
| FEB | 194,500 | 36,000 | 19,941 | 19,941 | 0.0 | 14,988 | 14,988 | 0.0 |
| MAR | 63,200 | 36,000 | 23,842 | 23,842 | 0.0 | 26,337 | 26,337 | 0.0 |
| APR | 60,400 | 36,000 | 6,947 | 6,947 | 0.0 | 8,196 | 8,192 | -0.1 |
| MAY | 255,400 | 36,000 | 10,971 | 10,971 | 0.0 | 6,375 | 6,375 | 0.0 |
| JUN | 210,500 | 36,000 | 6,223 | 6,223 | 0.0 | 1,581 | 1,582 | 0.1 |
| JUL | 108,400 | 36,000 | 3,482 | 3,476 | -0.2 | 1,121 | 1,122 | 0.1 |
| AUG | 62,000 | 36,000 | 3,259 | 3,259 | 0.0 | 951 | 951 | 0.0 |
| SEP | 61,900 | 36,000 | 1,048 | 1,048 | 0.0 | 15 | 15 | 0.0 |
| OCT | 71,300 | 36,000 | 2,210 | 2,210 | 0.0 | 1,334 | 1,334 | 0.0 |
| NOV | 66,500 | 36,000 | 17,501 | 17,501 | 0.0 | 11,085 | 11,010 | -0.7 |
| DEC | 68,000 | 36,000 | 18,829 | 18,829 | 0.0 | 14,181 | 14,181 | 0.0 |
| Annual | 1,427,700 | 432,000 | 131,192 | 131,186 | 0.0 | 99,105 | 99,028 | -0.1 |

As expected, the impacts to the 10th percentile instream flows and freshwater inflows at the various control points can be considered negligible.

*Figure 3.11* below shows a bar graph of the median flows, as well as lines showing the range of 10th percentile to 90th percentile flows both with and without Strategy 7 at CP M10000 for 2010, along with the target and critical bay and estuary freshwater inflows. *Figure 3.12* below shows a similar comparison for 2060.

**Figure 3.11 HB 1437 2010 Comparison of Freshwater Inflow Results at CP M10000 (Entrance to Matagorda Bay)**

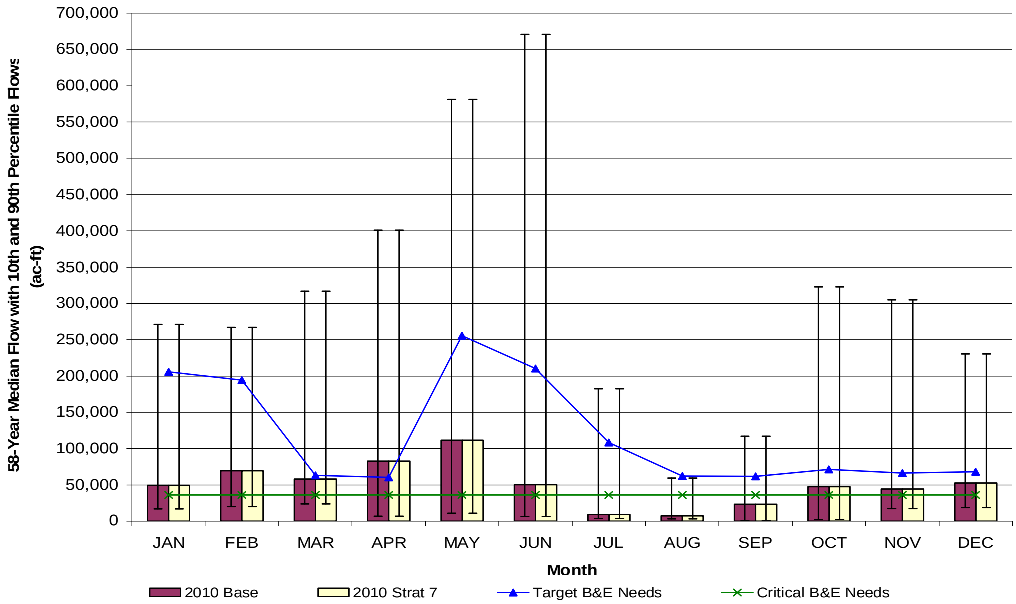



**Figure 3.12 HB 1437 2060 Comparison of Freshwater Inflow Results at CP M10000 (Entrance to Matagorda Bay)**

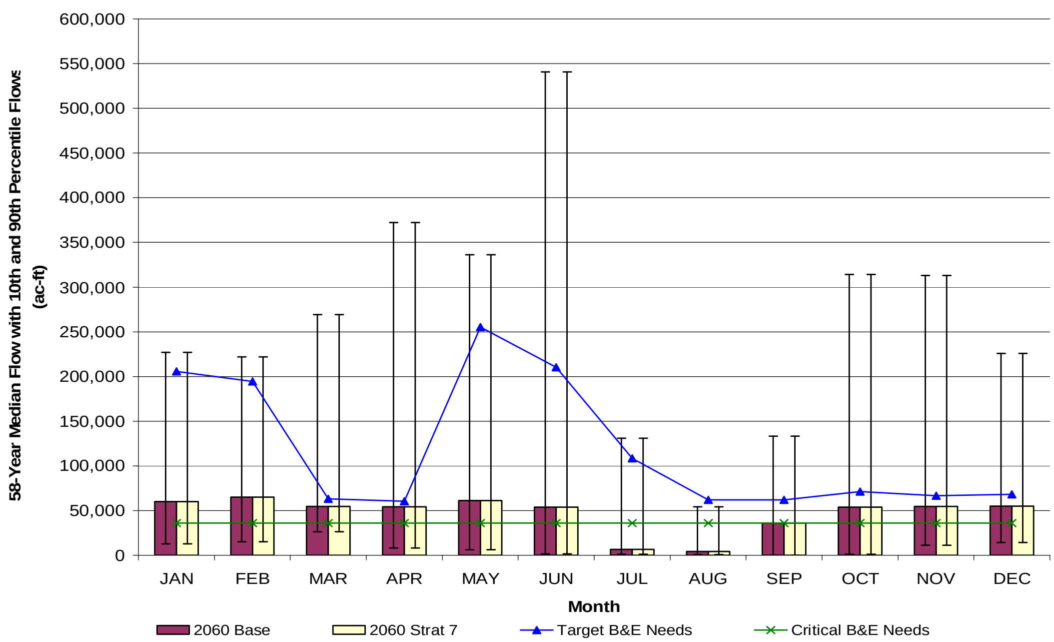


**Table 3.6F HB 1437 Frequency of Meeting Target and Critical Needs for 2060**

| | HB 1437 Strategy at CP J10000 (Colorado County) | | | | | | HB 1437 Strategy at CP M10000 (Matagorda Bay) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % of Time Flow Meets or Exceeds **Target Needs** | | | % of Time Flow Meets or Exceeds **Critical Needs** | | | % of Time Flow Meets or Exceeds **Target Needs** | | | % of Time Flow Meets or Exceeds **Critical Needs** | | |
| **Month** | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference |
| JAN | 81.4% | 81.4% | 0.0% | 98.3% | 98.3% | 0.0% | 18.6% | 18.6% | 0.0% | 71.2% | 71.2% | 0.0% |
| FEB | 84.7% | 84.7% | 0.0% | 100.0% | 100.0% | 0.0% | 18.6% | 18.6% | 0.0% | 76.3% | 76.3% | 0.0% |
| MAR | 93.2% | 93.2% | 0.0% | 93.2% | 93.2% | 0.0% | 42.4% | 42.4% | 0.0% | 76.3% | 76.3% | 0.0% |
| APR | 100.0% | 100.0% | 0.0% | 100.0% | 100.0% | 0.0% | 45.8% | 45.8% | 0.0% | 62.7% | 62.7% | 0.0% |
| MAY | 89.8% | 89.8% | 0.0% | 100.0% | 100.0% | 0.0% | 22.0% | 22.0% | 0.0% | 78.0% | 78.0% | 0.0% |
| JUN | 96.6% | 96.6% | 0.0% | 100.0% | 100.0% | 0.0% | 30.5% | 30.5% | 0.0% | 64.4% | 64.4% | 0.0% |
| JUL | 98.3% | 98.3% | 0.0% | 100.0% | 100.0% | 0.0% | 13.6% | 13.6% | 0.0% | 39.0% | 39.0% | 0.0% |
| AUG | 98.3% | 98.3% | 0.0% | 100.0% | 100.0% | 0.0% | 8.5% | 8.5% | 0.0% | 23.7% | 23.7% | 0.0% |
| SEP | 98.3% | 98.3% | 0.0% | 100.0% | 100.0% | 0.0% | 25.4% | 25.4% | 0.0% | 59.3% | 59.3% | 0.0% |
| OCT | 74.6% | 74.6% | 0.0% | 100.0% | 100.0% | 0.0% | 32.2% | 32.2% | 0.0% | 66.1% | 66.1% | 0.0% |
| NOV | 84.7% | 84.7% | 0.0% | 100.0% | 100.0% | 0.0% | 39.0% | 39.0% | 0.0% | 67.8% | 67.8% | 0.0% |
| DEC | 84.7% | 84.7% | 0.0% | 98.3% | 98.3% | 0.0% | 45.8% | 45.8% | 0.0% | 72.9% | 72.9% | 0.0% |
| Annual | 100.0% | 100.0% | 0.0% | 100.0% | 100.0% | 0.0% | 39.0% | 39.0% | 0.0% | 76.3% | 76.3% | 0.0% |

*Table 3.6F* demonstrates that the HB 1437 strategy has no impact on the frequency of the instream flows and freshwater inflows meeting their target and critical levels.

**Table 3.6G HB 1437 Flow Duration Below Target and Critical Needs for 2060**

| | HB 1437 Strategy at CP J10000 (Colorado County) | | | HB 1437 Strategy at CP M10000 (Matagorda Bay) | | |
|---|---|---|---|---|---|---|
| **Condition** | **Without Strategy** | **With Strategy** | **Difference** | **Without Strategy** | **With Strategy** | **Difference** |
| Number of Times Flow Falls Below **Target** Level | 38 | 38 | 0 | 85 | 85 | 0 |
| Maximum Duration Below **Target** Level (months) | 6 | 6 | 0 | 51 | 51 | 0 |
| Total Duration Below **Target** Level (months) | 68 | 68 | 0 | 506 | 506 | 0 |
| Average Duration Below **Target** Level (months) | 2 | 2 | 0 | 6 | 6 | 0 |
| Average Volume of Flow Per Event Below **Target** Level (Ac-Ft) | 10,634 | 10,659 | 25 | 504,828 | 504,744 | -84 |
| Number of Times Flow Falls Below **Critical** Level | 6 | 6 | 0 | 93 | 93 | 0 |
| Maximum Duration Below **Critical** Level (months) | 1 | 1 | 0 | 11 | 11 | 0 |
| Total Duration Below **Critical** Level (months) | 6 | 6 | 0 | 261 | 261 | 0 |
| Average Duration Below **Critical** Level (months) | 1 | 1 | 0 | 3 | 3 | 0 |
| Average Volume of Flow Per Event Below **Critical** Level (Ac-Ft) | 5,068 | 5,068 | 0 | 67,034 | 66,999 | -35 |

*Table 3.6G* shows that the HB 1437 strategy has a minimal impact on the average volume below the target and critical levels.

**LCRA Excess Flows Permit and Off-channel Storage**

**LCRA excess flows permit and off-channel storage**

This strategy uses two off-channel reservoirs, one in Matagorda County, and one in Colorado County, to collect excess flows during periods of high flow. The target bay and estuary inflows from the 2006 Matagorda Bay Freshwater Inflow Needs Study (FINS) and the target instream flows identified in the LCRA 2003 Water Management Plan were used as the bay and estuary and instream flow requirements that needed to be met before any excess flow could be diverted to either of the reservoirs. This strategy is only needed in 2060, and therefore, was only modeled for 2060. Because of the stringent environmental flow requirements, little impact to the 10$^{th}$ percentile flows is expected. For the analysis, the Region K WAM Run 3 Cutoff Model, which inherently contains Strategy 1 (Expand Contract) and Strategy 7 (HB 1437), was used for the base condition.

Impacts are compared for 2060 at Control Points K20000, K10000, and M10000. *Table 3.10A* shows the comparison at Control Point K20000. *Table 3.10B* shows the comparison at Control Point K10000. *Table 3.10C* shows the comparison at Control Point M10000. See *Figure 3.1* for control point locations. Please see Appendix C (pages C-106 through C-112) for impact analysis results of control points not discussed in this section.

**Table 3.10A Excess Flows Comparison of 10$^{th}$ Percentile Flows at CP K20000 (Wharton County) for 2060**

| Month | 7Q2 Flow ac-ft | Base Model ac-ft | Strategy ac-ft | % Change |
|---|---|---|---|---|
| JAN | 23,613 | 14,599 | 14,599 | 0.0 |
| FEB | 23,613 | 17,368 | 17,368 | 0.0 |
| MAR | 23,613 | 33,690 | 33,691 | 0.0 |
| APR | 23,613 | 21,167 | 21,175 | 0.0 |
| MAY | 23,613 | 27,977 | 27,976 | 0.0 |
| JUN | 23,613 | 20,518 | 20,505 | -0.1 |
| JUL | 23,613 | 15,053 | 15,053 | 0.0 |
| AUG | 23,613 | 11,617 | 11,617 | 0.0 |
| SEP | 23,613 | 11,875 | 11,937 | 0.5 |
| OCT | 23,613 | 9,708 | 9,708 | 0.0 |
| NOV | 23,613 | 16,617 | 16,617 | 0.0 |
| DEC | 23,613 | 17,041 | 17,041 | 0.0 |
| Annual | 283,356 | 217,230 | 217,288 | 0.0 |

**Table 3.10B Excess Flows Comparison of 10th Percentile Flows at CP K10000 (Matagorda County) for 2060**

| Month | 7Q2 Flow ac-ft | Base Model ac-ft | Strategy ac-ft | % Change |
|---|---|---|---|---|
| JAN | 12,374 | 15,015 | 15,015 | 0.0 |
| FEB | 12,374 | 18,782 | 18,782 | 0.0 |
| MAR | 12,374 | 32,712 | 32,551 | -0.5 |
| APR | 12,374 | 12,388 | 12,407 | 0.1 |
| MAY | 12,374 | 10,349 | 10,349 | 0.0 |
| JUN | 12,374 | 6,701 | 6,701 | 0.0 |
| JUL | 12,374 | 4,063 | 4,058 | -0.1 |
| AUG | 12,374 | 4,205 | 4,205 | 0.0 |
| SEP | 12,374 | 2,694 | 2,694 | 0.0 |
| OCT | 12,374 | 11,468 | 11,468 | 0.0 |
| NOV | 12,374 | 16,617 | 16,617 | 0.0 |
| DEC | 12,374 | 18,127 | 18,127 | 0.0 |
| Annual | 148,488 | 153,121 | 152,973 | -0.1 |

As is shown in *Tables 3.10A* and *3.10B* above, the 10th percentile instream flow impacts at CP K20000 and CP K10000 are very minor, and can be considered negligible. This was expected, considering the stringent environmental requirements placed on the strategy. The graphic results in Appendix C (C-107 through C-112) display the 90th percentile flow impacts at each control point, and show decreases in flow volume of as much as 10 percent for the months of January through May.

**Table 3.10C Excess Flows Comparison of 10th Percentile Flows at CP M10000 (Entrance to Matagorda Bay) for 2060**

| Month | Target B&E ac-ft | Critical B&E ac-ft | Base Model ac-ft | Strategy ac-ft | % Change |
|---|---|---|---|---|---|
| JAN | 205,600 | 36,000 | 12,939 | 12,939 | 0.0 |
| FEB | 194,500 | 36,000 | 14,988 | 14,988 | 0.0 |
| MAR | 63,200 | 36,000 | 26,337 | 26,337 | 0.0 |
| APR | 60,400 | 36,000 | 8,192 | 8,196 | 0.1 |
| MAY | 255,400 | 36,000 | 6,375 | 6,375 | 0.0 |
| JUN | 210,500 | 36,000 | 1,582 | 1,581 | -0.1 |
| JUL | 108,400 | 36,000 | 1,122 | 1,121 | -0.1 |
| AUG | 62,000 | 36,000 | 951 | 951 | 0.0 |
| SEP | 61,900 | 36,000 | 15 | 15 | 0.0 |
| OCT | 71,300 | 36,000 | 1,334 | 1,334 | 0.0 |
| NOV | 66,500 | 36,000 | 11,010 | 11,136 | 1.1 |
| DEC | 68,000 | 36,000 | 14,181 | 14,181 | 0.0 |
| Annual | 1,427,700 | 432,000 | 99,028 | 99,156 | 0.1 |

For Strategy 13, like the impacts to the 10th percentile instream flows, the impacts to the 10th percentile freshwater inflows at CP M10000 are very small, as is shown in *Table 3.10C*, and can be considered negligible.

*Figure 3.18* below shows a bar graph of the median flows, as well as lines showing the range of 10th percentile to 90th percentile flows both with and without Strategy 13 at CP M10000 for 2060, along with the target and critical bay and estuary freshwater inflows. An impact from the strategy that that can be seen clearly is a decrease in the 90th percentile inflows during January through April. This would seem appropriate given that the strategy diverts water during periods of high flow.

**Figure 3.18 Excess Flows 2060 Comparison of Freshwater Inflow Results at CP M10000 (Entrance to Matagorda Bay)**

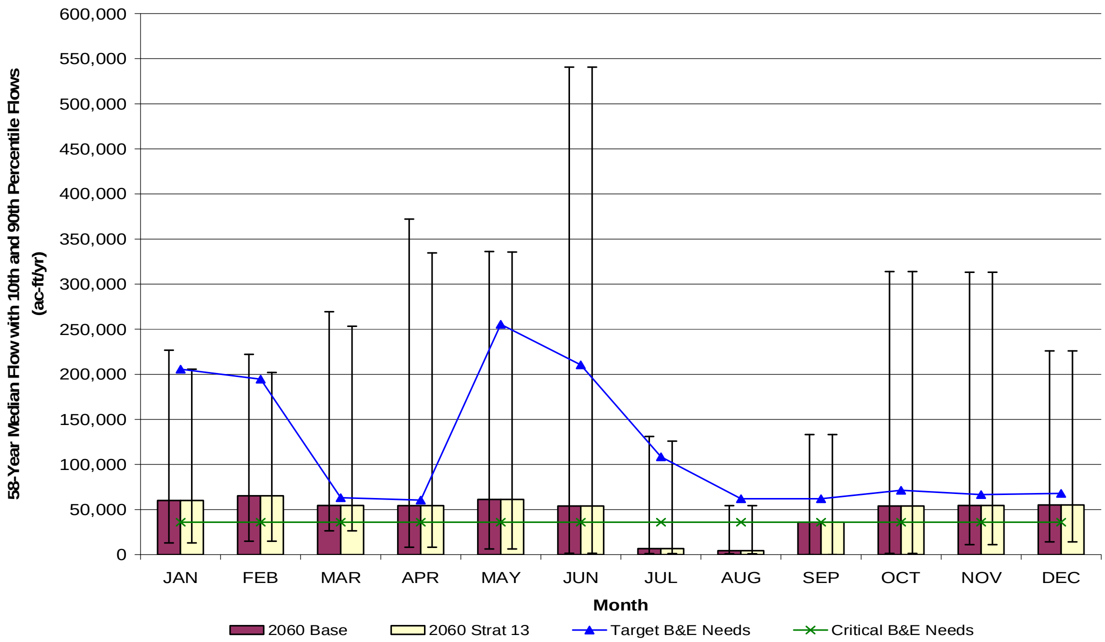



**Table 3.10D Excess Flows Frequency of Meeting Target and Critical Needs for 2060**

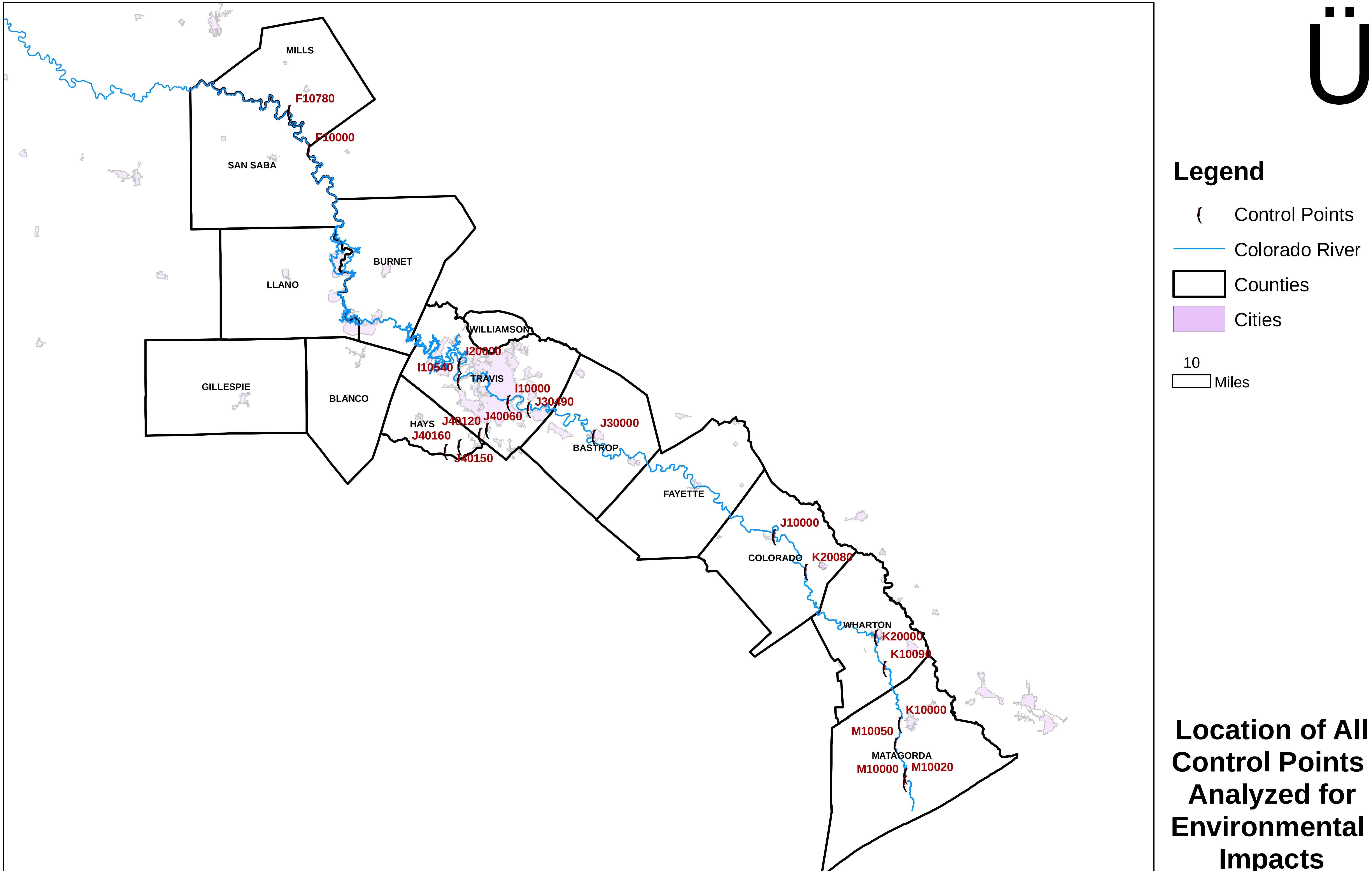
| | Excess Flows Strategy at CP K20000 (Wharton County) | | | | | | Excess Flows Strategy at CP M10000 (Matagorda Bay) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % of Time Flow Meets or Exceeds **Target Needs** | | | % of Time Flow Meets or Exceeds **Critical Needs** | | | % of Time Flow Meets or Exceeds **Target Needs** | | | % of Time Flow Meets or Exceeds **Critical Needs** | | |
| **Month** | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference | Without Strategy | With Strategy | Difference |
| JAN | 89.8% | 89.8% | 0.0% | 98.3% | 98.3% | 0.0% | 18.6% | 18.6% | 0.0% | 71.2% | 71.2% | 0.0% |
| FEB | 91.5% | 91.5% | 0.0% | 100.0% | 100.0% | 0.0% | 18.6% | 18.6% | 0.0% | 76.3% | 76.3% | 0.0% |
| MAR | 98.3% | 98.3% | 0.0% | 93.2% | 93.2% | 0.0% | 42.4% | 42.4% | 0.0% | 76.3% | 76.3% | 0.0% |
| APR | 84.7% | 84.7% | 0.0% | 74.6% | 74.6% | 0.0% | 45.8% | 45.8% | 0.0% | 62.7% | 62.7% | 0.0% |
| MAY | 78.0% | 78.0% | 0.0% | 84.7% | 84.7% | 0.0% | 22.0% | 22.0% | 0.0% | 78.0% | 78.0% | 0.0% |
| JUN | 76.3% | 76.3% | 0.0% | 98.3% | 98.3% | 0.0% | 30.5% | 30.5% | 0.0% | 64.4% | 64.4% | 0.0% |
| JUL | 89.8% | 89.8% | 0.0% | 98.3% | 98.3% | 0.0% | 13.6% | 13.6% | 0.0% | 39.0% | 39.0% | 0.0% |
| AUG | 94.9% | 94.9% | 0.0% | 96.6% | 96.6% | 0.0% | 8.5% | 8.5% | 0.0% | 23.7% | 23.7% | 0.0% |
| SEP | 76.3% | 76.3% | 0.0% | 98.3% | 98.3% | 0.0% | 25.4% | 25.4% | 0.0% | 59.3% | 59.3% | 0.0% |
| OCT | 78.0% | 78.0% | 0.0% | 93.2% | 93.2% | 0.0% | 32.2% | 32.2% | 0.0% | 66.1% | 66.1% | 0.0% |
| NOV | 89.8% | 89.8% | 0.0% | 100.0% | 100.0% | 0.0% | 39.0% | 39.0% | 0.0% | 67.8% | 67.8% | 0.0% |
| DEC | 94.9% | 94.9% | 0.0% | 100.0% | 100.0% | 0.0% | 45.8% | 45.8% | 0.0% | 72.9% | 72.9% | 0.0% |
| Annual | 100.0% | 100.0% | 0.0% | 100.0% | 100.0% | 0.0% | 39.0% | 39.0% | 0.0% | 76.3% | 71.2% | -5.1% |

*Table 3.10D* above shows that although the Excess Flows strategy has no monthly impacts to the frequency of the target and critical flow levels being met, it does have a negative impact of approximately five percent on the frequency of meeting the Matagorda Bay critical freshwater inflow level on an annual basis. The instream flows were analyzed at the Wharton County control point (CP K20000) for this strategy because the strategy occurs downstream of the J10000 control point the rest of the strategies were analyzed at. Target instream flow levels were available at this control point from the LCRA Water Management Plan, but there are no stated critical flow levels at this point. As such, the listed critical levels for the J10000 control point were used for comparison purposes only.

**Table 3.10E Excess Flows Flow Duration Below Target and Critical Needs for 2060**

| | Excess Flows Strategy at CP K20000 (Wharton County) | | | Excess Flows Strategy at CP M10000 (Matagorda Bay) | | |
|---|---|---|---|---|---|---|
| **Condition** | **Without Strategy** | **With Strategy** | **Difference** | **Without Strategy** | **With Strategy** | **Difference** |
| Number of Times Flow Falls Below **Target** Level | 62 | 62 | 0 | 85 | 85 | 0 |
| Maximum Duration Below **Target** Level (months) | 5 | 5 | 0 | 51 | 51 | 0 |
| Total Duration Below **Target** Level (months) | 93 | 93 | 0 | 506 | 506 | 0 |
| Average Duration Below **Target** Level (months) | 2 | 2 | 0 | 6 | 6 | 0 |
| Average Volume of Flow Per Event Below **Target** Level (Ac-Ft) | 10,977 | 10,979 | 2 | 503,853 | 504,827 | 974 |
| Number of Times Flow Falls Below **Critical** Level | 30 | 30 | 0 | 92 | 93 | 1 |
| Maximum Duration Below **Critical** Level (months) | 2 | 2 | 0 | 11 | 11 | 0 |
| Total Duration Below **Critical** Level (months) | 38 | 38 | 0 | 263 | 261 | -2 |
| Average Duration Below **Critical** Level (months) | 1 | 1 | 0 | 3 | 3 | 0 |
| Average Volume of Flow Per Event Below **Critical** Level (Ac-Ft) | 8,177 | 8,224 | 47 | 67,895 | 67,032 | -863 |

*Table 3.10E* shows that the Excess Flows strategy does have a small impact on the number, duration, and volume of occurrences below the target/critical flow levels. The negative impacts are small increases in the average volume of flow below the target/critical flow levels, and an increase in the number of times the freshwater inflow fell below the target level (92 to 93).




# Location of All Control Points Analyzed for Environmental Impacts

**Environmental Impacts of LCRA Contract Expansion**

### 2010 Freshwater Inflows to Matagorda Bay

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 114,000 | 43 | 72.9% | 43 | 72.9% | 0.0% |
| **MBHE 2** | 168,700 | 41 | 69.5% | 41 | 69.5% | 0.0% |
| **MBHE 3** | 246,200 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| **MBHE 4** | 433,200 | 28 | 47.5% | 28 | 47.5% | 0.0% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 81,000 | 34 | 57.6% | 34 | 57.6% | 0.0% |
| **MBHE 2** | 119,900 | 29 | 49.2% | 29 | 49.2% | 0.0% |
| **MBHE 3** | 175,000 | 20 | 33.9% | 20 | 33.9% | 0.0% |
| **MBHE 4** | 307,800 | 13 | 22.0% | 13 | 22.0% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 105,000 | 52 | 88.1% | 52 | 88.1% | 0.0% |
| **MBHE 2** | 155,400 | 45 | 76.3% | 45 | 76.3% | 0.0% |
| **MBHE 3** | 226,800 | 40 | 67.8% | 40 | 67.8% | 0.0% |
| **MBHE 4** | 399,000 | 31 | 52.5% | 31 | 52.5% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| **THRESHOLD** | 15,000 | 546 | 77.1% | 546 | 77.1% | 0.0% |

### 2060 Freshwater Inflows to Matagorda Bay

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 114,000 | 48 | 81.4% | 46 | 78.0% | -3.4% |
| **MBHE 2** | 168,700 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 3** | 246,200 | 35 | 59.3% | 37 | 62.7% | 3.4% |
| **MBHE 4** | 433,200 | 22 | 37.3% | 22 | 37.3% | 0.0% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 81,000 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| **MBHE 2** | 119,900 | 31 | 52.5% | 30 | 50.8% | -1.7% |
| **MBHE 3** | 175,000 | 19 | 32.2% | 17 | 28.8% | -3.4% |
| **MBHE 4** | 307,800 | 11 | 18.6% | 11 | 18.6% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 105,000 | 53 | 89.8% | 54 | 91.5% | 1.7% |
| **MBHE 2** | 155,400 | 46 | 78.0% | 45 | 76.3% | -1.7% |
| **MBHE 3** | 226,800 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 4** | 399,000 | 32 | 54.2% | 32 | 54.2% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| **THRESHOLD** | 15,000 | 540 | 76.3% | 530 | 74.9% | -1.4% |

**2010 Colorado River Instream Flow Analysis**

| 2010 CP K10000 Matagorda Co. | | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| | JAN | 19,369 | 91.5% | 91.5% | 0.0% | 30,252 | 74.6% | 74.6% | 0.0% | 51,527 | 57.6% | 57.6% | 0.0% |
| | FEB | 16,828 | 93.2% | 93.2% | 0.0% | 33,156 | 76.3% | 76.3% | 0.0% | 50,317 | 61.0% | 61.0% | 0.0% |
| | MAR | 12,543 | 100.0% | 100.0% | 0.0% | 32,650 | 79.7% | 79.7% | 0.0% | 63,701 | 50.8% | 50.8% | 0.0% |
| | APR | 16,066 | 79.7% | 79.7% | 0.0% | 33,382 | 57.6% | 57.6% | 0.0% | 60,159 | 52.5% | 52.5% | 0.0% |
| | MAY | 18,692 | 83.1% | 83.1% | 0.0% | 60,565 | 61.0% | 61.0% | 0.0% | 85,898 | 59.3% | 59.3% | 0.0% |
| | JUN | 22,076 | 62.7% | 62.7% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 42.4% | 42.4% | 0.0% |
| | JUL | 13,035 | 42.4% | 42.4% | 0.0% | 35,478 | 32.2% | 32.2% | 0.0% | 55,708 | 32.2% | 32.2% | 0.0% |
| | AUG | 6,579 | 74.6% | 74.6% | 0.0% | 19,307 | 35.6% | 35.6% | 0.0% | 32,097 | 25.4% | 25.4% | 0.0% |
| | SEP | 11,187 | 66.1% | 66.1% | 0.0% | 24,397 | 50.8% | 50.8% | 0.0% | 36,714 | 44.1% | 44.1% | 0.0% |
| | OCT | 9,039 | 88.1% | 88.1% | 0.0% | 22,136 | 74.6% | 74.6% | 0.0% | 46,054 | 55.9% | 55.9% | 0.0% |
| | NOV | 10,294 | 100.0% | 100.0% | 0.0% | 28,919 | 74.6% | 74.6% | 0.0% | 45,461 | 49.2% | 49.2% | 0.0% |
| | DEC | 12,420 | 98.3% | 98.3% | 0.0% | 28,899 | 78.0% | 78.0% | 0.0% | 45,870 | 64.4% | 64.4% | 0.0% |

| 2010 CP K20000 Wharton Co. | | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| | JAN | 19,369 | 91.5% | 91.5% | 0.0% | 30,252 | 74.6% | 74.6% | 0.0% | 51,527 | 52.5% | 52.5% | 0.0% |
| | FEB | 16,828 | 91.5% | 91.5% | 0.0% | 33,156 | 72.9% | 72.9% | 0.0% | 50,317 | 57.6% | 57.6% | 0.0% |
| | MAR | 12,543 | 100.0% | 100.0% | 0.0% | 32,650 | 86.4% | 86.4% | 0.0% | 63,701 | 49.2% | 49.2% | 0.0% |
| | APR | 16,066 | 91.5% | 91.5% | 0.0% | 33,382 | 64.4% | 64.4% | 0.0% | 60,159 | 54.2% | 54.2% | 0.0% |
| | MAY | 18,692 | 100.0% | 100.0% | 0.0% | 60,565 | 62.7% | 62.7% | 0.0% | 85,898 | 61.0% | 61.0% | 0.0% |
| | JUN | 22,076 | 93.2% | 93.2% | 0.0% | 58,552 | 50.8% | 50.8% | 0.0% | 89,970 | 45.8% | 45.8% | 0.0% |
| | JUL | 13,035 | 98.3% | 98.3% | 0.0% | 35,478 | 40.7% | 40.7% | 0.0% | 55,708 | 30.5% | 30.5% | 0.0% |
| | AUG | 6,579 | 98.3% | 98.3% | 0.0% | 19,307 | 84.7% | 84.7% | 0.0% | 32,097 | 49.2% | 49.2% | 0.0% |
| | SEP | 11,187 | 93.2% | 93.2% | 0.0% | 24,397 | 61.0% | 61.0% | 0.0% | 36,714 | 49.2% | 49.2% | 0.0% |
| | OCT | 9,039 | 91.5% | 91.5% | 0.0% | 22,136 | 74.6% | 74.6% | 0.0% | 46,054 | 50.8% | 50.8% | 0.0% |
| | NOV | 10,294 | 100.0% | 100.0% | 0.0% | 28,919 | 74.6% | 74.6% | 0.0% | 45,461 | 44.1% | 44.1% | 0.0% |
| | DEC | 12,420 | 98.3% | 98.3% | 0.0% | 28,899 | 79.7% | 79.7% | 0.0% | 45,870 | 54.2% | 54.2% | 0.0% |

**2010 Colorado River Instream Flow Analysis**

| 2010 CP J10000 Colorado Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 20,906 | 86.4% | 86.4% | 0.0% | 29,944 | 69.5% | 69.5% | 0.0% | 50,912 | 44.1% | 44.1% | 0.0% |
| FEB | 20,826 | 81.4% | 81.4% | 0.0% | 32,767 | 64.4% | 64.4% | 0.0% | 49,706 | 50.8% | 50.8% | 0.0% |
| MAR | 23,058 | 100.0% | 100.0% | 0.0% | 32,281 | 81.4% | 81.4% | 0.0% | 62,717 | 47.5% | 47.5% | 0.0% |
| APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 86.4% | 86.4% | 0.0% | 58,136 | 50.8% | 50.8% | 0.0% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 89.8% | 89.8% | 0.0% | 80,918 | 72.9% | 72.9% | 0.0% |
| JUN | 31,775 | 100.0% | 100.0% | 0.0% | 57,540 | 96.6% | 96.6% | 0.0% | 85,686 | 67.8% | 67.8% | 0.0% |
| JUL | 21,029 | 100.0% | 100.0% | 0.0% | 35,048 | 98.3% | 98.3% | 0.0% | 55,031 | 86.4% | 86.4% | 0.0% |
| AUG | 11,683 | 100.0% | 100.0% | 0.0% | 19,061 | 100.0% | 100.0% | 0.0% | 31,728 | 96.6% | 96.6% | 0.0% |
| SEP | 16,602 | 100.0% | 100.0% | 0.0% | 24,099 | 98.3% | 98.3% | 0.0% | 36,298 | 91.5% | 91.5% | 0.0% |
| OCT | 11,683 | 100.0% | 100.0% | 0.0% | 21,890 | 89.8% | 89.8% | 0.0% | 45,562 | 55.9% | 55.9% | 0.0% |
| NOV | 12,020 | 94.9% | 94.9% | 0.0% | 28,562 | 62.7% | 62.7% | 0.0% | 44,926 | 42.4% | 42.4% | 0.0% |
| DEC | 18,508 | 88.1% | 88.1% | 0.0% | 28,530 | 74.6% | 74.6% | 0.0% | 45,316 | 44.1% | 44.1% | 0.0% |

| 2010 CP J30000 Bastrop Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 12,789 | 86.4% | 86.4% | 0.0% | 19,246 | 69.5% | 69.5% | 0.0% | 26,624 | 47.5% | 47.5% | 0.0% |
| FEB | 15,217 | 83.1% | 83.1% | 0.0% | 17,605 | 83.1% | 83.1% | 0.0% | 27,602 | 57.6% | 57.6% | 0.0% |
| MAR | 16,848 | 100.0% | 100.0% | 0.0% | 16,848 | 100.0% | 100.0% | 0.0% | 30,559 | 81.4% | 81.4% | 0.0% |
| APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 66.1% | 66.1% | 0.0% |
| MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 91.5% | 0.0% | 50,666 | 88.1% | 88.1% | 0.0% |
| JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 96.6% | 96.6% | 0.0% |
| JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 98.3% | 98.3% | 0.0% | 37,507 | 94.9% | 94.9% | 0.0% |
| AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 100.0% | 100.0% | 0.0% | 23,427 | 100.0% | 100.0% | 0.0% |
| SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 98.3% | 98.3% | 0.0% | 25,170 | 83.1% | 83.1% | 0.0% |
| OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 96.6% | 96.6% | 0.0% | 26,624 | 74.6% | 74.6% | 0.0% |
| NOV | 10,711 | 94.9% | 94.9% | 0.0% | 16,840 | 81.4% | 81.4% | 0.0% | 25,230 | 52.5% | 52.5% | 0.0% |
| DEC | 11,437 | 89.8% | 89.8% | 0.0% | 19,123 | 78.0% | 78.0% | 0.0% | 27,669 | 54.2% | 54.2% | 0.0% |

**2060 Colorado River Instream Flow Analysis**

| 2060 CP K10000 Matagorda Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 19,369 | 86.4% | 89.8% | 3.4% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 64.4% | 64.4% | 0.0% |
| FEB | 16,828 | 91.5% | 91.5% | 0.0% | 33,156 | 81.4% | 81.4% | 0.0% | 50,317 | 67.8% | 67.8% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 89.8% | 89.8% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 86.4% | 84.7% | -1.7% | 33,382 | 66.1% | 67.8% | 1.7% | 60,159 | 44.1% | 47.5% | 3.4% |
| MAY | 18,692 | 81.4% | 79.7% | -1.7% | 60,565 | 54.2% | 55.9% | 1.7% | 85,898 | 47.5% | 45.8% | -1.7% |
| JUN | 22,076 | 71.2% | 71.2% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 39.0% | 39.0% | 0.0% |
| JUL | 13,035 | 52.5% | 69.5% | 16.9% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 32.2% | 3.4% |
| AUG | 6,579 | 72.9% | 98.3% | 25.4% | 19,307 | 39.0% | 44.1% | 5.1% | 32,097 | 27.1% | 30.5% | 3.4% |
| SEP | 11,187 | 71.2% | 76.3% | 5.1% | 24,397 | 61.0% | 59.3% | -1.7% | 36,714 | 59.3% | 59.3% | 0.0% |
| OCT | 9,039 | 89.8% | 91.5% | 1.7% | 22,136 | 76.3% | 74.6% | -1.7% | 46,054 | 55.9% | 55.9% | 0.0% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 78.0% | 79.7% | 1.7% | 45,461 | 64.4% | 64.4% | 0.0% |
| DEC | 12,420 | 100.0% | 100.0% | 0.0% | 28,899 | 83.1% | 83.1% | 0.0% | 45,870 | 62.7% | 66.1% | 3.4% |

| 2060 CP K20000 Wharton Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 19,369 | 84.7% | 86.4% | 1.7% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 54.2% | 57.6% | 3.4% |
| FEB | 16,828 | 89.8% | 89.8% | 0.0% | 33,156 | 76.3% | 76.3% | 0.0% | 50,317 | 59.3% | 61.0% | 1.7% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 93.2% | 91.5% | -1.7% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 96.6% | 91.5% | -5.1% | 33,382 | 71.2% | 72.9% | 1.7% | 60,159 | 47.5% | 49.2% | 1.7% |
| MAY | 18,692 | 93.2% | 94.9% | 1.7% | 60,565 | 59.3% | 59.3% | 0.0% | 85,898 | 49.2% | 49.2% | 0.0% |
| JUN | 22,076 | 88.1% | 93.2% | 5.1% | 58,552 | 57.6% | 57.6% | 0.0% | 89,970 | 40.7% | 40.7% | 0.0% |
| JUL | 13,035 | 94.9% | 98.3% | 3.4% | 35,478 | 40.7% | 44.1% | 3.4% | 55,708 | 30.5% | 28.8% | -1.7% |
| AUG | 6,579 | 96.6% | 98.3% | 1.7% | 19,307 | 64.4% | 81.4% | 16.9% | 32,097 | 32.2% | 44.1% | 11.9% |
| SEP | 11,187 | 91.5% | 94.9% | 3.4% | 24,397 | 62.7% | 64.4% | 1.7% | 36,714 | 57.6% | 57.6% | 0.0% |
| OCT | 9,039 | 91.5% | 93.2% | 1.7% | 22,136 | 76.3% | 74.6% | -1.7% | 46,054 | 54.2% | 54.2% | 0.0% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 76.3% | 78.0% | 1.7% | 45,461 | 54.2% | 54.2% | 0.0% |
| DEC | 12,420 | 96.6% | 96.6% | 0.0% | 28,899 | 81.4% | 81.4% | 0.0% | 45,870 | 59.3% | 59.3% | 0.0% |

**2060 Colorado River Instream Flow Analysis**

| 2060 CP J10000 Colorado Co. | | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| | JAN | 20,906 | 81.4% | 81.4% | 0.0% | 29,944 | 72.9% | 72.9% | 0.0% | 50,912 | 44.1% | 45.8% | 1.7% |
| | FEB | 20,826 | 83.1% | 84.7% | 1.7% | 32,767 | 74.6% | 74.6% | 0.0% | 49,706 | 54.2% | 54.2% | 0.0% |
| | MAR | 23,058 | 98.3% | 98.3% | 0.0% | 32,281 | 88.1% | 86.4% | -1.7% | 62,717 | 42.4% | 42.4% | 0.0% |
| | APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 74.6% | -1.7% | 58,136 | 49.2% | 49.2% | 0.0% |
| | MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 81.4% | 3.4% | 80,918 | 57.6% | 57.6% | 0.0% |
| | JUN | 31,775 | 98.3% | 98.3% | 0.0% | 57,540 | 83.1% | 89.8% | 6.8% | 85,686 | 57.6% | 59.3% | 1.7% |
| | JUL | 21,029 | 98.3% | 98.3% | 0.0% | 35,048 | 91.5% | 96.6% | 5.1% | 55,031 | 50.8% | 64.4% | 13.6% |
| | AUG | 11,683 | 98.3% | 98.3% | 0.0% | 19,061 | 98.3% | 98.3% | 0.0% | 31,728 | 83.1% | 91.5% | 8.5% |
| | SEP | 16,602 | 98.3% | 100.0% | 1.7% | 24,099 | 94.9% | 98.3% | 3.4% | 36,298 | 74.6% | 81.4% | 6.8% |
| | OCT | 11,683 | 98.3% | 100.0% | 1.7% | 21,890 | 76.3% | 78.0% | 1.7% | 45,562 | 61.0% | 61.0% | 0.0% |
| | NOV | 12,020 | 89.8% | 89.8% | 0.0% | 28,562 | 61.0% | 66.1% | 5.1% | 44,926 | 47.5% | 49.2% | 1.7% |
| | DEC | 18,508 | 84.7% | 84.7% | 0.0% | 28,530 | 76.3% | 78.0% | 1.7% | 45,316 | 49.2% | 49.2% | 0.0% |

| 2060 CP J30000 Bastrop Co. | | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| | JAN | 12,789 | 84.7% | 88.1% | 3.4% | 19,246 | 69.5% | 72.9% | 3.4% | 26,624 | 52.5% | 55.9% | 3.4% |
| | FEB | 15,217 | 84.7% | 83.1% | -1.7% | 17,605 | 78.0% | 79.7% | 1.7% | 27,602 | 62.7% | 64.4% | 1.7% |
| | MAR | 16,848 | 98.3% | 98.3% | 0.0% | 16,848 | 98.3% | 98.3% | 0.0% | 30,559 | 81.4% | 84.7% | 3.4% |
| | APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 59.3% | 1.7% |
| | MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 91.5% | 0.0% | 50,666 | 81.4% | 81.4% | 0.0% |
| | JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 93.2% | 3.4% |
| | JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 94.9% | 94.9% | 0.0% | 37,507 | 79.7% | 83.1% | 3.4% |
| | AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 98.3% | 0.0% | 23,427 | 98.3% | 98.3% | 0.0% |
| | SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 98.3% | 1.7% | 25,170 | 81.4% | 84.7% | 3.4% |
| | OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 93.2% | 3.4% | 26,624 | 66.1% | 67.8% | 1.7% |
| | NOV | 10,711 | 89.8% | 91.5% | 1.7% | 16,840 | 69.5% | 71.2% | 1.7% | 25,230 | 50.8% | 50.8% | 0.0% |
| | DEC | 11,437 | 91.5% | 89.8% | -1.7% | 19,123 | 74.6% | 74.6% | 0.0% | 27,669 | 52.5% | 55.9% | 3.4% |

**2060 Freshwater Inflows to Matagorda Bay**

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 114,000 | 48 | 81.4% | 48 | 81.4% | 0.0% |
| MBHE 2 | 168,700 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| MBHE 3 | 246,200 | 35 | 59.3% | 35 | 59.3% | 0.0% |
| MBHE 4 | 433,200 | 22 | 37.3% | 22 | 37.3% | 0.0% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 81,000 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| MBHE 2 | 119,900 | 31 | 52.5% | 31 | 52.5% | 0.0% |
| MBHE 3 | 175,000 | 19 | 32.2% | 19 | 32.2% | 0.0% |
| MBHE 4 | 307,800 | 11 | 18.6% | 11 | 18.6% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 105,000 | 53 | 89.8% | 53 | 89.8% | 0.0% |
| MBHE 2 | 155,400 | 46 | 78.0% | 45 | 76.3% | -1.7% |
| MBHE 3 | 226,800 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| MBHE 4 | 399,000 | 32 | 54.2% | 32 | 54.2% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| THRESHOLD | 15,000 | 540 | 76.3% | 540 | 76.3% | 0.0% |

**Colorado River Instream Flow Analysis**

**2060 CP K10000 Matagorda Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 86.4% | 86.4% | 0.0% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 64.4% | 64.4% | 0.0% |
| FEB | 16,828 | 91.5% | 91.5% | 0.0% | 33,156 | 81.4% | 81.4% | 0.0% | 50,317 | 67.8% | 67.8% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 89.8% | 89.8% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 86.4% | 86.4% | 0.0% | 33,382 | 66.1% | 66.1% | 0.0% | 60,159 | 44.1% | 44.1% | 0.0% |
| MAY | 18,692 | 81.4% | 81.4% | 0.0% | 60,565 | 54.2% | 54.2% | 0.0% | 85,898 | 47.5% | 45.8% | -1.7% |
| JUN | 22,076 | 71.2% | 71.2% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 39.0% | 39.0% | 0.0% |
| JUL | 13,035 | 52.5% | 52.5% | 0.0% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 28.8% | 0.0% |
| AUG | 6,579 | 72.9% | 72.9% | 0.0% | 19,307 | 39.0% | 39.0% | 0.0% | 32,097 | 27.1% | 27.1% | 0.0% |
| SEP | 11,187 | 71.2% | 71.2% | 0.0% | 24,397 | 61.0% | 61.0% | 0.0% | 36,714 | 59.3% | 59.3% | 0.0% |
| OCT | 9,039 | 89.8% | 89.8% | 0.0% | 22,136 | 76.3% | 76.3% | 0.0% | 46,054 | 55.9% | 55.9% | 0.0% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 78.0% | 78.0% | 0.0% | 45,461 | 64.4% | 64.4% | 0.0% |
| DEC | 12,420 | 100.0% | 100.0% | 0.0% | 28,899 | 83.1% | 83.1% | 0.0% | 45,870 | 62.7% | 62.7% | 0.0% |

**2060 CP K20000 Wharton Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 84.7% | 0.0% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 54.2% | 54.2% | 0.0% |
| FEB | 16,828 | 89.8% | 89.8% | 0.0% | 33,156 | 76.3% | 76.3% | 0.0% | 50,317 | 59.3% | 59.3% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 93.2% | 93.2% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 96.6% | 96.6% | 0.0% | 33,382 | 71.2% | 71.2% | 0.0% | 60,159 | 47.5% | 47.5% | 0.0% |
| MAY | 18,692 | 93.2% | 93.2% | 0.0% | 60,565 | 59.3% | 59.3% | 0.0% | 85,898 | 49.2% | 49.2% | 0.0% |
| JUN | 22,076 | 88.1% | 88.1% | 0.0% | 58,552 | 57.6% | 57.6% | 0.0% | 89,970 | 40.7% | 40.7% | 0.0% |
| JUL | 13,035 | 94.9% | 94.9% | 0.0% | 35,478 | 40.7% | 40.7% | 0.0% | 55,708 | 30.5% | 30.5% | 0.0% |
| AUG | 6,579 | 96.6% | 96.6% | 0.0% | 19,307 | 64.4% | 64.4% | 0.0% | 32,097 | 32.2% | 32.2% | 0.0% |
| SEP | 11,187 | 91.5% | 91.5% | 0.0% | 24,397 | 62.7% | 62.7% | 0.0% | 36,714 | 57.6% | 55.9% | -1.7% |
| OCT | 9,039 | 91.5% | 91.5% | 0.0% | 22,136 | 76.3% | 76.3% | 0.0% | 46,054 | 54.2% | 54.2% | 0.0% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 76.3% | 76.3% | 0.0% | 45,461 | 54.2% | 54.2% | 0.0% |
| DEC | 12,420 | 96.6% | 96.6% | 0.0% | 28,899 | 81.4% | 81.4% | 0.0% | 45,870 | 59.3% | 59.3% | 0.0% |

**Colorado River Instream Flow Analysis**

**2060**
**CP J10000**
**Colorado Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 20,906 | 81.4% | 81.4% | 0.0% | 29,944 | 72.9% | 71.2% | -1.7% | 50,912 | 44.1% | 44.1% | 0.0% |
| FEB | 20,826 | 83.1% | 83.1% | 0.0% | 32,767 | 74.6% | 74.6% | 0.0% | 49,706 | 54.2% | 54.2% | 0.0% |
| MAR | 23,058 | 98.3% | 98.3% | 0.0% | 32,281 | 88.1% | 88.1% | 0.0% | 62,717 | 42.4% | 42.4% | 0.0% |
| APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 76.3% | 0.0% | 58,136 | 49.2% | 49.2% | 0.0% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 78.0% | 0.0% | 80,918 | 57.6% | 57.6% | 0.0% |
| JUN | 31,775 | 98.3% | 98.3% | 0.0% | 57,540 | 83.1% | 83.1% | 0.0% | 85,686 | 57.6% | 57.6% | 0.0% |
| JUL | 21,029 | 98.3% | 98.3% | 0.0% | 35,048 | 91.5% | 91.5% | 0.0% | 55,031 | 50.8% | 50.8% | 0.0% |
| AUG | 11,683 | 98.3% | 98.3% | 0.0% | 19,061 | 98.3% | 98.3% | 0.0% | 31,728 | 83.1% | 83.1% | 0.0% |
| SEP | 16,602 | 98.3% | 98.3% | 0.0% | 24,099 | 94.9% | 94.9% | 0.0% | 36,298 | 74.6% | 72.9% | -1.7% |
| OCT | 11,683 | 98.3% | 98.3% | 0.0% | 21,890 | 76.3% | 76.3% | 0.0% | 45,562 | 61.0% | 61.0% | 0.0% |
| NOV | 12,020 | 89.8% | 89.8% | 0.0% | 28,562 | 61.0% | 61.0% | 0.0% | 44,926 | 47.5% | 47.5% | 0.0% |
| DEC | 18,508 | 84.7% | 84.7% | 0.0% | 28,530 | 76.3% | 76.3% | 0.0% | 45,316 | 49.2% | 49.2% | 0.0% |

**2060**
**CP J30000**
**Bastrop Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 12,789 | 84.7% | 81.4% | -3.4% | 19,246 | 69.5% | 66.1% | -3.4% | 26,624 | 52.5% | 49.2% | -3.4% |
| FEB | 15,217 | 84.7% | 83.1% | -1.7% | 17,605 | 78.0% | 76.3% | -1.7% | 27,602 | 62.7% | 57.6% | -5.1% |
| MAR | 16,848 | 98.3% | 98.3% | 0.0% | 16,848 | 98.3% | 98.3% | 0.0% | 30,559 | 81.4% | 79.7% | -1.7% |
| APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 57.6% | 0.0% |
| MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 91.5% | 0.0% | 50,666 | 81.4% | 81.4% | 0.0% |
| JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 89.8% | 0.0% |
| JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 94.9% | 94.9% | 0.0% | 37,507 | 79.7% | 79.7% | 0.0% |
| AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 98.3% | 0.0% | 23,427 | 98.3% | 98.3% | 0.0% |
| SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 94.9% | -1.7% | 25,170 | 81.4% | 81.4% | 0.0% |
| OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 89.8% | 0.0% | 26,624 | 66.1% | 66.1% | 0.0% |
| NOV | 10,711 | 89.8% | 89.8% | 0.0% | 16,840 | 69.5% | 69.5% | 0.0% | 25,230 | 50.8% | 50.8% | 0.0% |
| DEC | 11,437 | 91.5% | 89.8% | -1.7% | 19,123 | 74.6% | 74.6% | 0.0% | 27,669 | 52.5% | 52.5% | 0.0% |

# Environmental Impacts of LCRA-SAWS Water Project (LSWP)

## 2060 Freshwater Inflows to Matagorda Bay

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 114,000 | 48 | 81.4% | 46 | 78.0% | -3.4% |
| **MBHE 2** | 168,700 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 3** | 246,200 | 35 | 59.3% | 34 | 57.6% | -1.7% |
| **MBHE 4** | 433,200 | 22 | 37.3% | 20 | 33.9% | -3.4% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 81,000 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| **MBHE 2** | 119,900 | 31 | 52.5% | 32 | 54.2% | 1.7% |
| **MBHE 3** | 175,000 | 19 | 32.2% | 20 | 33.9% | 1.7% |
| **MBHE 4** | 307,800 | 11 | 18.6% | 11 | 18.6% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 105,000 | 53 | 89.8% | 55 | 93.2% | 3.4% |
| **MBHE 2** | 155,400 | 46 | 78.0% | 46 | 78.0% | 0.0% |
| **MBHE 3** | 226,800 | 39 | 66.1% | 38 | 64.4% | -1.7% |
| **MBHE 4** | 399,000 | 32 | 54.2% | 29 | 49.2% | -5.1% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| **THRESHOLD** | 15,000 | 540 | 76.3% | 565 | 79.8% | 3.5% |

**Environmental Impacts of LCRA-SAWS Water Project (LSWP)**

**2060 Colorado River Instream Flow Analysis**

**2060 CP K10000 Matagorda Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 86.4% | 93.2% | 6.8% | 30,252 | 78.0% | 74.6% | -3.4% | 51,527 | 64.4% | 61.0% | -3.4% |
| FEB | 16,828 | 91.5% | 98.3% | 6.8% | 33,156 | 81.4% | 86.4% | 5.1% | 50,317 | 67.8% | 62.7% | -5.1% |
| MAR | 12,543 | 98.3% | 100.0% | 1.7% | 32,650 | 89.8% | 84.7% | -5.1% | 63,701 | 44.1% | 42.4% | -1.7% |
| APR | 16,066 | 86.4% | 86.4% | 0.0% | 33,382 | 66.1% | 59.3% | -6.8% | 60,159 | 44.1% | 47.5% | 3.4% |
| MAY | 18,692 | 81.4% | 86.4% | 5.1% | 60,565 | 54.2% | 57.6% | 3.4% | 85,898 | 47.5% | 49.2% | 1.7% |
| JUN | 22,076 | 71.2% | 71.2% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 39.0% | 39.0% | 0.0% |
| JUL | 13,035 | 52.5% | 62.7% | 10.2% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 28.8% | 0.0% |
| AUG | 6,579 | 72.9% | 69.5% | -3.4% | 19,307 | 39.0% | 37.3% | -1.7% | 32,097 | 27.1% | 25.4% | -1.7% |
| SEP | 11,187 | 71.2% | 91.5% | 20.3% | 24,397 | 61.0% | 86.4% | 25.4% | 36,714 | 59.3% | 67.8% | 8.5% |
| OCT | 9,039 | 89.8% | 98.3% | 8.5% | 22,136 | 76.3% | 86.4% | 10.2% | 46,054 | 55.9% | 57.6% | 1.7% |
| NOV | 10,294 | 96.6% | 98.3% | 1.7% | 28,919 | 78.0% | 74.6% | -3.4% | 45,461 | 64.4% | 57.6% | -6.8% |
| DEC | 12,420 | 100.0% | 94.9% | -5.1% | 28,899 | 83.1% | 79.7% | -3.4% | 45,870 | 62.7% | 59.3% | -3.4% |

**2060 CP K20000 Wharton Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 93.2% | 8.5% | 30,252 | 78.0% | 76.3% | -1.7% | 51,527 | 54.2% | 49.2% | -5.1% |
| FEB | 16,828 | 89.8% | 98.3% | 8.5% | 33,156 | 76.3% | 81.4% | 5.1% | 50,317 | 59.3% | 54.2% | -5.1% |
| MAR | 12,543 | 98.3% | 100.0% | 1.7% | 32,650 | 93.2% | 83.1% | -10.2% | 63,701 | 44.1% | 39.0% | -5.1% |
| APR | 16,066 | 96.6% | 91.5% | -5.1% | 33,382 | 71.2% | 62.7% | -8.5% | 60,159 | 47.5% | 47.5% | 0.0% |
| MAY | 18,692 | 93.2% | 89.8% | -3.4% | 60,565 | 59.3% | 59.3% | 0.0% | 85,898 | 49.2% | 47.5% | -1.7% |
| JUN | 22,076 | 88.1% | 79.7% | -8.5% | 58,552 | 57.6% | 55.9% | -1.7% | 89,970 | 40.7% | 39.0% | -1.7% |
| JUL | 13,035 | 94.9% | 91.5% | -3.4% | 35,478 | 40.7% | 37.3% | -3.4% | 55,708 | 30.5% | 28.8% | -1.7% |
| AUG | 6,579 | 96.6% | 96.6% | 0.0% | 19,307 | 64.4% | 55.9% | -8.5% | 32,097 | 32.2% | 25.4% | -6.8% |
| SEP | 11,187 | 91.5% | 96.6% | 5.1% | 24,397 | 62.7% | 81.4% | 18.6% | 36,714 | 57.6% | 66.1% | 8.5% |
| OCT | 9,039 | 91.5% | 98.3% | 6.8% | 22,136 | 76.3% | 84.7% | 8.5% | 46,054 | 54.2% | 52.5% | -1.7% |
| NOV | 10,294 | 96.6% | 98.3% | 1.7% | 28,919 | 76.3% | 76.3% | 0.0% | 45,461 | 54.2% | 49.2% | -5.1% |
| DEC | 12,420 | 96.6% | 94.9% | -1.7% | 28,899 | 81.4% | 78.0% | -3.4% | 45,870 | 59.3% | 52.5% | -6.8% |

# Environmental Impacts of LCRA-SAWS Water Project (LSWP)

**2060 Colorado River Instream Flow Analysis**

**2060**
**CP J10000**
**Colorado Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 20,906 | 81.4% | 94.9% | 13.6% | 29,944 | 72.9% | 69.5% | -3.4% | 50,912 | 44.1% | 45.8% | 1.7% |
| FEB | 20,826 | 83.1% | 98.3% | 15.3% | 32,767 | 74.6% | 72.9% | -1.7% | 49,706 | 54.2% | 54.2% | 0.0% |
| MAR | 23,058 | 98.3% | 100.0% | 1.7% | 32,281 | 88.1% | 93.2% | 5.1% | 62,717 | 42.4% | 40.7% | -1.7% |
| APR | 17,792 | 100.0% | 98.3% | -1.7% | 32,965 | 76.3% | 71.2% | -5.1% | 58,136 | 49.2% | 50.8% | 1.7% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 81.4% | 3.4% | 80,918 | 57.6% | 62.7% | 5.1% |
| JUN | 31,775 | 98.3% | 100.0% | 1.7% | 57,540 | 83.1% | 72.9% | -10.2% | 85,686 | 57.6% | 54.2% | -3.4% |
| JUL | 21,029 | 98.3% | 100.0% | 1.7% | 35,048 | 91.5% | 64.4% | -27.1% | 55,031 | 50.8% | 33.9% | -16.9% |
| AUG | 11,683 | 98.3% | 98.3% | 0.0% | 19,061 | 98.3% | 86.4% | -11.9% | 31,728 | 83.1% | 47.5% | -35.6% |
| SEP | 16,602 | 98.3% | 98.3% | 0.0% | 24,099 | 94.9% | 81.4% | -13.6% | 36,298 | 74.6% | 49.2% | -25.4% |
| OCT | 11,683 | 98.3% | 98.3% | 0.0% | 21,890 | 76.3% | 78.0% | 1.7% | 45,562 | 61.0% | 52.5% | -8.5% |
| NOV | 12,020 | 89.8% | 100.0% | 10.2% | 28,562 | 61.0% | 61.0% | 0.0% | 44,926 | 47.5% | 49.2% | 1.7% |
| DEC | 18,508 | 84.7% | 94.9% | 10.2% | 28,530 | 76.3% | 72.9% | -3.4% | 45,316 | 49.2% | 47.5% | -1.7% |

**2060**
**CP J30000**
**Bastrop Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 12,789 | 84.7% | 94.9% | 10.2% | 19,246 | 69.5% | 79.7% | 10.2% | 26,624 | 52.5% | 49.2% | -3.4% |
| FEB | 15,217 | 84.7% | 96.6% | 11.9% | 17,605 | 78.0% | 89.8% | 11.9% | 27,602 | 62.7% | 76.3% | 13.6% |
| MAR | 16,848 | 98.3% | 98.3% | 0.0% | 16,848 | 98.3% | 98.3% | 0.0% | 30,559 | 81.4% | 79.7% | -1.7% |
| APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 57.6% | 0.0% |
| MAY | 16,909 | 100.0% | 98.3% | -1.7% | 35,601 | 91.5% | 88.1% | -3.4% | 50,666 | 81.4% | 81.4% | 0.0% |
| JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 81.4% | -8.5% |
| JUL | 8,424 | 100.0% | 98.3% | -1.7% | 21,336 | 94.9% | 89.8% | -5.1% | 37,507 | 79.7% | 54.2% | -25.4% |
| AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 98.3% | 0.0% | 23,427 | 98.3% | 81.4% | -16.9% |
| SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 93.2% | -3.4% | 25,170 | 81.4% | 66.1% | -15.3% |
| OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 91.5% | 1.7% | 26,624 | 66.1% | 59.3% | -6.8% |
| NOV | 10,711 | 89.8% | 98.3% | 8.5% | 16,840 | 69.5% | 76.3% | 6.8% | 25,230 | 50.8% | 54.2% | 3.4% |
| DEC | 11,437 | 91.5% | 100.0% | 8.5% | 19,123 | 74.6% | 79.7% | 5.1% | 27,669 | 52.5% | 50.8% | -1.7% |

**2060 Colorado River Instream Flow Analysis**

**2060**
**CP I10000**
**Travis Co.**

| MONTH | SUBSISTENCE FLOWS | | | |
|---|---|---|---|---|
| | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| **JAN** | 3,074 | 96.6% | 100.0% | 3.4% |
| **FEB** | 2,777 | 98.3% | 100.0% | 1.7% |
| **MAR** | 3,074 | 98.3% | 100.0% | 1.7% |
| **APR** | 2,975 | 100.0% | 100.0% | 0.0% |
| **MAY** | 3,074 | 100.0% | 100.0% | 0.0% |
| **JUN** | 2,975 | 100.0% | 100.0% | 0.0% |
| **JUL** | 3,074 | 100.0% | 100.0% | 0.0% |
| **AUG** | 3,074 | 100.0% | 100.0% | 0.0% |
| **SEP** | 2,975 | 100.0% | 100.0% | 0.0% |
| **OCT** | 3,074 | 100.0% | 100.0% | 0.0% |
| **NOV** | 2,975 | 100.0% | 100.0% | 0.0% |
| **DEC** | 3,074 | 98.3% | 100.0% | 1.7% |

**Environmental Impacts of City of Austin Return Flows and Reuse (Settlement Agreement with LCRA)**

**2010 Freshwater Inflows to Matagorda Bay**

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 114,000 | 43 | 72.9% | 45 | 76.3% | 3.4% |
| MBHE 2 | 168,700 | 41 | 69.5% | 42 | 71.2% | 1.7% |
| MBHE 3 | 246,200 | 38 | 64.4% | 39 | 66.1% | 1.7% |
| MBHE 4 | 433,200 | 28 | 47.5% | 31 | 52.5% | 5.0% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 81,000 | 34 | 57.6% | 37 | 62.7% | 5.1% |
| MBHE 2 | 119,900 | 29 | 49.2% | 31 | 52.5% | 3.3% |
| MBHE 3 | 175,000 | 20 | 33.9% | 22 | 37.3% | 3.4% |
| MBHE 4 | 307,800 | 13 | 22.0% | 13 | 22.0% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 105,000 | 52 | 88.1% | 54 | 91.5% | 3.4% |
| MBHE 2 | 155,400 | 45 | 76.3% | 50 | 84.7% | 8.4% |
| MBHE 3 | 226,800 | 40 | 67.8% | 41 | 69.5% | 1.7% |
| MBHE 4 | 399,000 | 31 | 52.5% | 32 | 54.2% | 1.7% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| THRESHOLD | 15,000 | 546 | 77.1% | 595 | 84.0% | 6.9% |

**2060 Freshwater Inflows to Matagorda Bay**

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 114,000 | 48 | 81.4% | 50 | 84.7% | 3.3% |
| MBHE 2 | 168,700 | 39 | 66.1% | 44 | 74.6% | 8.5% |
| MBHE 3 | 246,200 | 35 | 59.3% | 37 | 62.7% | 3.4% |
| MBHE 4 | 433,200 | 22 | 37.3% | 25 | 42.4% | 5.1% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 81,000 | 38 | 64.4% | 42 | 71.2% | 6.8% |
| MBHE 2 | 119,900 | 31 | 52.5% | 33 | 55.9% | 3.4% |
| MBHE 3 | 175,000 | 19 | 32.2% | 23 | 39.0% | 6.8% |
| MBHE 4 | 307,800 | 11 | 18.6% | 13 | 22.0% | 3.4% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 105,000 | 53 | 89.8% | 59 | 100.0% | 10.2% |
| MBHE 2 | 155,400 | 46 | 78.0% | 54 | 91.5% | 13.6% |
| MBHE 3 | 226,800 | 39 | 66.1% | 44 | 74.6% | 8.5% |
| MBHE 4 | 399,000 | 32 | 54.2% | 32 | 54.2% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| THRESHOLD | 15,000 | 540 | 76.3% | 594 | 83.9% | 7.6% |

**2010 Colorado River Instream Flow Analysis**

| 2010 CP K10000 Matagorda Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 93.2% | 8.5% | 30,252 | 76.3% | 83.1% | 6.8% | 51,527 | 62.7% | 64.4% | 1.7% |
| FEB | 16,828 | 89.8% | 98.3% | 8.5% | 33,156 | 79.7% | 79.7% | 0.0% | 50,317 | 66.1% | 62.7% | -3.4% |
| MAR | 12,543 | 96.6% | 100.0% | 3.4% | 32,650 | 88.1% | 81.4% | -6.7% | 63,701 | 42.4% | 54.2% | 11.8% |
| APR | 16,066 | 84.7% | 86.4% | 1.7% | 33,382 | 64.4% | 61.0% | -3.4% | 60,159 | 42.4% | 52.5% | 10.1% |
| MAY | 18,692 | 81.4% | 88.1% | 6.7% | 60,565 | 54.2% | 62.7% | 8.5% | 85,898 | 47.5% | 62.7% | 15.2% |
| JUN | 22,076 | 71.2% | 67.8% | -3.4% | 58,552 | 47.5% | 52.5% | 5.0% | 89,970 | 39.0% | 44.1% | 5.1% |
| JUL | 13,035 | 52.5% | 91.5% | 39.0% | 35,478 | 39.0% | 32.2% | -6.8% | 55,708 | 28.8% | 32.2% | 3.4% |
| AUG | 6,579 | 71.2% | 100.0% | 28.8% | 19,307 | 37.3% | 39.0% | 1.7% | 32,097 | 25.4% | 30.5% | 5.1% |
| SEP | 11,187 | 69.5% | 78.0% | 8.5% | 24,397 | 59.3% | 57.6% | -1.7% | 36,714 | 57.6% | 45.8% | -11.8% |
| OCT | 9,039 | 88.1% | 100.0% | 11.9% | 22,136 | 74.6% | 79.7% | 5.1% | 46,054 | 54.2% | 55.9% | 1.7% |
| NOV | 10,294 | 94.9% | 100.0% | 5.1% | 28,919 | 76.3% | 83.1% | 6.8% | 45,461 | 62.7% | 54.2% | -8.5% |
| DEC | 12,420 | 98.3% | 100.0% | 1.7% | 28,899 | 81.4% | 84.7% | 3.3% | 45,870 | 61.0% | 72.9% | 11.9% |

| 2010 CP K20000 Wharton Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 91.5% | 6.8% | 30,252 | 78.0% | 83.1% | 5.1% | 51,527 | 54.2% | 59.3% | 5.1% |
| FEB | 16,828 | 89.8% | 98.3% | 8.5% | 33,156 | 76.3% | 83.1% | 6.8% | 50,317 | 59.3% | 61.0% | 1.7% |
| MAR | 12,543 | 98.3% | 100.0% | 1.7% | 32,650 | 93.2% | 84.7% | -8.5% | 63,701 | 44.1% | 54.2% | 10.2% |
| APR | 16,066 | 96.6% | 100.0% | 3.4% | 33,382 | 71.2% | 71.2% | 0.0% | 60,159 | 47.5% | 54.2% | 6.8% |
| MAY | 18,692 | 93.2% | 100.0% | 6.8% | 60,565 | 59.3% | 66.1% | 6.8% | 85,898 | 49.2% | 62.7% | 13.6% |
| JUN | 22,076 | 88.1% | 98.3% | 10.2% | 58,552 | 57.6% | 54.2% | -3.4% | 89,970 | 40.7% | 47.5% | 6.8% |
| JUL | 13,035 | 94.9% | 98.3% | 3.4% | 35,478 | 40.7% | 72.9% | 32.2% | 55,708 | 30.5% | 32.2% | 1.7% |
| AUG | 6,579 | 96.6% | 100.0% | 3.4% | 19,307 | 64.4% | 94.9% | 30.5% | 32,097 | 32.2% | 66.1% | 33.9% |
| SEP | 11,187 | 91.5% | 100.0% | 8.5% | 24,397 | 62.7% | 83.1% | 20.3% | 36,714 | 57.6% | 52.5% | -5.1% |
| OCT | 9,039 | 91.5% | 100.0% | 8.5% | 22,136 | 76.3% | 84.7% | 8.5% | 46,054 | 54.2% | 52.5% | -1.7% |
| NOV | 10,294 | 96.6% | 100.0% | 3.4% | 28,919 | 76.3% | 83.1% | 6.8% | 45,461 | 54.2% | 49.2% | -5.1% |
| DEC | 12,420 | 96.6% | 100.0% | 3.4% | 28,899 | 81.4% | 84.7% | 3.4% | 45,870 | 59.3% | 64.4% | 5.1% |

**2010 Colorado River Instream Flow Analysis**

**2010 CP J10000 Colorado Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 20,906 | 81.4% | 89.8% | 8.5% | 29,944 | 72.9% | 81.4% | 8.5% | 50,912 | 44.1% | 50.8% | 6.8% |
| FEB | 20,826 | 83.1% | 89.8% | 6.8% | 32,767 | 74.6% | 74.6% | 0.0% | 49,706 | 54.2% | 57.6% | 3.4% |
| MAR | 23,058 | 98.3% | 100.0% | 1.7% | 32,281 | 88.1% | 78.0% | -10.2% | 62,717 | 42.4% | 47.5% | 5.1% |
| APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 98.3% | 22.0% | 58,136 | 49.2% | 52.5% | 3.4% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 94.9% | 16.9% | 80,918 | 57.6% | 79.7% | 22.0% |
| JUN | 31,775 | 98.3% | 100.0% | 1.7% | 57,540 | 83.1% | 98.3% | 15.3% | 85,686 | 57.6% | 78.0% | 20.3% |
| JUL | 21,029 | 98.3% | 100.0% | 1.7% | 35,048 | 91.5% | 100.0% | 8.5% | 55,031 | 50.8% | 94.9% | 44.1% |
| AUG | 11,683 | 98.3% | 100.0% | 1.7% | 19,061 | 98.3% | 100.0% | 1.7% | 31,728 | 83.1% | 98.3% | 15.3% |
| SEP | 16,602 | 98.3% | 100.0% | 1.7% | 24,099 | 94.9% | 100.0% | 5.1% | 36,298 | 74.6% | 94.9% | 20.3% |
| OCT | 11,683 | 98.3% | 100.0% | 1.7% | 21,890 | 76.3% | 100.0% | 23.7% | 45,562 | 61.0% | 57.6% | -3.4% |
| NOV | 12,020 | 89.8% | 100.0% | 10.2% | 28,562 | 61.0% | 74.6% | 13.6% | 44,926 | 47.5% | 45.8% | -1.7% |
| DEC | 18,508 | 84.7% | 96.6% | 11.9% | 28,530 | 76.3% | 81.4% | 5.1% | 45,316 | 49.2% | 50.8% | 1.7% |

**2010 CP J30000 Bastrop Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 12,789 | 83.1% | 100.0% | 16.9% | 19,246 | 67.8% | 89.8% | 22.0% | 26,624 | 50.8% | 64.4% | 13.6% |
| FEB | 15,217 | 83.1% | 94.9% | 11.8% | 17,605 | 76.3% | 89.8% | 13.5% | 27,602 | 61.0% | 72.9% | 11.9% |
| MAR | 16,848 | 96.6% | 100.0% | 3.4% | 16,848 | 96.6% | 100.0% | 3.4% | 30,559 | 79.7% | 86.4% | 6.7% |
| APR | 11,127 | 98.3% | 100.0% | 1.7% | 17,078 | 98.3% | 100.0% | 1.7% | 37,785 | 55.9% | 84.7% | 28.8% |
| MAY | 16,909 | 98.3% | 100.0% | 1.7% | 35,601 | 89.8% | 91.5% | 1.7% | 50,666 | 81.4% | 91.5% | 10.1% |
| JUN | 12,020 | 98.3% | 100.0% | 1.7% | 24,873 | 98.3% | 100.0% | 1.7% | 43,617 | 88.1% | 98.3% | 10.2% |
| JUL | 8,424 | 98.3% | 100.0% | 1.7% | 21,336 | 93.2% | 100.0% | 6.8% | 37,507 | 78.0% | 96.6% | 18.6% |
| AUG | 7,563 | 98.3% | 100.0% | 1.7% | 11,929 | 96.6% | 100.0% | 3.4% | 23,427 | 96.6% | 100.0% | 3.4% |
| SEP | 7,319 | 98.3% | 100.0% | 1.7% | 14,043 | 94.9% | 100.0% | 5.1% | 25,170 | 81.4% | 96.6% | 15.2% |
| OCT | 7,809 | 98.3% | 100.0% | 1.7% | 15,064 | 88.1% | 100.0% | 11.9% | 26,624 | 64.4% | 91.5% | 27.1% |
| NOV | 10,711 | 88.1% | 100.0% | 11.9% | 16,840 | 67.8% | 98.3% | 30.5% | 25,230 | 49.2% | 69.5% | 20.3% |
| DEC | 11,437 | 89.8% | 100.0% | 10.2% | 19,123 | 72.9% | 88.1% | 15.2% | 27,669 | 50.8% | 66.1% | 15.3% |

**2060 Colorado River Instream Flow Analysis**

| 2060 CP K10000 Matagorda Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 86.4% | 100.0% | 13.6% | 30,252 | 78.0% | 91.5% | 13.5% | 51,527 | 64.4% | 72.9% | 8.5% |
| FEB | 16,828 | 91.5% | 100.0% | 8.5% | 33,156 | 81.4% | 91.5% | 10.1% | 50,317 | 67.8% | 74.6% | 6.8% |
| MAR | 12,543 | 98.3% | 100.0% | 1.7% | 32,650 | 89.8% | 88.1% | -1.7% | 63,701 | 44.1% | 49.2% | 5.1% |
| APR | 16,066 | 86.4% | 96.6% | 10.2% | 33,382 | 66.1% | 72.9% | 6.8% | 60,159 | 44.1% | 49.2% | 5.1% |
| MAY | 18,692 | 81.4% | 91.5% | 10.1% | 60,565 | 54.2% | 59.3% | 5.1% | 85,898 | 47.5% | 50.8% | 3.3% |
| JUN | 22,076 | 71.2% | 78.0% | 6.8% | 58,552 | 47.5% | 52.5% | 5.0% | 89,970 | 39.0% | 42.4% | 3.4% |
| JUL | 13,035 | 52.5% | 76.3% | 23.8% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 32.2% | 3.4% |
| AUG | 6,579 | 72.9% | 100.0% | 27.1% | 19,307 | 39.0% | 47.5% | 8.5% | 32,097 | 27.1% | 37.3% | 10.2% |
| SEP | 11,187 | 71.2% | 93.2% | 22.0% | 24,397 | 61.0% | 66.1% | 5.1% | 36,714 | 59.3% | 59.3% | 0.0% |
| OCT | 9,039 | 89.8% | 100.0% | 10.2% | 22,136 | 76.3% | 88.1% | 11.8% | 46,054 | 55.9% | 62.7% | 6.8% |
| NOV | 10,294 | 96.6% | 100.0% | 3.4% | 28,919 | 78.0% | 88.1% | 10.1% | 45,461 | 64.4% | 71.2% | 6.8% |
| DEC | 12,420 | 100.0% | 100.0% | 0.0% | 28,899 | 83.1% | 93.2% | 10.1% | 45,870 | 62.7% | 78.0% | 15.3% |

| 2060 CP K20000 Wharton Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 100.0% | 15.3% | 30,252 | 78.0% | 91.5% | 13.6% | 51,527 | 54.2% | 67.8% | 13.6% |
| FEB | 16,828 | 89.8% | 100.0% | 10.2% | 33,156 | 76.3% | 86.4% | 10.2% | 50,317 | 59.3% | 67.8% | 8.5% |
| MAR | 12,543 | 98.3% | 100.0% | 1.7% | 32,650 | 93.2% | 91.5% | -1.7% | 63,701 | 44.1% | 50.8% | 6.8% |
| APR | 16,066 | 96.6% | 100.0% | 3.4% | 33,382 | 71.2% | 78.0% | 6.8% | 60,159 | 47.5% | 49.2% | 1.7% |
| MAY | 18,692 | 93.2% | 100.0% | 6.8% | 60,565 | 59.3% | 64.4% | 5.1% | 85,898 | 49.2% | 52.5% | 3.4% |
| JUN | 22,076 | 88.1% | 96.6% | 8.5% | 58,552 | 57.6% | 57.6% | 0.0% | 89,970 | 40.7% | 45.8% | 5.1% |
| JUL | 13,035 | 94.9% | 98.3% | 3.4% | 35,478 | 40.7% | 49.2% | 8.5% | 55,708 | 30.5% | 32.2% | 1.7% |
| AUG | 6,579 | 96.6% | 100.0% | 3.4% | 19,307 | 64.4% | 84.7% | 20.3% | 32,097 | 32.2% | 44.1% | 11.9% |
| SEP | 11,187 | 91.5% | 100.0% | 8.5% | 24,397 | 62.7% | 79.7% | 16.9% | 36,714 | 57.6% | 62.7% | 5.1% |
| OCT | 9,039 | 91.5% | 100.0% | 8.5% | 22,136 | 76.3% | 88.1% | 11.9% | 46,054 | 54.2% | 61.0% | 6.8% |
| NOV | 10,294 | 96.6% | 100.0% | 3.4% | 28,919 | 76.3% | 88.1% | 11.9% | 45,461 | 54.2% | 66.1% | 11.9% |
| DEC | 12,420 | 96.6% | 100.0% | 3.4% | 28,899 | 81.4% | 93.2% | 11.9% | 45,870 | 59.3% | 76.3% | 16.9% |

**Environmental Impacts of City of Austin Return Flows and Reuse (Settlement Agreement with LCRA)**

**2060 CP J10000 Colorado Co.**

| MONTH | SUBSISTENCE FLOWS FLOW (AC-FT/MO) | SUBSISTENCE FLOWS BASE % TIME MET | SUBSISTENCE FLOWS STRATEGY % TIME MET | SUBSISTENCE FLOWS DIFFERENCE % | BASE FLOWS - DRY CONDITIONS FLOW (AC-FT/MO) | BASE FLOWS - DRY CONDITIONS BASE % TIME MET | BASE FLOWS - DRY CONDITIONS STRATEGY % TIME MET | BASE FLOWS - DRY CONDITIONS DIFFERENCE % | BASE FLOWS - AVERAGE CONDITIONS FLOW (AC-FT/MO) | BASE FLOWS - AVERAGE CONDITIONS BASE % TIME MET | BASE FLOWS - AVERAGE CONDITIONS STRATEGY % TIME MET | BASE FLOWS - AVERAGE CONDITIONS DIFFERENCE % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 20,906 | 81.4% | 100.0% | 18.6% | 29,944 | 72.9% | 86.4% | 13.6% | 50,912 | 44.1% | 62.7% | 18.6% |
| FEB | 20,826 | 83.1% | 98.3% | 15.3% | 32,767 | 74.6% | 84.7% | 10.2% | 49,706 | 54.2% | 69.5% | 15.3% |
| MAR | 23,058 | 98.3% | 100.0% | 1.7% | 32,281 | 88.1% | 86.4% | -1.7% | 62,717 | 42.4% | 44.1% | 1.7% |
| APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 93.2% | 16.9% | 58,136 | 49.2% | 49.2% | 0.0% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 93.2% | 15.3% | 80,918 | 57.6% | 66.1% | 8.5% |
| JUN | 31,775 | 98.3% | 100.0% | 1.7% | 57,540 | 83.1% | 94.9% | 11.9% | 85,686 | 57.6% | 66.1% | 8.5% |
| JUL | 21,029 | 98.3% | 100.0% | 1.7% | 35,048 | 91.5% | 96.6% | 5.1% | 55,031 | 50.8% | 71.2% | 20.3% |
| AUG | 11,683 | 98.3% | 100.0% | 1.7% | 19,061 | 98.3% | 98.3% | 0.0% | 31,728 | 83.1% | 91.5% | 8.5% |
| SEP | 16,602 | 98.3% | 100.0% | 1.7% | 24,099 | 94.9% | 100.0% | 5.1% | 36,298 | 74.6% | 91.5% | 16.9% |
| OCT | 11,683 | 98.3% | 100.0% | 1.7% | 21,890 | 76.3% | 98.3% | 22.0% | 45,562 | 61.0% | 64.4% | 3.4% |
| NOV | 12,020 | 89.8% | 100.0% | 10.2% | 28,562 | 61.0% | 84.7% | 23.7% | 44,926 | 47.5% | 57.6% | 10.2% |
| DEC | 18,508 | 84.7% | 98.3% | 13.6% | 28,530 | 76.3% | 91.5% | 15.3% | 45,316 | 49.2% | 64.4% | 15.3% |

**2060 CP J30000 Bastrop Co.**

| MONTH | SUBSISTENCE FLOWS FLOW (AC-FT/MO) | SUBSISTENCE FLOWS BASE % TIME MET | SUBSISTENCE FLOWS STRATEGY % TIME MET | SUBSISTENCE FLOWS DIFFERENCE % | BASE FLOWS - DRY CONDITIONS FLOW (AC-FT/MO) | BASE FLOWS - DRY CONDITIONS BASE % TIME MET | BASE FLOWS - DRY CONDITIONS STRATEGY % TIME MET | BASE FLOWS - DRY CONDITIONS DIFFERENCE % | BASE FLOWS - AVERAGE CONDITIONS FLOW (AC-FT/MO) | BASE FLOWS - AVERAGE CONDITIONS BASE % TIME MET | BASE FLOWS - AVERAGE CONDITIONS STRATEGY % TIME MET | BASE FLOWS - AVERAGE CONDITIONS DIFFERENCE % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 12,789 | 84.7% | 100.0% | 15.3% | 19,246 | 69.5% | 98.3% | 28.8% | 26,624 | 52.5% | 86.4% | 33.9% |
| FEB | 15,217 | 84.7% | 100.0% | 15.3% | 17,605 | 78.0% | 100.0% | 22.0% | 27,602 | 62.7% | 83.1% | 20.4% |
| MAR | 16,848 | 98.3% | 100.0% | 1.7% | 16,848 | 98.3% | 100.0% | 1.7% | 30,559 | 81.4% | 88.1% | 6.7% |
| APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 84.7% | 27.1% |
| MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 93.2% | 1.7% | 50,666 | 81.4% | 88.1% | 6.7% |
| JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 94.9% | 5.1% |
| JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 94.9% | 100.0% | 5.1% | 37,507 | 79.7% | 86.4% | 6.7% |
| AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 100.0% | 1.7% | 23,427 | 98.3% | 100.0% | 1.7% |
| SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 100.0% | 3.4% | 25,170 | 81.4% | 94.9% | 13.5% |
| OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 100.0% | 10.2% | 26,624 | 66.1% | 88.1% | 22.0% |
| NOV | 10,711 | 89.8% | 100.0% | 10.2% | 16,840 | 69.5% | 100.0% | 30.5% | 25,230 | 50.8% | 79.7% | 28.9% |
| DEC | 11,437 | 91.5% | 100.0% | 8.5% | 19,123 | 74.6% | 96.6% | 22.0% | 27,669 | 52.5% | 81.4% | 28.9% |

## 2060 Freshwater Inflows to Matagorda Bay

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 114,000 | 48 | 81.4% | 48 | 81.4% | 0.0% |
| **MBHE 2** | 168,700 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 3** | 246,200 | 35 | 59.3% | 35 | 59.3% | 0.0% |
| **MBHE 4** | 433,200 | 22 | 37.3% | 21 | 35.6% | -1.7% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 81,000 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| **MBHE 2** | 119,900 | 31 | 52.5% | 30 | 50.8% | -1.7% |
| **MBHE 3** | 175,000 | 19 | 32.2% | 17 | 28.8% | -3.4% |
| **MBHE 4** | 307,800 | 11 | 18.6% | 11 | 18.6% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 105,000 | 53 | 89.8% | 53 | 89.8% | 0.0% |
| **MBHE 2** | 155,400 | 46 | 78.0% | 46 | 78.0% | 0.0% |
| **MBHE 3** | 226,800 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 4** | 399,000 | 32 | 54.2% | 32 | 54.2% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| **THRESHOLD** | 15,000 | 540 | 76.3% | 543 | 76.7% | 0.4% |

**2060 Colorado River Instream Flow Analysis**

**2060 CP K10000 Matagorda Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 86.4% | 86.4% | 0.0% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 64.4% | 64.4% | 0.0% |
| FEB | 16,828 | 91.5% | 91.5% | 0.0% | 33,156 | 81.4% | 79.7% | -1.7% | 50,317 | 67.8% | 67.8% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 89.8% | 89.8% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 86.4% | 86.4% | 0.0% | 33,382 | 66.1% | 67.8% | 1.7% | 60,159 | 44.1% | 44.1% | 0.0% |
| MAY | 18,692 | 81.4% | 81.4% | 0.0% | 60,565 | 54.2% | 54.2% | 0.0% | 85,898 | 47.5% | 45.8% | -1.7% |
| JUN | 22,076 | 71.2% | 71.2% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 39.0% | 39.0% | 0.0% |
| JUL | 13,035 | 52.5% | 49.2% | -3.4% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 28.8% | 0.0% |
| AUG | 6,579 | 72.9% | 62.7% | -10.2% | 19,307 | 39.0% | 39.0% | 0.0% | 32,097 | 27.1% | 27.1% | 0.0% |
| SEP | 11,187 | 71.2% | 71.2% | 0.0% | 24,397 | 61.0% | 61.0% | 0.0% | 36,714 | 59.3% | 59.3% | 0.0% |
| OCT | 9,039 | 89.8% | 88.1% | -1.7% | 22,136 | 76.3% | 74.6% | -1.7% | 46,054 | 55.9% | 59.3% | 3.4% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 78.0% | 78.0% | 0.0% | 45,461 | 64.4% | 59.3% | -5.1% |
| DEC | 12,420 | 100.0% | 98.3% | -1.7% | 28,899 | 83.1% | 81.4% | -1.7% | 45,870 | 62.7% | 62.7% | 0.0% |

**2060 CP K20000 Wharton Co.**

| MONTH | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 84.7% | 0.0% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 54.2% | 54.2% | 0.0% |
| FEB | 16,828 | 89.8% | 89.8% | 0.0% | 33,156 | 76.3% | 76.3% | 0.0% | 50,317 | 59.3% | 59.3% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 93.2% | 89.8% | -3.4% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 96.6% | 96.6% | 0.0% | 33,382 | 71.2% | 71.2% | 0.0% | 60,159 | 47.5% | 45.8% | -1.7% |
| MAY | 18,692 | 93.2% | 94.9% | 1.7% | 60,565 | 59.3% | 59.3% | 0.0% | 85,898 | 49.2% | 49.2% | 0.0% |
| JUN | 22,076 | 88.1% | 86.4% | -1.7% | 58,552 | 57.6% | 57.6% | 0.0% | 89,970 | 40.7% | 40.7% | 0.0% |
| JUL | 13,035 | 94.9% | 94.9% | 0.0% | 35,478 | 40.7% | 40.7% | 0.0% | 55,708 | 30.5% | 30.5% | 0.0% |
| AUG | 6,579 | 96.6% | 94.9% | -1.7% | 19,307 | 64.4% | 59.3% | -5.1% | 32,097 | 32.2% | 32.2% | 0.0% |
| SEP | 11,187 | 91.5% | 89.8% | -1.7% | 24,397 | 62.7% | 62.7% | 0.0% | 36,714 | 57.6% | 57.6% | 0.0% |
| OCT | 9,039 | 91.5% | 88.1% | -3.4% | 22,136 | 76.3% | 74.6% | -1.7% | 46,054 | 54.2% | 57.6% | 3.4% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 76.3% | 76.3% | 0.0% | 45,461 | 54.2% | 50.8% | -3.4% |
| DEC | 12,420 | 96.6% | 98.3% | 1.7% | 28,899 | 81.4% | 79.7% | -1.7% | 45,870 | 59.3% | 59.3% | 0.0% |

**2060 Colorado River Instream Flow Analysis**

| 2060 CP J10000 Colorado Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 20,906 | 81.4% | 81.4% | 0.0% | 29,944 | 72.9% | 71.2% | -1.7% | 50,912 | 44.1% | 45.8% | 1.7% |
| FEB | 20,826 | 83.1% | 79.7% | -3.4% | 32,767 | 74.6% | 74.6% | 0.0% | 49,706 | 54.2% | 52.5% | -1.7% |
| MAR | 23,058 | 98.3% | 98.3% | 0.0% | 32,281 | 88.1% | 86.4% | -1.7% | 62,717 | 42.4% | 42.4% | 0.0% |
| APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 79.7% | 3.4% | 58,136 | 49.2% | 49.2% | 0.0% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 76.3% | -1.7% | 80,918 | 57.6% | 57.6% | 0.0% |
| JUN | 31,775 | 98.3% | 98.3% | 0.0% | 57,540 | 83.1% | 81.4% | -1.7% | 85,686 | 57.6% | 57.6% | 0.0% |
| JUL | 21,029 | 98.3% | 96.6% | -1.7% | 35,048 | 91.5% | 91.5% | 0.0% | 55,031 | 50.8% | 50.8% | 0.0% |
| AUG | 11,683 | 98.3% | 98.3% | 0.0% | 19,061 | 98.3% | 98.3% | 0.0% | 31,728 | 83.1% | 83.1% | 0.0% |
| SEP | 16,602 | 98.3% | 98.3% | 0.0% | 24,099 | 94.9% | 94.9% | 0.0% | 36,298 | 74.6% | 71.2% | -3.4% |
| OCT | 11,683 | 98.3% | 98.3% | 0.0% | 21,890 | 76.3% | 76.3% | 0.0% | 45,562 | 61.0% | 59.3% | -1.7% |
| NOV | 12,020 | 89.8% | 91.5% | 1.7% | 28,562 | 61.0% | 61.0% | 0.0% | 44,926 | 47.5% | 49.2% | 1.7% |
| DEC | 18,508 | 84.7% | 84.7% | 0.0% | 28,530 | 76.3% | 74.6% | -1.7% | 45,316 | 49.2% | 47.5% | -1.7% |

| 2060 CP J30000 Bastrop Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 12,789 | 84.7% | 83.1% | -1.7% | 19,246 | 69.5% | 67.8% | -1.7% | 26,624 | 52.5% | 54.2% | 1.7% |
| FEB | 15,217 | 84.7% | 84.7% | 0.0% | 17,605 | 78.0% | 76.3% | -1.7% | 27,602 | 62.7% | 62.7% | 0.0% |
| MAR | 16,848 | 98.3% | 98.3% | 0.0% | 16,848 | 98.3% | 98.3% | 0.0% | 30,559 | 81.4% | 81.4% | 0.0% |
| APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 61.0% | 3.4% |
| MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 91.5% | 0.0% | 50,666 | 81.4% | 81.4% | 0.0% |
| JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 89.8% | 0.0% |
| JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 94.9% | 93.2% | -1.7% | 37,507 | 79.7% | 79.7% | 0.0% |
| AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 98.3% | 0.0% | 23,427 | 98.3% | 98.3% | 0.0% |
| SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 96.6% | 0.0% | 25,170 | 81.4% | 81.4% | 0.0% |
| OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 84.7% | -5.1% | 26,624 | 66.1% | 66.1% | 0.0% |
| NOV | 10,711 | 89.8% | 91.5% | 1.7% | 16,840 | 69.5% | 69.5% | 0.0% | 25,230 | 50.8% | 50.8% | 0.0% |
| DEC | 11,437 | 91.5% | 89.8% | -1.7% | 19,123 | 74.6% | 74.6% | 0.0% | 27,669 | 52.5% | 52.5% | 0.0% |

**2060 Freshwater Inflows to Matagorda Bay**

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 114,000 | 48 | 81.4% | 48 | 81.4% | 0.0% |
| MBHE 2 | 168,700 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| MBHE 3 | 246,200 | 35 | 59.3% | 35 | 59.3% | 0.0% |
| MBHE 4 | 433,200 | 22 | 37.3% | 20 | 33.9% | -3.4% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 81,000 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| MBHE 2 | 119,900 | 31 | 52.5% | 31 | 52.5% | 0.0% |
| MBHE 3 | 175,000 | 19 | 32.2% | 17 | 28.8% | -3.4% |
| MBHE 4 | 307,800 | 11 | 18.6% | 11 | 18.6% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| MBHE 1 | 105,000 | 53 | 89.8% | 53 | 89.8% | 0.0% |
| MBHE 2 | 155,400 | 46 | 78.0% | 46 | 78.0% | 0.0% |
| MBHE 3 | 226,800 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| MBHE 4 | 399,000 | 32 | 54.2% | 32 | 54.2% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| CRITERIA | TARGET | BASE | | STRATEGY | | DIFFERENCE |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| THRESHOLD | 15,000 | 540 | 76.3% | 540 | 76.3% | 0.0% |

## Environmental Impacts of Alternative Strategy Off-Channel Storage

**2060 Colorado River Instream Flow Analysis**

| 2060 CP K10000 Matagorda Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 86.4% | 86.4% | 0.0% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 64.4% | 64.4% | 0.0% |
| FEB | 16,828 | 91.5% | 91.5% | 0.0% | 33,156 | 81.4% | 81.4% | 0.0% | 50,317 | 67.8% | 67.8% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 89.8% | 89.8% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 86.4% | 86.4% | 0.0% | 33,382 | 66.1% | 66.1% | 0.0% | 60,159 | 44.1% | 44.1% | 0.0% |
| MAY | 18,692 | 81.4% | 81.4% | 0.0% | 60,565 | 54.2% | 54.2% | 0.0% | 85,898 | 47.5% | 47.5% | 0.0% |
| JUN | 22,076 | 71.2% | 71.2% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 39.0% | 39.0% | 0.0% |
| JUL | 13,035 | 52.5% | 52.5% | 0.0% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 28.8% | 0.0% |
| AUG | 6,579 | 72.9% | 72.9% | 0.0% | 19,307 | 39.0% | 39.0% | 0.0% | 32,097 | 27.1% | 27.1% | 0.0% |
| SEP | 11,187 | 71.2% | 71.2% | 0.0% | 24,397 | 61.0% | 61.0% | 0.0% | 36,714 | 59.3% | 59.3% | 0.0% |
| OCT | 9,039 | 89.8% | 89.8% | 0.0% | 22,136 | 76.3% | 76.3% | 0.0% | 46,054 | 55.9% | 55.9% | 0.0% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 78.0% | 78.0% | 0.0% | 45,461 | 64.4% | 64.4% | 0.0% |
| DEC | 12,420 | 100.0% | 100.0% | 0.0% | 28,899 | 83.1% | 83.1% | 0.0% | 45,870 | 62.7% | 62.7% | 0.0% |

| 2060 CP K20000 Wharton Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 19,369 | 84.7% | 84.7% | 0.0% | 30,252 | 78.0% | 78.0% | 0.0% | 51,527 | 54.2% | 54.2% | 0.0% |
| FEB | 16,828 | 89.8% | 89.8% | 0.0% | 33,156 | 76.3% | 76.3% | 0.0% | 50,317 | 59.3% | 59.3% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 93.2% | 93.2% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 96.6% | 96.6% | 0.0% | 33,382 | 71.2% | 71.2% | 0.0% | 60,159 | 47.5% | 47.5% | 0.0% |
| MAY | 18,692 | 93.2% | 93.2% | 0.0% | 60,565 | 59.3% | 59.3% | 0.0% | 85,898 | 49.2% | 49.2% | 0.0% |
| JUN | 22,076 | 88.1% | 88.1% | 0.0% | 58,552 | 57.6% | 57.6% | 0.0% | 89,970 | 40.7% | 40.7% | 0.0% |
| JUL | 13,035 | 94.9% | 94.9% | 0.0% | 35,478 | 40.7% | 40.7% | 0.0% | 55,708 | 30.5% | 30.5% | 0.0% |
| AUG | 6,579 | 96.6% | 96.6% | 0.0% | 19,307 | 64.4% | 64.4% | 0.0% | 32,097 | 32.2% | 32.2% | 0.0% |
| SEP | 11,187 | 91.5% | 91.5% | 0.0% | 24,397 | 62.7% | 62.7% | 0.0% | 36,714 | 57.6% | 57.6% | 0.0% |
| OCT | 9,039 | 91.5% | 91.5% | 0.0% | 22,136 | 76.3% | 76.3% | 0.0% | 46,054 | 54.2% | 54.2% | 0.0% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 76.3% | 76.3% | 0.0% | 45,461 | 54.2% | 54.2% | 0.0% |
| DEC | 12,420 | 96.6% | 96.6% | 0.0% | 28,899 | 81.4% | 81.4% | 0.0% | 45,870 | 59.3% | 59.3% | 0.0% |

**2060 Colorado River Instream Flow Analysis**

| 2060 CP J10000 Colorado Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 20,906 | 81.4% | 81.4% | 0.0% | 29,944 | 72.9% | 72.9% | 0.0% | 50,912 | 44.1% | 44.1% | 0.0% |
| FEB | 20,826 | 83.1% | 83.1% | 0.0% | 32,767 | 74.6% | 74.6% | 0.0% | 49,706 | 54.2% | 54.2% | 0.0% |
| MAR | 23,058 | 98.3% | 98.3% | 0.0% | 32,281 | 88.1% | 88.1% | 0.0% | 62,717 | 42.4% | 42.4% | 0.0% |
| APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 76.3% | 0.0% | 58,136 | 49.2% | 49.2% | 0.0% |
| MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 78.0% | 0.0% | 80,918 | 57.6% | 57.6% | 0.0% |
| JUN | 31,775 | 98.3% | 98.3% | 0.0% | 57,540 | 83.1% | 83.1% | 0.0% | 85,686 | 57.6% | 57.6% | 0.0% |
| JUL | 21,029 | 98.3% | 98.3% | 0.0% | 35,048 | 91.5% | 91.5% | 0.0% | 55,031 | 50.8% | 50.8% | 0.0% |
| AUG | 11,683 | 98.3% | 98.3% | 0.0% | 19,061 | 98.3% | 98.3% | 0.0% | 31,728 | 83.1% | 83.1% | 0.0% |
| SEP | 16,602 | 98.3% | 98.3% | 0.0% | 24,099 | 94.9% | 94.9% | 0.0% | 36,298 | 74.6% | 74.6% | 0.0% |
| OCT | 11,683 | 98.3% | 98.3% | 0.0% | 21,890 | 76.3% | 76.3% | 0.0% | 45,562 | 61.0% | 61.0% | 0.0% |
| NOV | 12,020 | 89.8% | 89.8% | 0.0% | 28,562 | 61.0% | 61.0% | 0.0% | 44,926 | 47.5% | 47.5% | 0.0% |
| DEC | 18,508 | 84.7% | 84.7% | 0.0% | 28,530 | 76.3% | 76.3% | 0.0% | 45,316 | 49.2% | 49.2% | 0.0% |

| 2060 CP J30000 Bastrop Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % | FLOW (AC-FT/MO) | BASE % TIME MET | STRATEGY % TIME MET | DIFFERENCE % |
| JAN | 12,789 | 84.7% | 84.7% | 0.0% | 19,246 | 69.5% | 69.5% | 0.0% | 26,624 | 52.5% | 52.5% | 0.0% |
| FEB | 15,217 | 84.7% | 84.7% | 0.0% | 17,605 | 78.0% | 78.0% | 0.0% | 27,602 | 62.7% | 62.7% | 0.0% |
| MAR | 16,848 | 98.3% | 98.3% | 0.0% | 16,848 | 98.3% | 98.3% | 0.0% | 30,559 | 81.4% | 81.4% | 0.0% |
| APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 57.6% | 0.0% |
| MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 91.5% | 0.0% | 50,666 | 81.4% | 81.4% | 0.0% |
| JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 89.8% | 0.0% |
| JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 94.9% | 94.9% | 0.0% | 37,507 | 79.7% | 79.7% | 0.0% |
| AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 98.3% | 0.0% | 23,427 | 98.3% | 98.3% | 0.0% |
| SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 96.6% | 0.0% | 25,170 | 81.4% | 81.4% | 0.0% |
| OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 89.8% | 0.0% | 26,624 | 66.1% | 66.1% | 0.0% |
| NOV | 10,711 | 89.8% | 89.8% | 0.0% | 16,840 | 69.5% | 69.5% | 0.0% | 25,230 | 50.8% | 50.8% | 0.0% |
| DEC | 11,437 | 91.5% | 91.5% | 0.0% | 19,123 | 74.6% | 74.6% | 0.0% | 27,669 | 52.5% | 52.5% | 0.0% |

**2060 Freshwater Inflows to Matagorda Bay**

| SPRINGTIME ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 114,000 | 48 | 81.4% | 48 | 81.4% | 0.0% |
| **MBHE 2** | 168,700 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 3** | 246,200 | 35 | 59.3% | 35 | 59.3% | 0.0% |
| **MBHE 4** | 433,200 | 22 | 37.3% | 22 | 37.3% | 0.0% |

| FALL ONSET FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 81,000 | 38 | 64.4% | 38 | 64.4% | 0.0% |
| **MBHE 2** | 119,900 | 31 | 52.5% | 31 | 52.5% | 0.0% |
| **MBHE 3** | 175,000 | 19 | 32.2% | 19 | 32.2% | 0.0% |
| **MBHE 4** | 307,800 | 11 | 18.6% | 11 | 18.6% | 0.0% |

| INTERVENING SIX MONTHS FLOW CRITERIA MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT) | # OF YEARS | % | # OF YEARS | % | % |
| **MBHE 1** | 105,000 | 53 | 89.8% | 53 | 89.8% | 0.0% |
| **MBHE 2** | 155,400 | 46 | 78.0% | 46 | 78.0% | 0.0% |
| **MBHE 3** | 226,800 | 39 | 66.1% | 39 | 66.1% | 0.0% |
| **MBHE 4** | 399,000 | 32 | 54.2% | 32 | 54.2% | 0.0% |

Note: Intervening six months includes June, July, November, December, and the remaining Springtime Onset months that are not used for the 3 consecutive month calculation.

| NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET | | | | | | |
|---|---|---|---|---|---|---|
| **CRITERIA** | **TARGET** | **BASE** | | **STRATEGY** | | **DIFFERENCE** |
| | (AC-FT/mo) | # OF MONTHS | % | # OF MONTHS | % | % |
| **THRESHOLD** | 15,000 | 540 | 76.3% | 545 | 77.0% | 0.7% |

**Environmental Impacts of Alternative Strategy Groundwater Importation**

**2060 Colorado River Instream Flow Analysis**

| 2060 CP K10000 Matagorda Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 19,369 | 86.4% | 89.8% | 3.4% | 30,252 | 78.0% | 81.4% | 3.4% | 51,527 | 64.4% | 64.4% | 0.0% |
| FEB | 16,828 | 91.5% | 91.5% | 0.0% | 33,156 | 81.4% | 81.4% | 0.0% | 50,317 | 67.8% | 67.8% | 0.0% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 89.8% | 89.8% | 0.0% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 86.4% | 86.4% | 0.0% | 33,382 | 66.1% | 67.8% | 1.7% | 60,159 | 44.1% | 45.8% | 1.7% |
| MAY | 18,692 | 81.4% | 81.4% | 0.0% | 60,565 | 54.2% | 55.9% | 1.7% | 85,898 | 47.5% | 47.5% | 0.0% |
| JUN | 22,076 | 71.2% | 71.2% | 0.0% | 58,552 | 47.5% | 47.5% | 0.0% | 89,970 | 39.0% | 39.0% | 0.0% |
| JUL | 13,035 | 52.5% | 54.2% | 1.7% | 35,478 | 39.0% | 39.0% | 0.0% | 55,708 | 28.8% | 28.8% | 0.0% |
| AUG | 6,579 | 72.9% | 67.8% | -5.1% | 19,307 | 39.0% | 39.0% | 0.0% | 32,097 | 27.1% | 32.2% | 5.1% |
| SEP | 11,187 | 71.2% | 72.9% | 1.7% | 24,397 | 61.0% | 61.0% | 0.0% | 36,714 | 59.3% | 59.3% | 0.0% |
| OCT | 9,039 | 89.8% | 89.8% | 0.0% | 22,136 | 76.3% | 76.3% | 0.0% | 46,054 | 55.9% | 57.6% | 1.7% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 78.0% | 83.1% | 5.1% | 45,461 | 64.4% | 64.4% | 0.0% |
| DEC | 12,420 | 100.0% | 98.3% | -1.7% | 28,899 | 83.1% | 83.1% | 0.0% | 45,870 | 62.7% | 66.1% | 3.4% |

| 2060 CP K20000 Wharton Co. | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| JAN | 19,369 | 84.7% | 88.1% | 3.4% | 30,252 | 78.0% | 81.4% | 3.4% | 51,527 | 54.2% | 57.6% | 3.4% |
| FEB | 16,828 | 89.8% | 91.5% | 1.7% | 33,156 | 76.3% | 76.3% | 0.0% | 50,317 | 59.3% | 61.0% | 1.7% |
| MAR | 12,543 | 98.3% | 98.3% | 0.0% | 32,650 | 93.2% | 89.8% | -3.4% | 63,701 | 44.1% | 44.1% | 0.0% |
| APR | 16,066 | 96.6% | 94.9% | -1.7% | 33,382 | 71.2% | 72.9% | 1.7% | 60,159 | 47.5% | 47.5% | 0.0% |
| MAY | 18,692 | 93.2% | 94.9% | 1.7% | 60,565 | 59.3% | 59.3% | 0.0% | 85,898 | 49.2% | 49.2% | 0.0% |
| JUN | 22,076 | 88.1% | 88.1% | 0.0% | 58,552 | 57.6% | 57.6% | 0.0% | 89,970 | 40.7% | 42.4% | 1.7% |
| JUL | 13,035 | 94.9% | 96.6% | 1.7% | 35,478 | 40.7% | 40.7% | 0.0% | 55,708 | 30.5% | 30.5% | 0.0% |
| AUG | 6,579 | 96.6% | 96.6% | 0.0% | 19,307 | 64.4% | 66.1% | 1.7% | 32,097 | 32.2% | 37.3% | 5.1% |
| SEP | 11,187 | 91.5% | 91.5% | 0.0% | 24,397 | 62.7% | 62.7% | 0.0% | 36,714 | 57.6% | 57.6% | 0.0% |
| OCT | 9,039 | 91.5% | 91.5% | 0.0% | 22,136 | 76.3% | 74.6% | -1.7% | 46,054 | 54.2% | 55.9% | 1.7% |
| NOV | 10,294 | 96.6% | 96.6% | 0.0% | 28,919 | 76.3% | 78.0% | 1.7% | 45,461 | 54.2% | 54.2% | 0.0% |
| DEC | 12,420 | 96.6% | 98.3% | 1.7% | 28,899 | 81.4% | 81.4% | 0.0% | 45,870 | 59.3% | 61.0% | 1.7% |

## Environmental Impacts of Alternative Strategy Groundwater Importation

**2060 Colorado River Instream Flow Analysis**

| 2060 | | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CP J10000 | MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| Colorado Co. | | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| | JAN | 20,906 | 81.4% | 81.4% | 0.0% | 29,944 | 72.9% | 76.3% | 3.4% | 50,912 | 44.1% | 45.8% | 1.7% |
| | FEB | 20,826 | 83.1% | 84.7% | 1.7% | 32,767 | 74.6% | 74.6% | 0.0% | 49,706 | 54.2% | 55.9% | 1.7% |
| | MAR | 23,058 | 98.3% | 98.3% | 0.0% | 32,281 | 88.1% | 84.7% | -3.4% | 62,717 | 42.4% | 42.4% | 0.0% |
| | APR | 17,792 | 100.0% | 100.0% | 0.0% | 32,965 | 76.3% | 79.7% | 3.4% | 58,136 | 49.2% | 49.2% | 0.0% |
| | MAY | 26,132 | 100.0% | 100.0% | 0.0% | 59,397 | 78.0% | 79.7% | 1.7% | 80,918 | 57.6% | 59.3% | 1.7% |
| | JUN | 31,775 | 98.3% | 98.3% | 0.0% | 57,540 | 83.1% | 83.1% | 0.0% | 85,686 | 57.6% | 59.3% | 1.7% |
| | JUL | 21,029 | 98.3% | 98.3% | 0.0% | 35,048 | 91.5% | 93.2% | 1.7% | 55,031 | 50.8% | 52.5% | 1.7% |
| | AUG | 11,683 | 98.3% | 100.0% | 1.7% | 19,061 | 98.3% | 98.3% | 0.0% | 31,728 | 83.1% | 84.7% | 1.7% |
| | SEP | 16,602 | 98.3% | 100.0% | 1.7% | 24,099 | 94.9% | 94.9% | 0.0% | 36,298 | 74.6% | 78.0% | 3.4% |
| | OCT | 11,683 | 98.3% | 98.3% | 0.0% | 21,890 | 76.3% | 78.0% | 1.7% | 45,562 | 61.0% | 62.7% | 1.7% |
| | NOV | 12,020 | 89.8% | 91.5% | 1.7% | 28,562 | 61.0% | 69.5% | 8.5% | 44,926 | 47.5% | 49.2% | 1.7% |
| | DEC | 18,508 | 84.7% | 84.7% | 0.0% | 28,530 | 76.3% | 79.7% | 3.4% | 45,316 | 49.2% | 49.2% | 0.0% |

| 2060 | | SUBSISTENCE FLOWS | | | | BASE FLOWS - DRY CONDITIONS | | | | BASE FLOWS - AVERAGE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CP J30000 | MONTH | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE | FLOW | BASE | STRATEGY | DIFFERENCE |
| Bastrop Co. | | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % | (AC-FT/MO) | % TIME MET | % TIME MET | % |
| | JAN | 12,789 | 84.7% | 88.1% | 3.4% | 19,246 | 69.5% | 74.6% | 5.1% | 26,624 | 52.5% | 55.9% | 3.4% |
| | FEB | 15,217 | 84.7% | 84.7% | 0.0% | 17,605 | 78.0% | 81.4% | 3.4% | 27,602 | 62.7% | 66.1% | 3.4% |
| | MAR | 16,848 | 98.3% | 98.3% | 0.0% | 16,848 | 98.3% | 98.3% | 0.0% | 30,559 | 81.4% | 84.7% | 3.4% |
| | APR | 11,127 | 100.0% | 100.0% | 0.0% | 17,078 | 100.0% | 100.0% | 0.0% | 37,785 | 57.6% | 61.0% | 3.4% |
| | MAY | 16,909 | 100.0% | 100.0% | 0.0% | 35,601 | 91.5% | 91.5% | 0.0% | 50,666 | 81.4% | 81.4% | 0.0% |
| | JUN | 12,020 | 100.0% | 100.0% | 0.0% | 24,873 | 100.0% | 100.0% | 0.0% | 43,617 | 89.8% | 89.8% | 0.0% |
| | JUL | 8,424 | 100.0% | 100.0% | 0.0% | 21,336 | 94.9% | 94.9% | 0.0% | 37,507 | 79.7% | 83.1% | 3.4% |
| | AUG | 7,563 | 100.0% | 100.0% | 0.0% | 11,929 | 98.3% | 100.0% | 1.7% | 23,427 | 98.3% | 98.3% | 0.0% |
| | SEP | 7,319 | 100.0% | 100.0% | 0.0% | 14,043 | 96.6% | 98.3% | 1.7% | 25,170 | 81.4% | 83.1% | 1.7% |
| | OCT | 7,809 | 100.0% | 100.0% | 0.0% | 15,064 | 89.8% | 89.8% | 0.0% | 26,624 | 66.1% | 69.5% | 3.4% |
| | NOV | 10,711 | 89.8% | 91.5% | 1.7% | 16,840 | 69.5% | 72.9% | 3.4% | 25,230 | 50.8% | 52.5% | 1.7% |
| | DEC | 11,437 | 91.5% | 88.1% | -3.4% | 19,123 | 74.6% | 78.0% | 3.4% | 27,669 | 52.5% | 55.9% | 3.4% |