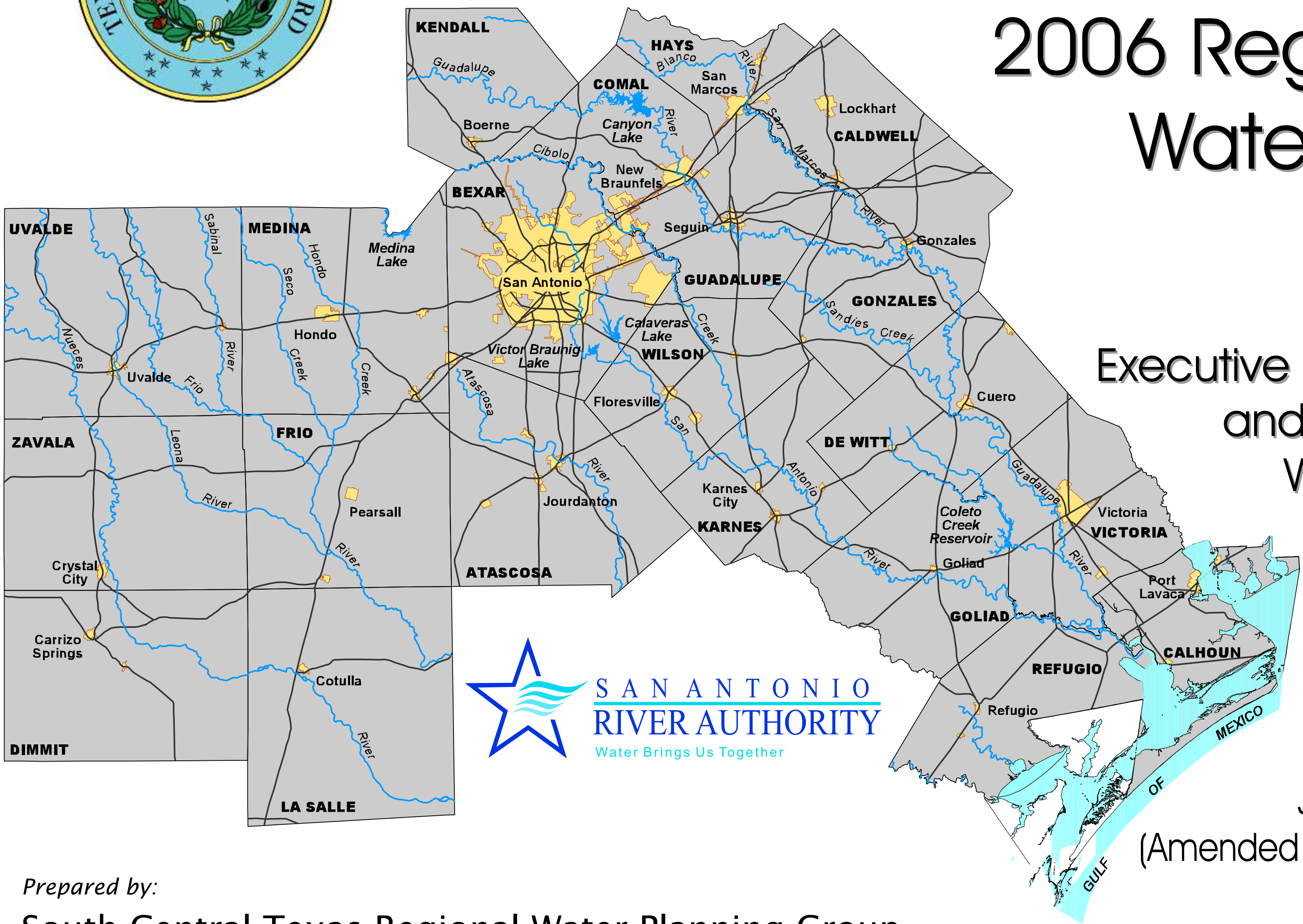
South Central Texas Regional Water Planning Area

2006 Regional Water Plan

Volume I Executive Summary and Regional Water Plan



SAN ANTONIO RIVER AUTHORITY
Water Brings Us Together

January 2006
(Amended August 2009)

Prepared by:
South Central Texas Regional Water Planning Group

With administration by:
San Antonio River Authority

With technical assistance by:
HDR Engineering, Inc.
Margaret Dalthorp

In association with:
Paul Price Associates, Inc.
John Folk-Williams

HDR ONE COMPANY *Many Solutions*℠

South Central Texas Regional Water Planning Area

2006 Regional Water Plan

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Mr. Pedro Nieto
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Municipalities

Mr. Milton Stolte
Agriculture

Ms. Susan Hughes
Environmental

Ms. Gloria Rivera
Small Business

Mr. Bill West
River Authorities

Mr. Robert Potts
Water Districts

Signed in recognition of the adoption of the 2006 South Central Texas Regional Water Plan on January 19, 2006.

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2006 South Central Texas Regional Water Plan

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Region L
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August 10, 2009

Mr. J. Kevin Ward, Executive Administrator
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Re: Amended 2006 South Central Texas Regional Water Plan Approval

The South Central Texas Regional Water Planning Group (SCTRWPG) acted to amend the adopted 2006 South Central Texas Regional Water Plan (SCTRWP) during its meeting of August 6, 2009 and respectfully requests Texas Water Development Board (TWDB) approval of the amended 2006 SCTRWP for the five-year period beginning January 5, 2007 pursuant to House Bill (HB) 3776 of the 80th Texas Legislature. Prerequisites to TWDB approval of the 2006 SCTRWP pursuant to HB3776 and the actions by which they were satisfied by amendment of the 2006 SCTRWP are summarized as follows:

1. **Removal of Sections 4C.7, 4C.8, and 4C.32**

   Sections 4C.7 (Lower Guadalupe Water Supply Project), 4C.8 (Increased LGWSP Capacity for GBRA Needs), and 4C.32 (Lower Guadalupe Water Supply Project for GBRA Needs) are removed from Volume II of the 2006 SCTRWP. Sections 4C.7 and 4C.8 were simply documentation of technical evaluations of water management strategies that were not recommended to meet needs in the adopted 2006 SCTRWP. Section 4C.32 was documentation of technical evaluation of a water management strategy recommended to meet needs in the adopted 2006 SCTRWP. Section 4C.32 is replaced by Section 4C.33 (Lower Guadalupe Water Supply Project for Upstream GBRA Needs) described below.

2. **Addition of Section 4C.33**

   Section 4C.33 (Lower Guadalupe Water Supply Project for Upstream GBRA Needs), initially evaluated in 2011 SCTRWP Study 1 and documented in Attachment A, has been added to Volume II of the 2006 SCTRWP. The Lower Guadalupe Water Supply Project for Upstream GBRA Needs is recommended to meet projected needs in the amended 2006 SCTRWP.

Projected needs of Water User Groups and Wholesale Water Providers met by the Lower Guadalupe Water Supply Project for GBRA Needs (Section 4C.32) in the adopted 2006 SCTRWP are met by the Lower Guadalupe Water Supply Project for Upstream GBRA Needs (Section 4C.33) in the amended 2006 SCTRWP. Pursuant to HB3776, the SCTRWPG acknowledges the following regarding the Lower Guadalupe Water Supply Project for Upstream GBRA Needs (Section 4C.33):

a) The project was developed by the SCTRWPG in association with the Guadalupe-Blanco River Authority.

b) The project includes facilities for diversion of up to 75,000 acre-feet per year (below the City of Victoria) and transmission, treatment, and delivery of up to 60,000 acre-feet per year of surface water, provided however that at least 100,000 acre-feet per year of the surface water must be reserved for lower basin needs.

c) The project includes no use of fresh groundwater.

d) Consent of affected property owners must be obtained before an off-channel reservoir may be developed as part of the project.

e) The Guadalupe-Blanco River Authority and SCTRWPG have adopted language that recognizes and supports the need to address inflow amounts necessary to protect and preserve a healthy ecosystem in the San Antonio Bay - Guadalupe Estuary system in conjunction with the development of water supplies to meet human water needs. This language is included in Section 4C.33.

3. **Revisions to text, graphics, and tables in the 2006 SCTRWP referencing the LGWSP for GBRA Needs water management strategy**

   Text, tables, and figures are being revised to replace "LGWSP for GBRA Needs" with "LGWSP for Upstream GBRA Needs." Text, tables, and database records referencing the associated quantity of firm water supply are being changed to replace 63,072 acft/yr with 60,000 acft/yr. Text, tables, and database records referencing the associated unit cost of water are being changed to replace $1,344/acft/yr with 1,226/acft/yr in the short-term (debt service) period and to replace $441/acft/yr with $434/acft/yr in the long-term (post-debt service) period. In addition, graphics showing pipeline routes and quantities of water in the 2006 SCTRWP are being revised as necessary to replace the LGWSP for GBRA Needs (Section 4C.32) with the LGWSP for Upstream GBRA Needs (Section 4C.33). These revisions include, but are not limited to, the following text sections, tables, and figures:

1. Executive Summary text	pg ES-14
2. Figure ES-8	pg ES-15
3. Executive Summary text	pgs ES-18 and ES-19
4. Figure 4B.1-4	pg 4B.1-7
5. Section 4B.1 text	pg 4B.1-15
6. Table 4B.2.3-11	pg 4B.2-59
7. Table 4B.2.3-13	pg 4B.2-60
8. Table 4B.2.3-15	pg 4B.2-61
9. Table 4B.2.11-5	pg 4B.2-114
10. Table 4B.2.11-7	pg 4B.2-116
11. Table 4B.2.12-3	pg 4B.2-127
12. Table 4B.2.12-13	pg 4B.2-133
13. Table 4B.2.12-15	pg 4B.2-135
14. Table 4B.2.14-3	pg 4B.2-152
15. Section 4B.3 text	pg 4B.3-10
16. Table 4B.3.5-1	pg 4B.3.10
17. Table 4B.3.5-2	pg 4B.3.11
18. Table 9-1	pg 9-3
19. Exhibit 9-B	Section 9
20. Appendix A	
21. Recommended WMS Table	Appendix D
22. WWP (GBRA) Figure	Appendix D
23. WWP (GBRA) Table	Appendix D

Finally, the Table of Contents, List of Figures, and List of Tables in both volumes of the 2006 SCTRWP are being revised as necessary. Once all revisions are incorporated, the complete amended 2006 SCTRWP will be submitted in electronic format for TWDB records and posting on the TWDB website. It is expected that all revisions will be completed in August 2009.

Comprehensive revisions have not been made to Section 7 – Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources which documents the cumulative effects of implementation of the 2006 SCTRWP, as these revisions were not deemed necessary to support the amendment process. The cumulative impacts associated with the LGWSP for Upstream GBRA Needs (Section 4C.33) are less than those associated with the LGWSP for GBRA Needs (Section 4C.32) due to reduced surface water diversions, smaller off-channel reservoir size, less transmission pipeline length, and other factors. Analyses of the cumulative effects of implementation of recommended water management strategies will be performed as part of the process to develop the 2011 SCTRWP.

In accordance with TWDB rules, a Public Hearing regarding proposed amendment of the 2006 SCTRWP was held on May 7, 2009 at the offices of the San Antonio Water System. Comments from the public were received during the hearing and by subsequent written submittal during an open comment period exceeding 30 days. The SCTRWPG considered comments received and appropriate responses to these comments during its meeting of August 6, 2009. Public comments and SCTRWPG responses are summarized in Attachment B.

Should you need additional information regarding this request for approval of the amended 2006 SCTRWP, please contact me at your earliest convenience.

Respectfully Submitted,

Con Mims, Chair
South Central Texas Regional Water Planning Group

cc: Matt Nelson, Manager, Regional Water Planning, TWDB
Steve Raabe, Director of Technical Services, San Antonio River Authority
Sam Vaugh, Vice President, HDR Engineering, Inc.

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Attachment A

See "Section 4C.33

Lower Guadalupe Water Supply Project for Upstream GBRA Needs"

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Attachment B

Amendment of the

2006 South Central Texas Regional Water Plan
Public Comments and Responses

South Central Texas Regional Water Planning Group

Amendment of the 2006 South Central Texas Regional Water Plan

Public Comments and Responses

Introduction

The South Central Texas Regional Water Planning Group (SCTRWPG) held a Public Hearing regarding proposed amendment of the 2006 South Central Texas Regional Water Plan (SCTRWP) on May 7, 2009 at the offices of the San Antonio Water System. Comments from the public were received during the hearing and by subsequent written submittal during an open comment period exceeding 30 days. Oral comments were provided by three (3) individuals during the Public Hearing. Written comments were subsequently received from three (3) entities: Victoria County Groundwater Conservation District (VCGCD); Exelon Generation Company, LLC (Exelon); and Greater Edwards Aquifer Alliance (GEAA). Key elements of each public comment are paraphrased or *quoted* below and followed by the response of the SCTRWPG.

Oral Comments of Tim Andruss, General Manager, VCGCD:

Concerned that the Lower Guadalupe Water Supply Project (LGWSP) for Upstream GBRA Needs could be modified to include production of brackish and/or fresh groundwater and thereby affect groundwater supplies in Victoria County.

Response: The LGWSP for Upstream GBRA Needs recommended by the SCTRWPG in the amended 2006 SCTRWP includes neither fresh nor brackish groundwater. Modification of this water management strategy to include groundwater would not be consistent with the 2006 SCTRWP.

Oral Comments of Kevin Janak, Victoria County Commissioner, Precinct 2:

Concerned that future changes in the LGWSP for Upstream GBRA Needs could include use of groundwater resources and negatively affect Victoria economic development.

Response: The LGWSP for Upstream GBRA Needs recommended by the SCTRWPG in the amended 2006 SCTRWP includes neither fresh nor brackish groundwater. Modification of this water management strategy to include groundwater would not be consistent with the 2006 SCTRWP.

Oral Comments of Jerry James, Director, Environmental Services, City of Victoria:

The regional water planning process is working as interests have been brought together and alternatives have been evaluated in a public process. The City of Victoria will continue to be engaged in the regional water planning process.

Response: The SCTRWPG acknowledges comments from the City of Victoria and appreciates active involvement of the City of Victoria in the regional water planning process.

Written Comments of Thomas Mundy, Director, New Plant Development, Exelon

Exelon Comment #1:
In analyzing the availability of water for the LGWSP for Upstream GBRA Needs, Region L has focused on CA 18-5178, the least senior of GBRA's lower basin water rights. But as noted in the proposed amendment, GBRA could provide most, if not all, of the water for the LGWSP for Upstream GBRA Needs from "firm senior water rights." We believe this statement should be expanded to recognize that the water could also be supplied under other portions of GBRA's non-firm lower basin water rights.
Response: The last paragraph in Section 4C.33.2 will be replaced with the following text. "It is noted that GBRA could provide most, if not all, of the 60,000 acft/yr delivery amount using CA# 18-5176, CA# 18-5177, and/or more senior portions of CA# 18-5178, rather than the junior portion of CA# 18-5178. This would substantially reduce off-channel storage requirements, but could necessitate occasional suspension of water use for irrigation."

Exelon Comment #2:
In addition, because it is anticipated that the LGWSP for Upstream GBRA Needs may be supplied using other water rights, we encourage the Planning Group to add a statement to the Project Description for the LGWSP for Upstream GBRA Needs that alternative uses of the water, if necessary authorizations are obtained pursuant to TCEQ rules and applicable law, are consistent with the adopted plan. This would eliminate potential confusion during the interim period between the adoption of the proposed amendment to the 2006 Regional Water Plan and the adoption of the 2011 Regional Water Plan.
Response: The following text will be appended to the first paragraph in Section 4C.33.1. "To the extent that supplies in excess of those being used by GBRA's municipal customers are available, water supplies associated with this strategy may also be used to meet projected needs of GBRA's non-municipal customers. Such uses are deemed consistent with the 2006 SCTRWP if any necessary supplemental authorizations are obtained pursuant to Texas Commission on Environmental Quality (TCEQ) rules and applicable law."

Written Comments of Tim Andruss, General Manager, VCGCD

VCGCD Comment #1:
Victoria County Groundwater Conservation District is concerned that the inclusion of the Lower Guadalupe Water Supply Project for Upstream GBRA Needs could lead to circumstances, either directly or indirectly, that negatively impact the groundwater resources in Victoria County. It is our view and basis for concern that any large groundwater development project in Calhoun County, whether brackish groundwater or otherwise, could cause significant negative impacts on the groundwater resources within Victoria County including substantial drawdown or water quality degradation. Victoria County Groundwater Conservation District respectfully requests that the Region L membership consider our concern as you decide whether or not to amend the 2006 Regional Water Plan for Region L.
Response: The SCTRWPG acknowledges this concern of the VCGCD and has chosen to amend the 2006 SCTRWP. The LGWSP for Upstream GBRA Needs recommended by the SCTRWPG in the amended 2006 SCTRWP includes neither fresh nor brackish

groundwater. Modification of this water management strategy to include groundwater would not be consistent with the 2006 SCTRWP.

VCGCD Comment #2:
In addition, the District strongly encourages the planning group to adequately investigate the impacts current and future projects would have on groundwater resources.
Response: Potential impacts of current and recommended water management strategies on groundwater resources are typically investigated by the SCTRWPG as part of its technical evaluation of individual strategies that rely on groundwater resources and as part of its evaluation of cumulative effects of regional water plan implementation (Section 7.1 of the 2006 SCTRWP).

Written Comments of Annalisa Peace, Executive Director, GEAA

GEAA Comment #1:
On page 33-3 the statement is made that the Guadalupe Blanco River Authority (GBRA) will work with Region L participants and other public and private water rights holders in the basin toward the development of a voluntary strategy to promote environmental stewardship. This goal is somewhat vague and should be more detailed as how this concept would actually work and what, in fact, constitutes environmental stewardship. Specific conservation agencies should be identified along with their roles and, in particular, how this body would actually function, along with specific goals and desired outcomes.
Response: If GBRA chooses to pursue development of the LGWSP for Upstream GBRA Needs pursuant to the 2006 SCTRWP, it is assumed that GBRA will proceed in accordance with the referenced statement developed by the SCTRWPG.

GEAA Comment #2:
Page 33-7 through page 33-16 presents a boilerplate version of environmental descriptions for the flora and fauna of the general project area. Only one and a half pages (page 33-10 and part of page 33-16) speak to the topic of environmental mitigation. Furthermore, statements on these pages are heavily qualified with such phrases as "would be" and "some care may be necessary" and "key considerations." We believe that detailed environmental assessment studies along with prudent site-specific mitigation measures are needed for a project of this magnitude.
Response: Detailed environmental assessment studies and selection of appropriate mitigation measures are components of the permitting, rather than the planning, process.

GEAA Comment #3:
On page 33-19 there is a cost summary that details estimated costs, including the cost for environmental studies. GEAA would like to ascertain the actual role that HDR will play in this project. If in fact HDR will perform the engineering and cost analyses, then GEAA believes that the environmental studies should be carried out by an independent environmental consultant to maintain transparency and avoid any potential conflicts of interest.
Response: If GBRA chooses to pursue development of the LGWSP for Upstream GBRA Needs, HDR's role (if any) in engineering and/or environmental studies will be determined in conformance with applicable law.

GEAA Comment #4:

Page 33-20 lists implementation issues. Once again the word "may" is used several times on the page. GEAA believes that if funding is sought from the Texas Water Development Board (TWDB), then a full-fledged environmental assessment, consistent with TWDB requirements, should be prepared listing all existing environmental resources, the impacts that various project alternatives will have upon these resources along with a no-action alternative.

Response: If GBRA chooses to pursue development of the LGWSP for Upstream GBRA Needs, environmental studies will be performed in conformance with applicable state and federal requirements.

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FROM: South Central Texas Regional Water Planning Group (Region L)

DATE: April 3, 2009

SUBJECT: Notice of Public Hearing to Receive Input on Proposed Amendment to the 2006 Regional Water Plan for Region L

NOTICE OF PUBLIC HEARING
REGIONAL WATER PLANNING

Notice is hereby given that the South Central Texas Regional Water Planning Group – Region L is seeking input on an amendment of the 2006 Regional Water Plan regarding the Lower Guadalupe Water Supply Project for GBRA Needs. Written and oral comments (not to exceed five (5) minutes per speaker) regarding the proposed amendment will be taken at a Public Meeting at 10:00 am on Thursday, May 7th, 2009 at the San Antonio Water System, Customer Service Building, CR 145 located at 2800 US Highway 281 North, San Antonio, Texas 78212.

Copies of the proposed amendment and 2006 Regional Water Plan may be obtained on the Region L website at www.regionltexas.org or at a public library in each county or the county clerk's office having land in the regional water planning area.

Region L includes the following counties: Uvalde, Zavala, Dimmit, Frio, La Salle, Medina, Atascosa, Bexar, Wilson, Karnes, Goliad, Refugio, Calhoun, Victoria, DeWitt, Gonzales, Guadalupe, Caldwell, Comal, Kendall and the southern half of Hays Counties. Written comments on the proposed amendment must be filed with the San Antonio River Authority by June 7th, 2009 as follows:

Steven J. Raabe, P.E.
Administrative Agent for Region L
c/o San Antonio River Authority
P.O. Box 839980
San Antonio, TX 78283-9980

For additional information, please contact: Erin Newberry, Region L, c/o San Antonio River Authority, P.O. Box 839980, San Antonio, Texas 78283-9980 or phone (210) 302-3293/email: enewberry@sara-tx.org.

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2006 South Central Texas Regional Water Plan

Executive Summary

Background

Since 1957, the Texas Water Development Board (TWDB) has been charged with preparing a comprehensive and flexible long-term plan for the development, conservation, and management of the state's water resources. The current state water plan, *Water for Texas, January 2002*, was produced by the TWDB and based on approved regional water plans pursuant to requirements of Senate Bill 1 (SB1), enacted in 1997 by the 75th Legislature. As stated in SB1, the purpose of the regional water planning effort is to:

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

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

The TWDB divided the state into 16 planning regions and appointed members to the regional planning groups. As shown in Figure ES-1, the South Central Texas Region (Region L) includes all of 20 counties as well as the portion of Hays County located in the Guadalupe River Basin. The South Central Texas Regional Water Planning Group (SCTRWPG) has a total of 21 voting members. The members represent 11 interests or stakeholders (Public, Counties, Municipalities, Industry, Agriculture, Environmental, Small Business, Electric Generating Utilities, River Authorities, Water Districts, and Water Utilities), serve without pay, and are responsible for the development of the South Central Texas Regional Water Plan (Table ES-1).

The SCTRWPG adopted bylaws to govern its operations and, in accordance with its bylaws, selected the San Antonio River Authority (SARA) to serve as its administrative agency (Qualified Political Subdivision) to: 1) Develop scopes of work; 2) Apply for TWDB planning grants; 3) Contract with the TWDB for the grants; and 4) Manage the development of the Regional Water Plan, including supervision of technical and public participation consultants. Members of the SCTRWPG and key staff of several participants serve as an ad hoc Staff Workgroup to review and guide SARA and consultants' work.

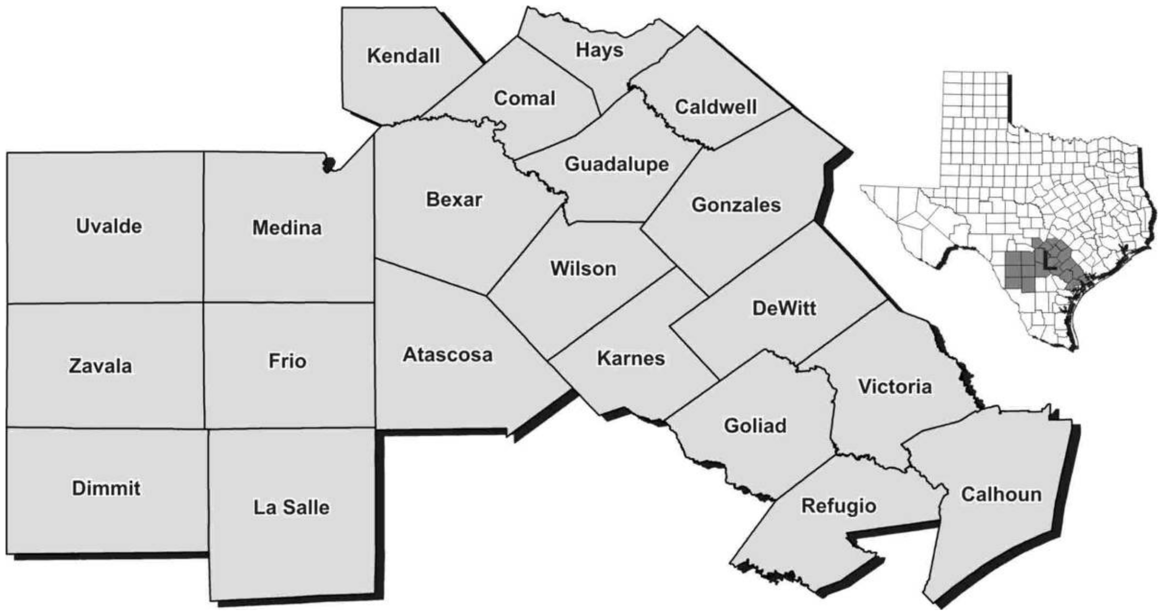

Figure ES-1. South Central Texas Planning Region (Region L)

Table ES-1.
South Central Texas Regional Water Planning Group Members

Name	*Interest*	*Membership*	*Affiliation*
Evelyn Bonavita	Public	Chair, Exec. Comm.	League of Women Voters
Richard Eppright	Agriculture	Vice-Chair, Exec. Comm.	TX & SW Cattle Raisers
Gregory E. Rothe	River Authorities	Secretary, Exec. Comm.	San Antonio RA
Mike Mahoney	Water Districts	Member, Exec. Comm.	Evergreen UWCD
Douglas R. Miller	Small Business	Member, Exec. Comm.	Miller & Miller
Comm. Jay Millikin	Counties	Member	Comal County
Comm. John Kight	Counties	Member	Kendall County
David Chardavoyne	Municipalities	Member	San Antonio Water Sys.
Pedro Nieto	Municipalities	Member	City of Uvalde
Gary Middleton	Municipalities	Member	City of Victoria
James M. Miller	Industry	Member	Invista / DuPont
Milton Stolte	Agriculture	Member	Texas Farm Bureau
Bill Jones	Agriculture	Member	D.M. O'Connor Ranches
Susan Hughes	Environmental	Member	Bexar Audubon Society
Darrell Brownlow	Small Business	Member	Environmental Consultant
Gloria Rivera	Small Business	Member	Electrical Engineer
Mike Fields	Electricity Generating Utilities	Member, Region P Liaison	Coleto Creek Power
Bill West	River Authorities	Member	Guadalupe-Blanco RA
Con Mims	River Authorities	Member, Region N Liaison	Nueces RA
Robert Potts	Water Districts	Member	Edwards Aquifer Auth.
Ron Naumann	Water Utilities	Member	Springs Hill WSC

Pursuant to Regional and State Water Planning Guidelines (Texas Administrative Code, Title 31, Part 10, Chapters 357 and 358), the SCTRWPG developed the 2001 South Central Texas Regional Water Plan, which was then integrated into Water for Texas – 2002 by the TWDB. The 2006 South Central Texas Regional Water Plan, of which this Executive Summary is a part, represents the first update of a regional water plan as presently required occur on a five-year cycle. The TWDB will integrate this Regional Water Plan into a State Water Plan to be issued in 2007.

The structure of the 2006 Regional Water Plan is organized in accordance with TWDB guidelines and summarized by section title as follows.

1) Description of South Central Texas Region (Volume I)
2) Population and Water Demand Projections (Volume I)
3) Water Supply Analyses (Volume I)
4A) Comparison of Supply and Demand Projections to Determine Needs (Volume I)
4B) Water Supply Plans (Volume I)
4C) Technical Evaluations of Water Management Strategies (Volume II)
5) Impacts of Water Management Strategies on Key Parameters of Water Quality and Moving Water from Rural and Agricultural Areas (Volume I)
6) Water Conservation and Drought Management Recommendations (Volume I)
7) Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources (Volume I)
8) Policies and Recommendations (Volume I)
9) Water Infrastructure Funding Recommendations (Volume I)
10) Regional Water Plan Adoption (Volume I)

Description of South Central Texas Region

The South Central Texas Region includes counties that are located in whole or in part in the Rio Grande, Nueces, San Antonio, Guadalupe, Lavaca, and Colorado River Basins and the San Antonio-Nueces, Lavaca-Guadalupe, and Colorado-Lavaca Coastal Basins. Major urban population centers include the cities of San Antonio, Victoria, Seguin, New Braunfels, and San Marcos which are located within Bexar, Victoria, Guadalupe, Comal, and Hays Counties, respectively. The regional economy is dominated by the trades & services and manufacturing sectors with much smaller, but significant, contributions from the agricultural and mining sectors. Physical terrain of the region ranges from the Hill Country of the Edwards Plateau to the Coastal Plains. Vegetational areas include the Edwards Plateau, South Texas Plains, Blackland

Prairies, Post Oak Savannah, and Gulf Prairies and Marshes. Many species occur within the region that are listed by the U.S. Fish & Wildlife Service (USFWS) or Texas Parks & Wildlife Department (TPWD) as rare, threatened, or endangered. Several of the species listed as endangered occur in or near Comal and San Marcos Springs, the two largest springs in Texas. Average annual precipitation ranges from less than 22 inches in Dimmit County up to 40 inches in Calhoun County.

Population and Water Demand Projections

In order to develop water plans to meet future water needs, it is necessary to make projections of future water demands for the region. Integrating information from the 2000 Census and reported water uses from the around the state, the TWDB provided draft population and water demand projections for cities, rural areas, and water user groups within each of the 21 counties of the region. **The population of the South Central Texas Region was estimated at about 2.0 million in 2000 and is projected to grow to about 4.3 million in 2060.** Of this 2060 total, 68 percent are projected to reside in the San Antonio River Basin. Demand projections were prepared by the TWDB for each water user category, including municipal, industrial, steam-electric power generation, irrigation, mining, and livestock. Municipal projections are at the level of detail of each city, individual utility providing more than 280 acft/yr, rural area, and county or part of county of each river basin. Projections were also provided at the county and river basin area level of detail for industry, steam-electric power generation, irrigation, mining, and livestock. These projections were forwarded by the SCTRWPG to local officials for review. In response to requests by these reviewers, the projections were modified for certain entities within the planning area. Final, approved water demand projections are summarized below.

Municipal water is fresh water used for drinking, sanitation, and other purposes in homes and commercial establishments of both cities and rural areas. Total municipal water use in the South Central Texas Region in 2000 was 340,028 acft/yr and is projected to increase to 637,235 acft/yr by 2060 (Figure ES-2). Industrial water is fresh water used in the manufacture of industrial products. All industries in the region used 100,195 acft of water in 2000 and are projected to have a demand of 179,715 acft/yr in 2060 (Figure ES-2).

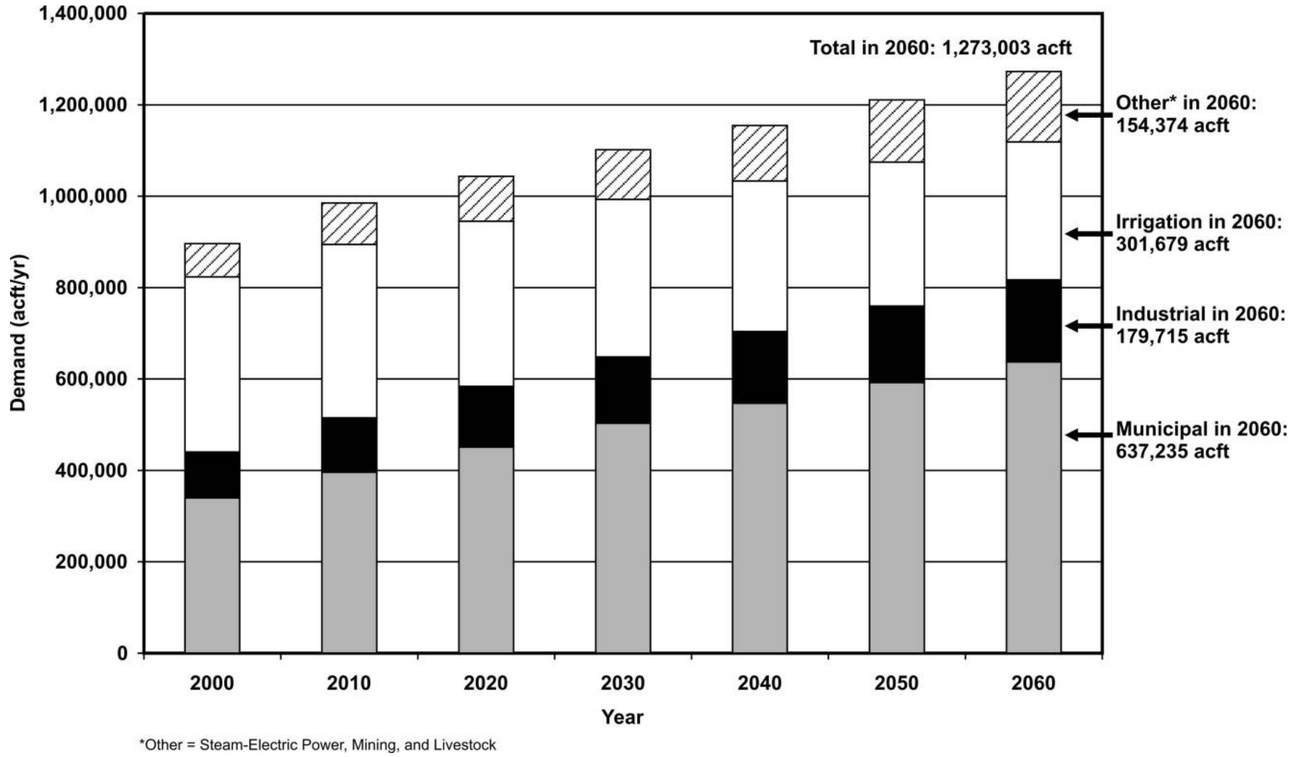

Figure ES-2. Projected Water Demands

Eight counties (Atascosa, Bexar, Calhoun, Frio, Goliad, Guadalupe, Hays, and Victoria) of the region use cooling and boiler feed water in steam-electric power production. In 2000, 35,379 acft of water were used, and it is estimated that by the year 2060, 109,776 acft/yr of water will be needed for the production of steam-electric power (Figure ES-2). In the South Central Texas Region, the principal uses of water for mining are for the extraction of stone, clay, and petroleum and for sand and gravel washing. In the region, total mining water use was 11,757 acft in 2000 and is projected to increase to 18,644 acft/yr in 2060, an increase of over 58 percent (Figure ES-2).

The TWDB *irrigation* water use data show annual use for irrigation to grow cotton, grain, vegetables, and tree crops in the South Central Texas Region in 2000 of 383,332 acft/yr, or 3.8 percent of the total irrigation water used in Texas in 2000. Projected irrigation water demands in 2060 are 301,679 acft/yr, or 21 percent less than in 2000 (Figure ES-2). The projected decline is based upon increased irrigation efficiency, economic factors, and reduced government programs affecting the profitability of irrigated agriculture. In 2000, water use in the region for *livestock* purposes was estimated at 25,660 acft/yr. The TWDB projections for livestock use in the region in the years 2010 through 2060 are 25,954 acft/yr.

Projected total water demand for the South Central Texas Region is the sum of water demand projections for municipal, industrial, steam-electric power generation, mining, irrigation, and livestock uses. Projected percentage changes in the composition of total water demand by use category from 2000 to 2060 are shown in Figure ES-3.

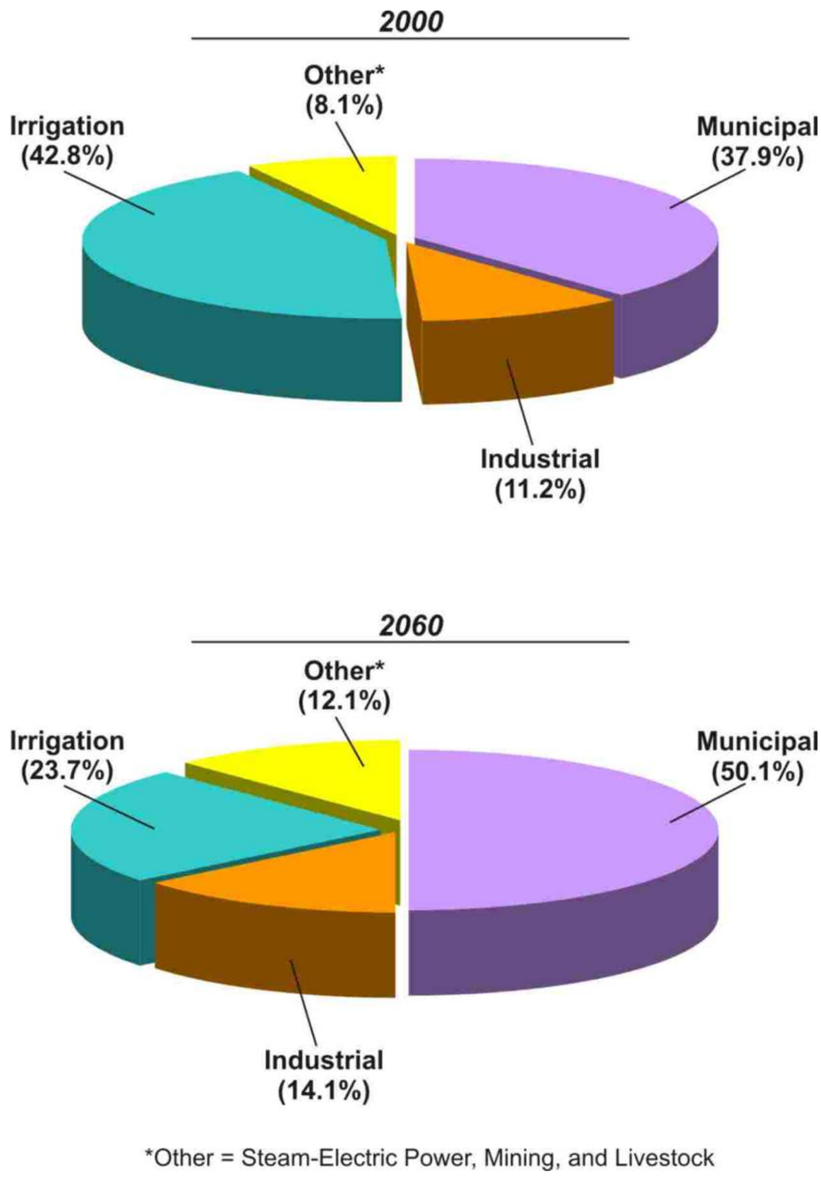

Figure ES-3. Distribution of Total Demand Among Uses

In accordance with TWDB guidelines, the SCTRWPG identified seven Wholesale Water Providers in the South Central Texas Region. These providers are listed in Table ES-2, along with a general description of their service areas. TWDB guidance defines a Wholesale Water Provider as a provider such as a river authority, water supply corporation, or city that has, or is expected to have, contracts to sell more than 1,000 acft wholesale in a year. The SCTRWPG has worked with each of the Wholesale Water Providers in an effort to quantify their projected demands, which typically include the demands of several cities, utilities, and other water user groups.

Table ES-2.
Wholesale Water Providers and Service Areas

Wholesale Water Provider	*Service Areas*
Regional Water Provider for Bexar County (RWPBC)	Bexar County
San Antonio Water System (SAWS)	Bexar County
Bexar Metropolitan Water District (BMWD)	Bexar, Atascosa, Comal, and Guadalupe Counties
Canyon Regional Water Authority (CRWA)	Bexar, Caldwell, Comal, Guadalupe, Hays, and Wilson Counties
Guadalupe-Blanco River Authority (GBRA)	Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Refugio, and Calhoun Counties
Schertz-Seguin Local Government Corporation (SSLGC)	City of Schertz, City of Seguin, City of Selma, City of Universal City, Springs Hill WSC, Green Valley SUD, and Crystal Clear WSC
Springs Hill WSC	City of La Vernia, Springs Hills WSC, Crystal Clear WSC, and East Central WSC

Water Supply

There are five major and two minor aquifers supplying water to the region. The five major aquifers are the Edwards (Balcones Fault Zone), Carrizo-Wilcox, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers. The two minor aquifers are the Sparta and Queen City Aquifers. The Region is located in parts of the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins and parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins. The existing surface water supplies of the region include storage reservoirs and run-of-river water rights.

The total quantity of water obtained from aquifers of the region and used within the region in 2000 was 705,661 acft. Of this total, 55.6 percent was from the Edwards Aquifer, 36.1 percent was from the Carrizo, 5.6 percent was from the Gulf Coast, 2.1 percent was from the Trinity, and the remaining 0.6 percent was from the Queen City, Sparta, and Edwards-Trinity (Plateau) Aquifers.

Projected future groundwater supplies available in the South Central Texas Region during the drought of record are 935,593 acft/yr in 2010, 925,559 acft/yr in 2030, and 924,203 acft/yr in 2060. Such available supplies may be limited subject to the permitting authority of groundwater conservation districts. Supplies available from the Sparta, Queen City, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers are projected to hold steady on an annual basis throughout the 2010 through 2060 projections period. These aquifers are projected to supply only about 18 percent of the total groundwater available to the region in 2060. The supply available from the Carrizo Aquifer is projected to decline from 414,774 acft/yr for the 2010 through 2020 period to 404,740 acft/yr for the period after 2020. The supply available from the Trinity Aquifer is projected to decline from 9,563 acft/yr for the 2010 through 2040 period to 8,207 acft/yr for the period after 2040. In the case of the Edwards Aquifer, SB 1477 limits pumpage withdrawals to 450,000 acft/yr until December 31, 2007, and to 400,000 acft/yr beginning in 2008.[1] In addition, SB 1477 states in Section 1.14(h): "… the authority, through a program, shall implement and enforce water management practices, procedures, and methods to ensure that, not later than December 31, 2012, the continuous minimum springflows of the Comal Springs and the San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. The authority from time to time as appropriate may revise the practices, procedures, and methods. To meet this requirement, the authority shall require: (1) phased reductions in the amount of water that may be used or withdrawn by existing users or

[1] For planning purposes, an estimate of 340,000 acft/yr of available supply during a drought of record from the Edwards Aquifer was agreed upon by the South Central Texas Regional Water Planning Group and the staff of the Texas Water Development Board. This quantity was adopted as a placeholder number until the EAA obtains approval from the U.S. Fish and Wildlife Service of a Habitat Conservation Plan (HCP). TWDB staff, in a letter to Greg Ellis, dated November 16, 1999, agreed to accept water availability from the Edwards Aquifer as 340,000 acft/yr after 2012 in the Regional Water Plan, if it includes actions to be taken to ensure that the required level of protection of the endangered species at San Marcos and Comal Springs will be maintained during a drought of record. Independent studies by the TWDB, HDR, and Bio-West indicate that annual Edwards Aquifer pumpage would have to be limited to about 225,000 acft/yr to maintain uninterrupted discharge of at least 60 cfs from Comal Springs during a repeat of the drought of record.

categories of other users; or (2) implementation of alternative management practices, procedures, and methods." Thus, supplies from the Edwards Aquifer may be less than the pumpage limits specified in SB 1477. For purposes of the 2006 South Central Texas Regional Water Plan, the supply from the Edwards Aquifer is assumed to be 340,000 acft/yr.

Development of surface water resources has been limited in the South Central Texas Region because of the presence of significant quantities of groundwater. The largest run-of-river water rights are concentrated below the confluence of the Guadalupe and San Antonio Rivers and are held by the Guadalupe-Blanco River Authority and Union Carbide Corporation. These diversion rights total about 175,500 acft/yr. Significant water rights associated with existing reservoirs are held by the Guadalupe-Blanco River Authority (Canyon Reservoir), Bexar-Medina-Atascosa Counties WCID #1 (Medina Lake System), San Antonio City Public Service (Calaveras and Braunig Lakes), and Coleto Creek Power (Coleto Creek Reservoir). Diversion rights associated with these reservoirs total about 218,000 acft/yr.

Water Demand and Water Supply Comparisons

The South Central Texas Region water supply and demand data are shown graphically, by decade, for the years 2010 to 2060. The amount by which drought demand exceeds current supply is defined, for regional planning purposes, as the needs. In year 2010, needs (shortages) are about 156,600 acft/yr, in 2030 the projected need is about 256,430 acft/yr, and in 2060 the projected need for drought of record conditions is about 416,850 acft/yr (Figure ES-4).

Figure ES-5 shows the projected water needs for the region at each decade. In 2010, the projected need (shortage) for municipal, industrial, steam-electric, and mining is approximately 101,000 acft/yr, and the need for irrigation and livestock is about 55,000 acft/yr. The projected needs in 2060 are about 381,000 acft/yr for municipal, industrial, steam-electric, and mining, and about 36,000 acft/yr for irrigation and livestock. Table ES-3 identifies the counties in which one or more water user groups have a projected water need (shortage) during the planning period. Thirteen of the counties in the region have municipal water user groups for which there are projected shortages. There are three counties with projected manufacturing or industrial water needs (shortages), four counties with projected steam-electric power generation water needs, five counties with projected irrigation water needs, three counties with projected mining water needs, and four counties with projected livestock water needs.

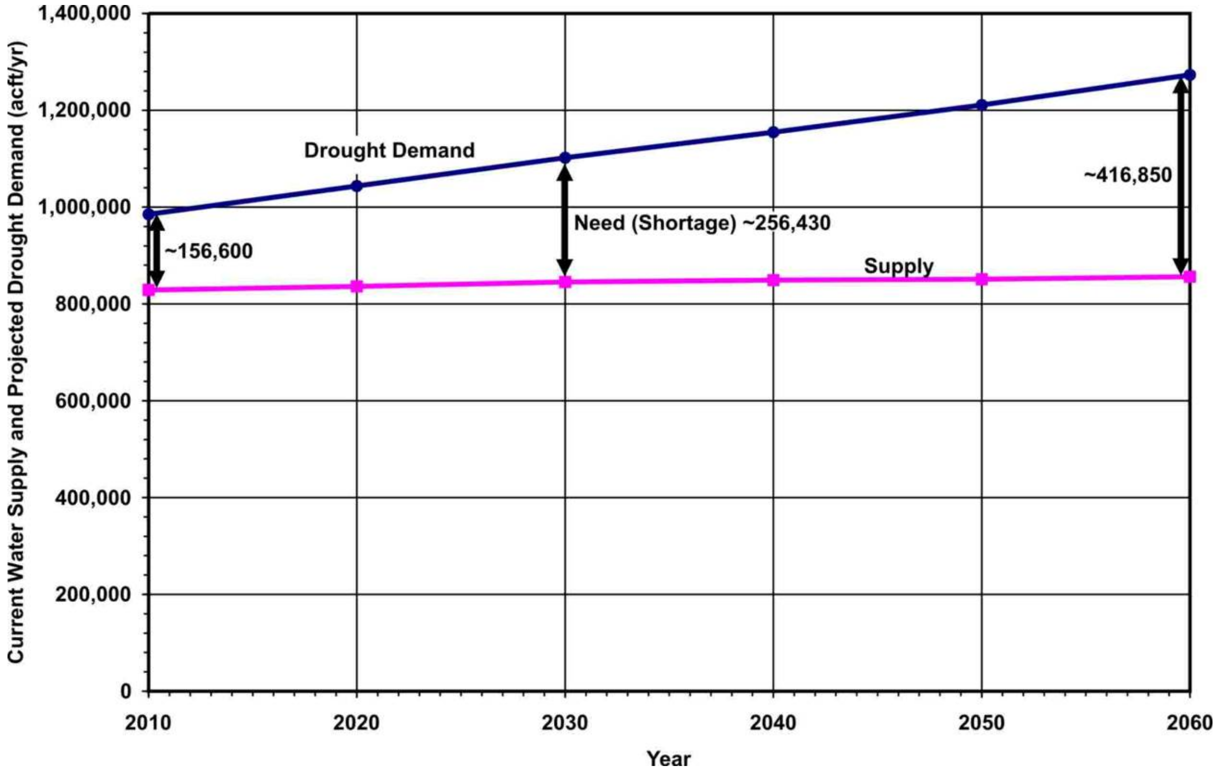

Figure ES-4. Supply, Demand, and Need (Shortage)

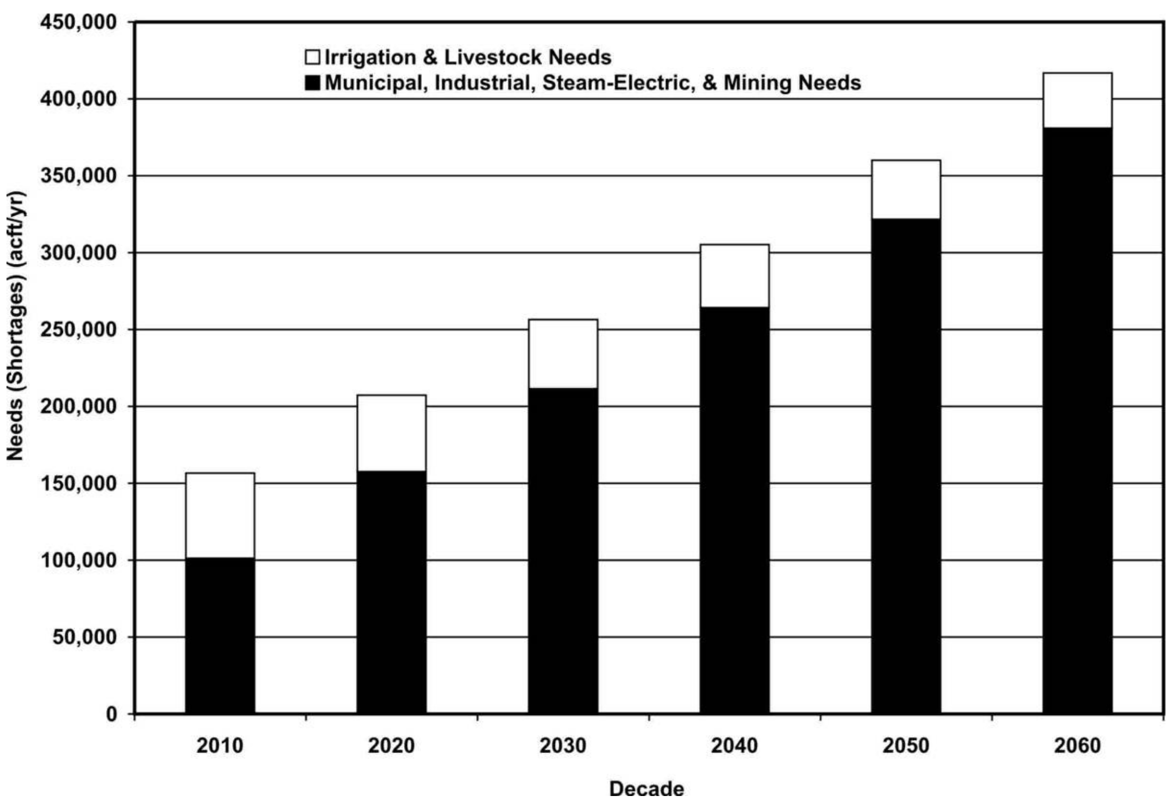

Figure ES-5. Projected Water Needs (Shortages)

Table ES-3.
Counties and Types of Water User Groups with Projected Water Needs (Shortages)

County	***Municipal***	***Manufacturing***	***Steam-Electric Power***	***Mining***	***Irrigation***	***Livestock***
Atascosa	X		X		X	
Bexar	X	X		X	X	X
Caldwell	X					
Calhoun	X					
Comal	X	X		X		X
DeWitt						
Dimmit						
Frio						
Goliad			X			
Gonzales	X					
Guadalupe	X		X			
Hays (part)	X		X	X		X
Karnes	X					
Kendall	X				X	X
La Salle						
Medina	X				X	
Refugio						
Uvalde	X					
Victoria		X				
Wilson	X					
Zavala					X	
Total	**13**	**3**	**4**	**3**	**5**	**4**

Social and Economic Impacts of Not Meeting Projected Water Needs

The SCTRWPG identified 67 individual water user groups that showed an unmet need during drought-of-record supply conditions for each decade from 2000 to 2060. Of the 21 counties of the South Central Texas Region, 16 have water user groups with projected water needs (shortages). Compared to the projected growth in population, the region does not have available municipal water supplies for 562,264 (23 percent) of the projected 2,460,599 population in 2010, 1,165,034 (35 percent) of the projected 3,292,970 population in 2030, and 1,954,807 (45 percent) of the projected 4,297,786 population in 2060. Of these totals, school age population estimates are 146,656 in 2010, 308,368 in 2030, and 531,831 in 2060.

The estimated effect of projected water shortages upon gross value of business, which includes the direct and indirect effects, are $910 million per year in 2010, $4.70 billion per year in 2030, and $10.81 billion per year in 2060. If the water needs are left entirely unmet, the level of shortage in 2010 results in 10,080 fewer jobs than would be expected if the water needs of 2010 are fully met. The gap in job growth due to water shortages grows to 34,235 by 2030 and to 97,950 by 2060. The estimated effect of the projected water shortages upon personal income in 2010 is $664 million, in 2030 is $2.26 billion, and in 2060 is $5.48 billion. Lost taxes paid to local, state, and federal governments due to unmet water needs are $32.34 million in 2010, $118 million in 2030, and $335.2 million in 2060.

Water Management Strategies to Meet Projected Water Needs

The regional water planning process includes making projections of the water needs of each water user group, identification of potentially feasible water management strategies through public input, and evaluation of such strategies in accordance with TWDB Rules. Technical evaluation of water management strategies includes calculation of potential quantity of water during drought conditions, reliability of supplies, cost of water delivered to the water users' distribution systems in a form ready to be distributed for end use, environmental and implementation issues, effects upon other water resources of the state, threats to agricultural and natural resources, consistency comparisons among strategies, recreational effects, third party social and economic impacts of voluntary transfers, efficient use of existing supplies, and water quality considerations. The planning process for the South Central Texas Region is summarized in Figure ES-6.

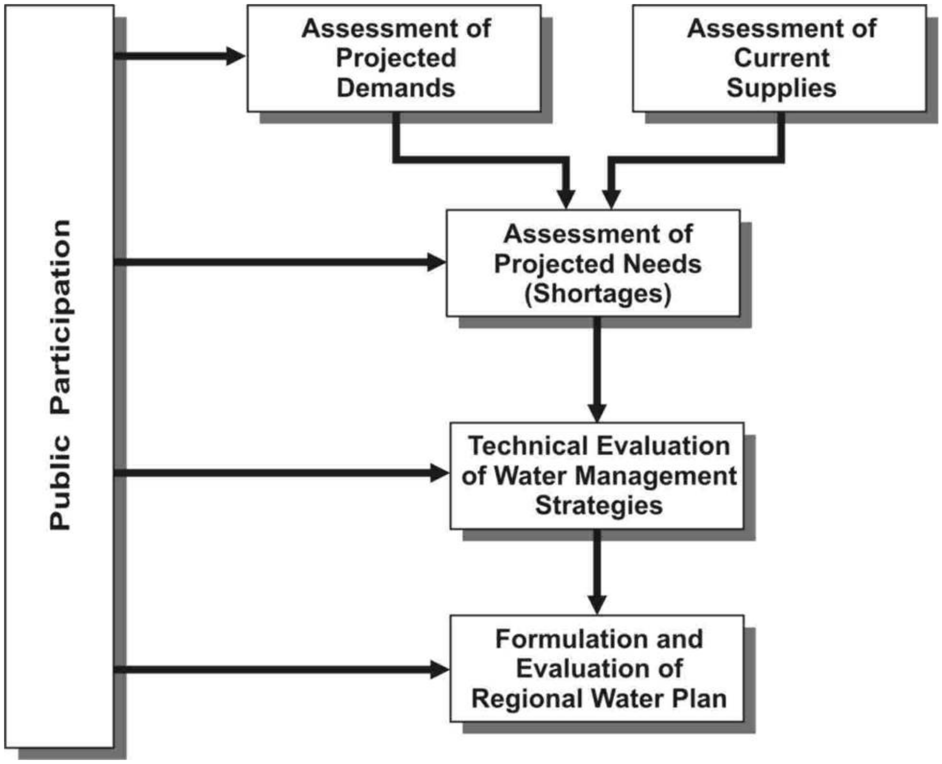

Figure ES-6. Regional Planning Process

South Central Texas Regional Water Plan

The South Central Texas Regional Water Plan includes recommended water management strategies that emphasize water conservation; maximize utilization of available resources, water rights, and reservoirs; engage the efficiency of conjunctive use of surface and groundwater, avoid development of large new reservoirs; and limit depletion of storage in aquifers. There are additional strategies that have significant support within the region, yet require further study regarding quantity of dependable water supply made available during severe drought, feasibility, and/or cost of implementation, that are also included in the Plan. **Water management strategies recommended to meet projected needs in the South Central Texas Region could produce new supplies in excess of 738,000 acft/yr in 2060 and may be categorized by source as shown in Figure ES-7.**

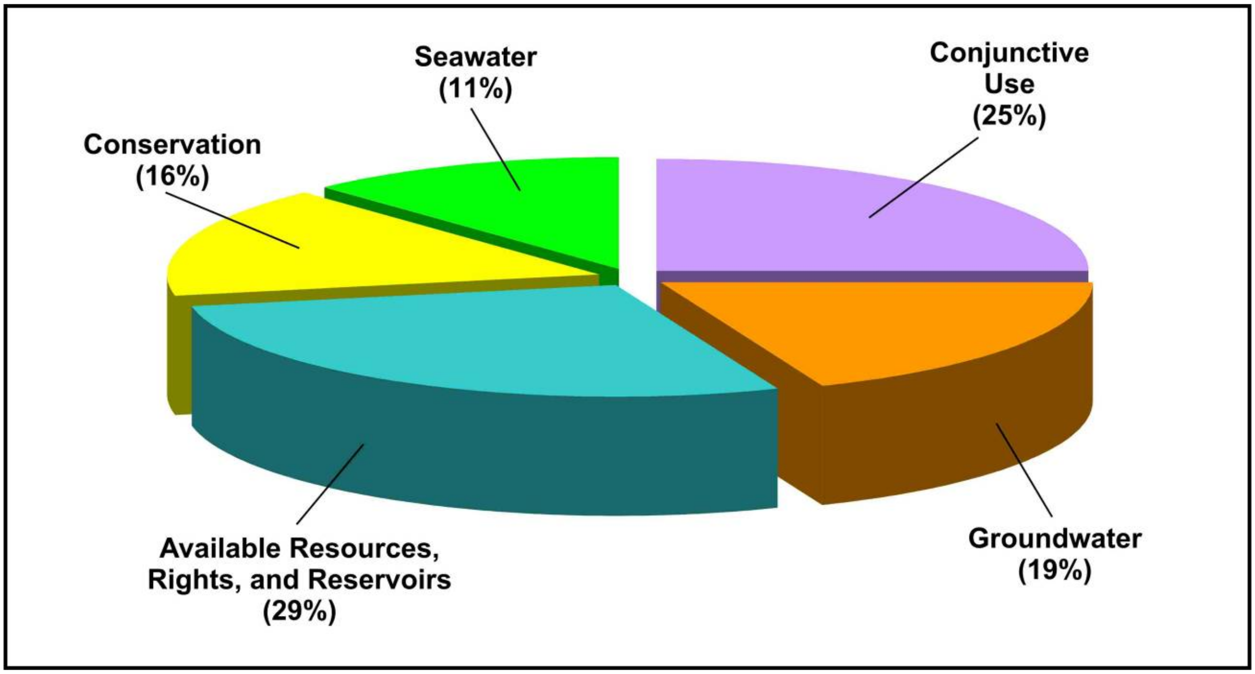

Figure ES-7. Sources of New Supply

Specific recommended water management strategies in the Plan are summarized by approximate timing of potential implementation in Figure ES-8. Water management strategies emphasizing conservation comprise about 16 percent of recommended new supplies and include:

- Municipal Water Conservation (72,570 acft/yr @ $432/acft/yr);
- Steam-Electric Water Conservation (28,459 acft/yr);
- Irrigation Water Conservation (14,089 acft/yr @ $113/acft/yr); and
- Mining Water Conservation (1,425 acft/yr).

Water management strategies maximizing use of available resources, water rights, and reservoirs comprise about 29 percent of recommended new supplies and include:

- Edwards Transfers (71,335 acft/yr @ $135/acft/yr);
- SAWS Recycled Water Program Expansion and other Recycled Water (46,634 acft/yr @ $434/acft/yr);
- Canyon Reservoir (27,150 acft/yr @ $294/acft/yr+);
- Wimberley & Woodcreek Water Supply from Canyon Reservoir (4,636 acft/yr @ $989/acft/yr);
- Purchase from Wholesale Water Provider (LNRA) (489 acft/yr @ $897/acft/yr);
- Surface Water Rights (2,867+ acft/yr); and
- Lower Guadalupe Water Supply Project for Upstream GBRA Needs (60,000 acft/yr @ $1,226/acft/yr).

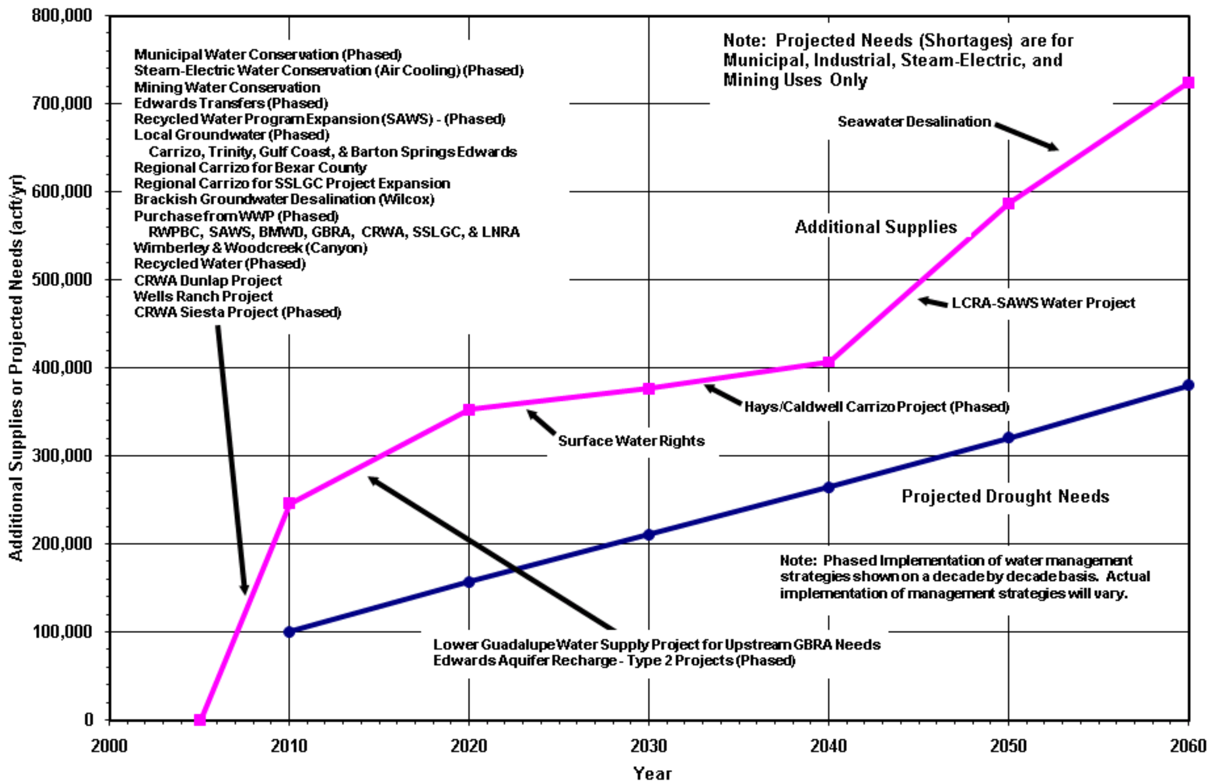

Figure ES-8. Phased Implementation of Water Management Strategies

Water management strategies that simultaneously develop groundwater supplies and limit depletion of storage in regional aquifers comprise about 19 percent of recommended new supplies and include:

- Local Carrizo, Gulf Coast, Trinity, and Barton Springs Edwards (46,917 acft/yr @ $135/acft/yr - $904/acft/yr);
- Regional Carrizo for Bexar County Supply (56,188 acft/yr @ $862/acft/yr);
- Regional Carrizo for SSLGC Project Expansion (12,800 acft/yr @ $411/acft/yr);
- Hays/Caldwell Carrizo Project (15,000 acft/yr @ $694/acft/yr);
- Wells Ranch Project (3,400 acft/yr @ $690/acft/yr); and
- Brackish Groundwater Desalination – Wilcox Aquifer (5,662 acft/yr @ $1,502/acft/yr).

Recommended water management strategies that engage the efficiency of conjunctive use of surface and groundwater as well as maximize the use of available resources and water rights comprise approximately 25 percent of recommended new supplies and include:

- Edwards Recharge – Type 2 Projects (L-18a) (21,577 acft/yr @ $1,355/acft/yr);
- CRWA Dunlap Project (5,600 acft/yr @ $956/acft/yr)
- CRWA Siesta Project (5,042 acft/yr @ $853/acft/yr); and
- LCRA-SAWS Water Project (150,000 acft/yr @ $1,326/acft/yr).

Finally, the Regional Water Plan includes the development of a Seawater Desalination water management strategy at 84,012 acft/yr (75 mgd) which could represent approximately 11 percent of the recommended new supplies.

The Regional Water Plan includes several water management strategies that require further study and funding prior to implementation. Several of these strategies employ technologies that have been used previously, but further research is necessary to determine the cost of implementation, optimal scale and location, and quantity of dependable water supply that would be available in severe drought. These strategies are:

- Brush Management;
- Weather Modification;
- Rainwater Harvesting;
- Small Aquifer Recharge Dams;
- Simsboro Aquifer Project (GBRA);
- Brackish Groundwater Desalination – Edwards Aquifer (SAWS);
- Mesa Water Supply Project (SAWS);
- Cooperation with Corpus Christi for New Water Sources;
- Drought Management; and
- Additional Storage (ASR and/or Surface).

Although specific quantities of new supply dependable in drought have not been determined for these strategies, it is understood that their implementation will contribute positively to storage and system management of many diverse strategies in the Regional Water Plan. The SCTRWPG recommends that State funding be made available to cooperatively support the refinement and implementation of these strategies.

The 2006 South Central Texas Regional Water Plan also recognizes Edwards Aquifer Recharge and Recirculation Systems (R&R) as a water management strategy requiring further evaluation. As it did in the 2001 Regional Water Plan, the SCTRWPG recommends State and local funding for research at a level that ensures due consideration of this strategy.

In early 2005, the SCTRWPG received a request from Canyon Regional Water Authority (in cooperation with Bexar Metropolitan Water District) to amend the 2001 South Central Texas Regional Water Plan to include water management strategies identified as the Dunlap, Siesta, and Wells Ranch Projects. Technical evaluations of these three potentially feasible water management strategies have been completed in accordance with TWDB guidance for regional water planning. Pursuant to an October 13, 2005 public hearing and consideration of public comment, the SCTRWPG has chosen to amend the 2001 Plan and modify the 2006 Plan to include recommendation of these three strategies to meet projected needs.

There are significant quantities of projected water supply needs or shortages in the region for municipal, industrial, steam-electric, and mining uses. As indicated in Figure ES-8, implementation of a number of water management strategies on an expedited basis will be necessary to avoid significant hardship, water rationing, and/or cessation of discharge from Comal Springs in the event of severe drought during the next decade. Substantial water supply needs or shortages are also projected for irrigation use in the South Central Texas Region. However, based upon present economic conditions for agriculture and the fact that there are no really low-cost water supplies to be developed, the SCTRWPG has determined that it is not economically feasible to meet projected irrigation needs at this time, since the net farm income to pay for water is less than the costs of water at the potential sources.

Implementation of the 2006 South Central Texas Regional Water Plan will result in the development of new water supplies that will be reliable in the event of a repeat of the most severe drought on record. It is evident in Figure ES-8 that implementation of all recommended water management strategies is not likely to be necessary in order to meet projected needs within the planning period. The SCTRWPG explicitly recognizes the difference between additional supplies and projected needs as System Management Supplies and has recommended water management strategies over and above those apparently needed to meet projected demands in the Regional Water Plan for the following reasons:

- To recognize both the long lead times and the uncertainty associated with risk factors that may prevent implementation of water management strategies and necessitate replacement strategies;

- To preserve flexibility for water user groups or wholesale water suppliers to select the most feasible projects among several consistent with the Regional Plan and therefore ensure that such projects are potentially eligible for permitting and funding;
- To serve as additional supplies in the event that rules, regulations, or other restrictions limit use of any planned strategies; and/or
- To ensure adequate supplies in the event of a drought more severe than that which occurred historically.

Costs associated with the implementation and long-term operations and maintenance of water management strategies have been estimated in accordance with TWDB rules and general guidelines and reflect regional water treatment capacity and balancing storage facilities sufficient to meet peak daily and seasonal water demands in the larger urban areas. **Total estimated project cost (in 2002 dollars) for the recommended water management strategies for municipal supply that will likely require long-term financing for implementation is about $5.034 billion. Annual unit costs for recommended water management strategies for municipal supply in the 2006 South Central Texas Regional Water Plan (in 2002 dollars) are estimated to range from a low of about $135/acft/yr ($0.41 per 1,000 gallons) for Edwards Transfers to a high of about $1,502/acft/yr ($4.61 per 1,000 gallons) for Brackish Groundwater Desalination – Wilcox Aquifer and average about $873/acft/yr ($2.68 per 1,000 gallons).** No costs have been included for projects that are presently under construction and potentially feasible water management strategies requiring further study.

The South Central Texas Regional Water Planning Group has identified the following environmental benefits and concerns associated with the implementation of the Regional Water Plan.

Environmental Benefits

- Substantial commitment to water conservation through adoption of an aggressive water conservation water management strategy effectively reduces projected water shortages thereby delaying or eliminating the need for implementation of other water management strategies having greater associated environmental impacts.
- Development of new water supply sources for Bexar, Comal, and Hays Counties reduces reliance on the Edwards Aquifer during drought thereby contributing to maintenance of springflow and protection of endangered species. The Regional Water Plan recognizes the on-going initiatives of the Edwards Aquifer Authority (EAA) to obtain U.S. Fish & Wildlife Service approval of a Habitat Conservation Plan which will help to define the requirements for maintenance of springflow and protection of endangered species.

- Implementation of the 2006 Regional Water Plan is likely to result in increased instream flows in the San Antonio River.
- Edwards Aquifer Recharge Enhancement through the construction of Type 2 recharge dams (L-18a) contributes not only to municipal water supply, but also to maintenance of springflow, protection of endangered species in and below the springs, increased instream flows, and increased freshwater inflows to the Guadalupe Estuary.
- The Regional Water Plan makes greatest beneficial use of existing surface water rights and major storage facilities (Canyon Reservoir, Highland Lakes System) thereby minimizing the development of new water supply sources and associated environmental impacts. Examples include reliance on presently under-utilized water rights held by the Guadalupe-Blanco River Authority (GBRA) and Union Carbide Corporation (UCC) below the confluence of the Guadalupe and San Antonio Rivers and by the Lower Colorado River Authority (LCRA) on the Lower Colorado River. Enhanced use of existing surface water rights and major storage facilities accounts for approximately one-third of the total new water supplies for municipal, industrial, steam-electric, and mining uses by 2060.
- The Regional Water Plan avoids large-scale development of new reservoirs having associated terrestrial and aquatic habitat and cultural resources impacts and focuses on smaller, off-channel balancing reservoirs essential for efficient operations and meeting peak seasonal water needs.
- Inclusion of Edwards Aquifer transfers from irrigation use to municipal use through lease/purchase of pumpage rights and development of conserved water through installation of LEPA irrigation systems results in substantial increases in municipal water supply without construction of additional transmission and storage facilities having associated environmental effects.
- The San Antonio Water System (SAWS) goal of meeting 20 percent of projected water demand through its Recycled Water Program makes greatest use of developed water resources.
- Inclusion of groundwater development has limited associated environmental effects as compared to those typically associated with development of new surface water supply reservoirs.
- Inclusion of Seawater Desalination is perceived to have fewer associated environmental effects, as compared to those typically associated with development of new (fresh) surface water supplies.

Environmental Concerns

- Potential reductions in freshwater inflows to bays and estuaries, including associated effects on wetland and marsh habitats and marine species, are identified as matters of concern. Primary concerns focus upon the potential effects of the LCRA-SAWS Water Project on freshwater inflows to Matagorda Bay and the Lower Guadalupe Water Supply Project for Upstream GBRA Needs on freshwater inflows to the Guadalupe Estuary.
- Concentration of Edwards Aquifer pumpage closer to Comal Springs as a result of implementation of Edwards Transfers tends to reduce discharge from Comal Springs.

- Potential conflicts with stream segments identified by TPWD as ecologically significant are associated with the LCRA-SAWS Water Project, Lower Guadalupe Water Supply Project for GBRA Needs, and Edwards Recharge – Type 2 Projects (L-18a).
- Potential effects on small springs and instream flows below these springs may be associated with the development of groundwater supplies.
- Intake siting, brine discharge location(s), and potential effects on marine habitat and species are environmental concerns associated with Seawater Desalination.

Regional Water Plan Summary

Recommended water management strategies to meet the projected needs of each city, utility, water user group, and wholesale water provider in the South Central Texas Region are summarized by county in Table ES-4.

Table ES-4.
Regional Water Supply Plan Summary

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Atascosa County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.1**
Benton City WSC	772	1,288	1,758	0	385	1,058	Municipal Water Conservation (L-10 Mun) and Local Carrizo Aquifer
Bexar Met Water District	505	715	895				See Bexar County
Charlotte	296	324	350	0	0	0	Municipal Water Conservation (L-10 Mun)
Jourdanton	801	914	1,026	0	0	0	Municipal Water Conservation (L-10 Mun)
Lytle	412	433	456	196	217	243	Municipal Water Conservation (L-10 Mun) and Edwards Transfers (L-15)
McCoy WSC	1,065	1,643	2,181	515	1,107	1,675	Municipal Water Conservation (L-10 Mun) and Local Carrizo Aquifer
Pleasanton	1,906	2,027	2,151	0	0	0	Municipal Water Conservation (L-10 Mun)
Poteet	735	740	752	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	449	251	97	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	6	6	6	0	0	0	
Steam-Electric	5,884	6,962	11,510	0	0	3,952	Local Carrizo Aquifer
Mining	1,298	1,405	1,509	0	0	0	
Irrigation	40,885	38,185	34,502	1,961	111	0	Irrigation Water Conservation (L-10 Irr.)
Livestock	1,745	1,745	1,745	0	0	0	
Bexar County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.2**
Alamo Heights	2,071	2,136	2,170	515	580	614	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Atascosa Rural WSC	941	1,264	1,613	561	884	1,233	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Balcones Heights	514	578	670	0	0	0	Municipal Water Conservation (L-10 Mun)
Bexar Met Water District	8,897	9,109	9,449	7,067	8,466	10,136	Municipal Water Conservation (L-10 Mun), Edwards Transfers (L-15), Local Trinity Aquifer, Local Carrizo Aquifer, Wells Ranch Project, Purchase from WWP (CRWA), & Purchase from WWP (RWPBC)
Castle Hills	820	793	771	96	69	47	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (BMWD)
China Grove	376	531	695	0	0	0	Municipal Water Conservation (L-10 Mun)
Converse	1,907	2,729	3,564	0	597	1,432	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (BMWD)
East Central SUD	1,325	1,790	2,289	0	251	942	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (CRWA)
Elmendorf	112	132	156	0	0	0	Municipal Water Conservation (L-10 Mun)
Fair Oaks Ranch	1,090	1,097	1,104	0	0	0	Municipal Water Conservation (L-10 Mun)
Green Valley SUD	458	818	1,182				See Guadalupe County
Helotes	1,537	2,820	4,047	0	0	0	Municipal Water Conservation (L-10 Mun)
Hill Country Village	838	831	826	730	723	718	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (BMWD)
Hollywood Park	2,314	2,458	2,616	1,969	2,113	2,271	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (BMWD)
Kirby	1,005	1,007	1,034	299	301	328	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Lackland AFB (CDP)	3,104	3,056	3,016	857	809	769	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Leon Valley	1,091	1,049	1,036	0	0	0	Municipal Water Conservation (L-10 Mun)
Live Oak	1,145	1,177	1,284	0	0	0	
Lytle	5	8	12				See Atascosa County
Olmos Park	403	441	484	0	0	0	Municipal Water Conservation (L-10 Mun)
San Antonio	216,945	265,370	317,727	63,804	121,790	180,204	Municipal Water Conservation (L-10 Mun), Edwards Transfers (L-15), Purchase from WWP (SAWS), Purchase from WWP (BMWD), & Purchase from WWP (RWPBC)

Continued on next page

Table ES-4 Continued

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Bexar County (Continued)		**Table 2-12**			**Table 4A-1**		**Section 4B.2.2**
Schertz	272	456	649				See Guadalupe County
Selma	1,531	2,309	2,155	757	1,705	1,695	Municipal Water Conservation (L-10 Mun), Purchase from WWP (SSLGC), & Purchase from WWP (RWPBC)
Shavano Park	819	847	880	499	527	560	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Somerset	405	552	709	0	0	0	Municipal Water Conservation (L-10 Mun)
St. Hedwig	310	403	501	0	0	0	Municipal Water Conservation (L-10 Mun)
Terrell Hills	863	956	1,057	0	0	0	Municipal Water Conservation (L-10 Mun)
Universal City	2,608	3,175	3,101	141	708	634	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Water Service Inc. (Apex Water Ser.)	570	809	1,061	908	1,381	2,015	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Windcrest	1,204	1,187	1,182	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	6,624	6,536	7,496	0	108	106	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (RWPBC)
Industrial	25,951	32,775	42,110	3,258	10,082	19,419	Recycled Water (SAWS) & Purchase from WWP (RWPBC)
Steam-Electric	17,309	20,196	33,390	0	0	0	
Mining	3,582	4,150	4,766	23	953	1,229	Local Carrizo Aquifer & Purchase from WWP (RWPBC)
Irrigation	15,273	14,010	12,306	184	529	417	Irrigation Water Conservation (L-10 Irr.)
Livestock	1,319	1,319	1,319	0	80	91	Local Carrizo Aquifer
Caldwell County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.3**
Aqua WSC	267	396	580	49	178	362	Municipal Water Conservation (L-10 Mun) & Local Carrizo Aquifer
County Line WSC	204	405	695				See Hays County
Creedmoor-Maha WSC	234	367	560	0	0	0	Municipal Water Conservation (L-10 Mun)
Goforth WSC	184	342	571				See Hays County
Gonzales County WSC	63	94	136				See Gonzales County
Lockhart	2,451	3,629	5,285	341	1,519	3,175	Municipal Water Conservation (L-10 Mun), Local Carrizo Aquifer, Hays/Caldwell Carrizo Project, & Purchase from WWP (GBRA)
Luling	1,067	1,299	1,594	168	400	695	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Martindale	125	139	158	0	0	0	
Martindale WSC	142	158	179	0	0	41	Purchase from WWP (GBRA)
Maxwell WSC	503	844	1,331	0	73	692	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Mustang Ridge	135	215	329	19	99	213	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Niederwald	26	61	111				See Hays County
Polonia WSC	668	1,074	1,656	0	137	719	Municipal Water Conservation (L-10 Mun) & Local Carrizo Aquifer
Rural	237	199	143	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	15	21	29	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	14	16	18	0	0	0	
Irrigation	1,044	824	578	0	0	0	
Livestock	918	918	918	0	0	0	

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Table ES-4 Continued

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Calhoun County		Table 2-12			Table 4A-1		Section 4B.2.4
Calhoun County WS	436	572	632	0	0	0	
Point Comfort	224	500	667	46	322	489	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (LNRA)
Port Lavaca	1,769	1,981	2,345	0	0	0	Municipal Water Conservation (L-10 Mun)
Seadrift	252	257	258	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural (Port O'Conner MUD)	198	222	264	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	49,784	59,235	72,238	0	0	0	
Steam-Electric	569	530	877	0	0	0	
Mining	32	36	38	0	0	0	
Irrigation	15,568	12,096	9,581	0	0	0	
Livestock	342	342	342	0	0	0	
Comal County		Table 2-12			Table 4A-1		Section 4B.2.5
Bexar Met Water District	462	1,059	2,001				See Bexar County
Bulverde City	1,053	2,528	4,995	653	2,128	4,595	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Canyon Lake WSC	2,928	6,838	13,331	0	2,838	9,331	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Crystal Clear WSC	240	426	731				See Guadalupe County
Fair Oaks Ranch	58	58	59				See Bexar County
Garden Ridge	565	860	1,360	285	580	1,080	Municipal Water Conservation (L-10 Mun), Edwards Transfers (L-15), & Purchase from WWP (SSLGC)
Green Valley SUD	235	409	696				See Guadalupe County
New Braunfels	10,042	15,390	24,416	91	4,599	14,475	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Schertz	82	169	312				See Guadalupe County
Selma	77	193	274				See Bexar County
Water Service Inc. (Apex Water Ser)	308	509	845				See Bexar County
Rural	2,721	3,159	3,998	1,752	1,211	2,071	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Industrial	7,729	9,314	11,553	0	59	2,297	Recycled Water
Steam-Electric	0	0	0	0	0	0	
Mining	2,678	3,029	3,401	1,905	2,210	2,694	Water Conservation (Mining) & Recycled Water
Irrigation	204	169	119	0	0	0	
Livestock	298	298	298	109	111	120	Local Trinity Aquifer
DeWitt County		Table 2-12			Table 4A-1		Section 4B.2.6
Cuero	1,249	1,250	1,177	0	0	0	Municipal Water Conservation (L-10 Mun)
Gonzales County WSC	107	108	104				See Gonzales County
Yoakum	352	351	328	0	0	0	Municipal Water Conservation (L-10 Mun)
Yorktown	343	340	318	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	1,013	990	912	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	184	212	254	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	64	68	71	0	0	0	
Irrigation	159	108	54	0	0	0	
Livestock	1,689	1,689	1,689	0	0	0	

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Table ES-4 Continued

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Dimmit County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.7**
Asherton	286	306	279	0	0	0	Municipal Water Conservation (L-10 Mun)
Big Wells	149	159	145	0	0	0	Municipal Water Conservation (L-10 Mun)
Carrizo Springs	1,842	1,996	1,836	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	284	295	263	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	0	0	0	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	1,003	1,051	1,095	0	0	0	
Irrigation	10,611	10,255	8,987	0	0	0	
Livestock	552	552	552	0	0	0	
Frio County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.8**
Benton City WSC	3	5	6				See Atascosa County
Dilley	1,229	1,555	1,825	0	0	0	Municipal Water Conservation (L-10 Mun)
Pearsall	1,443	1,449	1,449	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	727	881	1,007	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	0	0	0	0	0	0	
Steam-Electric	107	100	165	0	0	0	
Mining	109	102	96	0	0	0	
Irrigation	82,017	76,302	68592	0	0	0	
Livestock	1,209	1,209	1,209	0	0	0	
Goliad County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.9**
Goliad	416	527	594	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	608	759	848	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	4	12	24	0	0	0	
Steam-Electric	9,136	10,808	17,870	0	0	4,842	Purchase from WWP (GBRA)
Mining	398	205	46	0	0	0	
Irrigation	309	232	149	0	0	0	
Livestock	920	920	920	0	0	0	
Gonzales County		**Table 2-12**			**Table 4-10**		**Section 4B.2.10**
Gonzales	1,545	1,710	1,759	0	0	0	Municipal Water Conservation (L-10 Mun)
Gonzales County WSC	1,578	1,982	2,120	0	75	255	Municipal Water Conservation (L-10 Mun) & Local Carrizo Aquifer
Nixon	438	479	488	0	0	0	Municipal Water Conservation (L-10 Mun)
Waelder	154	190	203	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	393	263	204	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	2,400	2,822	3,402	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	28	26	24	0	0	0	
Irrigation	1,304	969	621	0	0	0	
Livestock	5,453	5,453	5,453	0	0	0	

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Table ES-4 Continued

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Guadalupe County		Table 2-12			Table 4A-1		Section 4B.2.11
Cibolo	866	1,546	2,730	66	0	0	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (CRWA)
Crystal Clear WSC	1,316	2,112	3,493	0	494	2,701	Municipal Water Conservation (L-10 Mun), Local Carrizo Aquifer, Edwards Transfers, Purchase from WWP (GBRA), Purchase from WWP (CRWA), & Purchase from WWP (SSLGC)
East Central WSC	128	200	316				See Bexar County
Green Valley SUD	2,382	3,735	6,094	229	710	1,816	Municipal Water Conservation (L-10 Mun), Edwards Transfers, Purchase from WWP (GBRA), Purchase from WWP (CRWA), & Purchase from WWP (SSLGC)
Marion	164	194	251	0	13	70	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (CRWA)
Martindale WSC	47	84	150				See Caldwell County
New Braunfels	467	960	1,810				See Comal County
Santa Clara	220	492	954	76	348	810	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (CRWA)
Schertz	3,797	6,448	11,098	0	635	5,621	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (SSLGC)
Seguin	5,018	6,454	9,047	0	0	0	Municipal Water Conservation (L-10 Mun)
Selma	59	113	176				See Bexar County
Springs Hill WSC	2,349	3,056	4,330	0	0	0	Municipal Water Conservation (L-10 Mun)
Water Service Inc. (Apex Water Ser)	30	45	71				See Bexar County
Rural	270	156	13	48	25	0	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (CRWA)
Industrial	2,638	3,249	4,097	0	0	0	
Steam-Electric	10,065	16,844	27,848	3,225	10,004	21,008	Recycled Water & Water Conservation (Steam-Electric)
Mining	306	330	353	0	0	0	
Irrigation	1,070	846	705	0	0	0	
Livestock	1,057	1,057	1,057	0	0	0	
Hays (Part) County		Table 2-12			Table 4A-1		Section 4B.2.12
County Line WSC	947	2,319	2,982	44	1416	2,365	Municipal Water Conservation (L-10 Mun), Local Trinity Aquifer, Edwards Transfers (L-15), Purchase from WWP (GBRA), & Purchase from WWP (CRWA)
Creedmoor-Maha WSC	10	15	23				See Caldwell County
Crystal Clear WSC	485	806	1,327				See Guadalupe County
Goforth WSC	972	1,704	2,914	79	969	2,408	Municipal Water Conservation (L-10 Mun), Local Trinity Aquifer, Local Edwards (Barton Springs) Aquifer, & Purchase from WWP (GBRA)
Kyle	2,740	4,217	5,203	1388	2865	3,851	Municipal Water Conservation (L-10 Mun), Hays/Caldwell Carrizo Project, & Purchase from WWP (GBRA)
Maxwell WSC	157	249	402				See Caldwell County
Mountain City	45	98	183	0	0	50	Municipal Water Conservation (L-10 Mun) & Local Edwards (Barton Springs) Aquifer
Niederwald	104	194	338	35	160	354	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Plum Creek Water Company	566	963	1,630	0	274	941	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
San Marcos	8,038	14,371	24,439	0	5,807	15,875	Municipal Water Conservation (L-10 Mun), Purchase from WWP (GBRA), Additional Surface Water Rights, Recycled Water, & Hays/Caldwell Carrizo Project
Wimberley WSC	776	1,224	1,966	177	628	1,479	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Woodcreek	246	385	610	118	257	506	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Woodcreek Utilities	748	1,564	2,873	475	1,292	2,651	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Rural	1,444	1,855	2,584	1,033	1,444	2,201	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Industrial	212	285	386	0	0	0	
Steam-Electric	5,331	8,922	14,751	0	252	8,351	Water Conservation (Steam-Electric)
Mining	142	157	163	82	91	107	Recycled Water
Irrigation	353	347	338	0	0	0	
Livestock	280	280	280	82	82	82	Local Trinity Aquifer

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Table ES-4 Continued

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Karnes County	**Table 2-12**			**Table 4A-1**			**Section 4B.2.13**
El Oso WSC	503	570	626	0	0	0	Municipal Water Conservation (L-10 Mun)
Falls City	113	131	145	0	0	0	Municipal Water Conservation (L-10 Mun)
Karnes City	432	474	512	0	0	0	Municipal Water Conservation (L-10 Mun)
Kenedy	763	874	993	187	298	417	Municipal Water Conservation (L-10 Mun) & Local Gulf Coast Aquifer
Runge	195	219	247	0	0	0	Municipal Water Conservation (L-10 Mun)
Sunko WSC	49	57	64				See Wilson County
Rural (TDCJ)	500	500	500	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	348	604	776	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	118	125	137	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	106	102	100	0	0	0	
Irrigation	1,382	1,131	836	0	0	0	
Livestock	1,185	1,185	1,185	0	0	0	
Kendall County	**Table 2-12**			**Table 4A-1**			**Section 4B.2.14**
Boerne	1,570	2,843	4,282	0	23	1,542	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Fair Oaks Ranch	286	300	316				See Bexar County
Water Service Inc (Apex Water Ser)	43	61	81				See Bexar County
Rural	2,750	4,938	7,460	221	1,612	4,163	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (GBRA)
Industrial	0	0	0	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	6	6	6	0	0	0	
Irrigation	714	685	646	148	141	140	Local Trinity Aquifer
Livestock	446	446	446	25	25	25	Local Trinity Aquifer
LaSalle County	**Table 2-12**			**Table 4A-1**			**Section 4B.2.15**
Cotulla	1,407	1,566	1,743	0	0	0	Municipal Water Conservation (L-10 Mun)
Encinal	110	108	107	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	282	384	500	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	0	0	0	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	0	0	0	0	0	0	
Irrigation	4,791	4,500	4,097	0	0	0	
Livestock	1,687	1,687	1,687	0	0	0	

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Table ES-4 Continued

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Medina County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.16**
Benton City WSC	414	589	805				See Atascosa County
Bexar Met Water District	24	41	60				See Bexar County
Castroville	680	802	961	274	396	555	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Devine	837	856	896	0	0	0	Municipal Water Conservation (L-10 Mun)
East Medina SUD	881	1,108	1,385	0	95	372	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Hondo	1,784	2,205	2,717	804	1,225	1,737	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
La Coste	205	239	281	96	130	172	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Lytle	62	59	58				See Atascosa County
Natalia	330	415	519	198	283	387	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Yancey WSC	832	1,180	1,603	577	925	1,348	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Rural	1,527	2,162	2,949	180	799	1,567	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Industrial	67	82	103	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	130	137	143	0	0	0	
Irrigation	54,450	50,005	44,015	4,651	1,200	0	Irrigation Water Conservation (L-10 Irr.)
Livestock	1,298	1,298	1,298	0	0	0	
Refugio County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.17**
Refugio	645	723	777	0	0	0	Municipal Water Conservation (L-10 Mun)
Woodsboro	283	289	293	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	321	270	232	0	0	0	
Industrial	0	0	0	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	7	8	8	0	0	0	
Irrigation	69	69	69	0	0	0	
Livestock	623	623	623	0	0	0	
Uvalde County		**Table 2-12**			**Table 4A-1**		**Section 4B.2.18**
Sabinal	407	398	389	139	130	121	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Uvalde	6,087	6,144	6,178	3,793	3,850	3,884	Municipal Water Conservation (L-10 Mun) & Edwards Transfers (L-15)
Rural	1,572	2,110	2,532	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	432	473	538	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	313	364	418	0	0	0	
Irrigation	55,791	51,513	45,703	0	0	0	
Livestock	1,284	1,284	1,284	0	0	0	

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Table ES-4 Concluded

County/Water User Group	Demand 2010 (acft)	Demand 2030 (acft)	Demand 2060 (acft)	Need (Shortage) 2010 (acft)	Need (Shortage) 2030 (acft)	Need (Shortage) 2060 (acft)	Recommended Management Strategies to Meet Needs (Shortages)
Victoria County	Table 2-12			Table 4A-1			Section 4B.2.19
Victoria	11,924	13,184	14,360	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	2,666	3,194	3,674	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	28,726	35,035	43,520	0	0	6,566	Purchase from WWP (GBRA)
Steam-Electric	2,026	2,035	3,365	0	0	0	
Mining	3,944	4,906	6,041	0	0	0	
Irrigation	9,936	7,402	4,759	0	0	0	
Livestock	1,085	1,085	1,085	0	0	0	
Wilson County	Table 2-12			Table 4A-1			Section 4B.2.20
East Central WSC	104	146	222				See Bexar County
El Oso WSC	52	71	102				See Bexar County
Floresville	1,805	2,245	3,000	0	0	411	Municipal Water Conservation (L-10 Mun) & Local Carrizo Aquifer
La Vernia	278	464	764	0	0	114	Municipal Water Conservation (L-10 Mun) & Purchase from WWP (CRWA)
McCoy WSC	41	82	147				See Atascosa County
Oak Hills WSC	693	1,251	2,160	0	81	990	Municipal Water Conservation (L-10 Mun) & Local Carrizo Aquifer
Poth	348	434	585	0	0	0	Municipal Water Conservation (L-10 Mun)
SS WSC	1,563	2,886	5,030	223	1,546	3,690	Municipal Water Conservation (L-10 Mun), Local Carrizo Aquifer, & Purchase from WWP (CRWA)
Stockdale	350	426	558	0	0	0	Municipal Water Conservation (L-10 Mun)
Sunko WSC	564	826	1,262	0	0	392	Municipal Water Conservation (L-10 Mun) & Local Carrizo Aquifer
Rural	609	1,146	2,006	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	1	1	1	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	242	229	218	0	0	0	
Irrigation	11,296	8,921	6,330	0	0	0	
Livestock	1,808	1,808	1,808	0	0	0	
Zavala County	Table 2-12			Table 4A-1			Section 4B.2.21
Crystal City	2,247	2,343	2,370	0	0	0	Municipal Water Conservation (L-10 Mun)
Rural	864	1,134	1,371	0	0	0	Municipal Water Conservation (L-10 Mun)
Industrial	1043	1154	1315	0	0	0	
Steam-Electric	0	0	0	0	0	0	
Mining	122	127	130	0	0	0	
Irrigation	71,800	66,238	58,692	48,165	42,621	35,078	Irrigation Water Conservation (L-10 Irr.)
Livestock	756	756	756	0	0	0	
Wholesale Water Providers	Tables 2-13 through 2-19			Table 4A-3			Section 4B.3
Regional Water Provider for Bexar Co	0	79,500	111,500	0	79,500	111,500	Municipal Water Conservation (L-10 Mun.), Edwards Aquifer Recharge – Type 2 Projects, & Seawater Desalination
San Antonio Water System	214,990	261,501	314,702	57,442	108,453	165,859	Municipal Water Conservation (L-10 Mun), Edwards Transfers, Recycled Water Program Expansion, Regional Carrizo for Bexar County, Local Trinity, Brackish Groundwater Desalination (Wilcox), & LCRA-SAWS Water Project
Guadalupe-Blanco River Authority	225,126	233,283	216,548	0	0	0	Municipal Water Conservation (L-10 Mun), Lower Guadalupe Water Supply Project for GBRA Needs, Canyon Reservoir, & Wimberley & Woodcreek Water Supply from Canyon Reservoir
Bexar Met	42,876	50,620	58,329	20,300	32,268	40,011	Municipal Water Conservation (L-10 Mun), Edwards Transfers, Local Trinity, Local Carrizo, Wells Ranch Project, Purchase from WWP (CRWA), & Purchase from WWP (RWPBC)
Canyon Regional Water Authority	14,701	22,776	27,803	1,714	9,789	14,816	Municipal Water Conservation (L-10 Mun), CRWA Dunlap Project, CRWA Siesta Project, & Hays/Caldwell Carrizo Project
Schertz-Seguin Local Government Corp.	14,070	16,815	24,992	1,870	4,615	12,792	Municipal Water Conservation (L-10 Mun) & Regional Carrizo for SSLCG Project Expansion
Springs Hill WSC	3,384	4,091	5,365	0	0	0	Municipal Water Conservation (L-10 Mun)

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Section 1
Description of the
South Central Texas Region
[31 TAC §357.7(a)(1)]

1.1 Background

Water supplies of the South Central Texas Region are obtained from the Edwards-Balcones Fault Zone, Carrizo-Wilcox, Trinity, and Gulf Coast Aquifers; from two minor aquifers (Queen City and Sparta); and from the rivers, streams, and reservoirs within the region. The water supply picture of the region is very complex, involving intricate relationships between surface water and groundwater. The Edwards-Balcones Fault Zone Aquifer (hereinafter referred to as the Edwards Aquifer) supplied approximately 56 percent of the total water used in the South Central Texas Region in 2000. Water demands for the area that is now being supplied from the Edwards Aquifer are growing at a rate of approximately 2.0 percent per year. However, not even the present level of use can be sustained while maintaining levels of flows at Comal and San Marcos Springs adequate to support habitats of threatened and endangered species and also meet downstream water rights. Demands on the Trinity and Carrizo-Wilcox (hereinafter referred to as the Carrizo Aquifer) Aquifers of the South Central Texas Region exceed recharge in some areas. In other areas that now depend upon the Carrizo and Gulf Coast Aquifers, present withdrawal rates are substantially less than recharge. Throughout the region, there is an awareness of the dynamic interrelationships of surface water and groundwater and of the importance of maintaining instream flows and freshwater inflows to bays and estuaries.

Operations of the largest existing surface water supply sources in the region are also directly linked to the Edwards Aquifer. Dependable supplies from Canyon Reservoir for municipal and industrial customers are a function of springflows from the Edwards Aquifer, since releases from Canyon Reservoir are necessary to meet downstream water rights when springflows drop below certain levels. Storage in the Medina Lake System contributes significantly to recharge of the Edwards Aquifer, and reservoirs used for steam-electric power generation (Coleto Creek, Calaveras, and Braunig) and hydropower generation are dependent upon springflows and/or treated municipal effluent that originate from the Edwards Aquifer. Surface water supplies available to the region are also a function of recharge to and withdrawal from the aquifers, as are the quantities of streamflows permitted for use in counties of the

Nueces, San Antonio, and Guadalupe River Basins outside of the South Central Texas Region. In water planning for the South Central Texas Region, these factors, together with the numerous potential water management strategies available to the South Central Texas Region, are taken into account herein.

1.2 Physical Description of the South Central Texas Region

The South Central Texas Region includes counties that are located in whole or in part in the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins, and the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins (Table 1-1). The physical terrain of the region ranges from the Hill Country of the Edwards Plateau to the Coastal Plains. A general description of the region, including geology, climate, water resources, vegetational areas, and major water demand centers, is presented in the following sections.

1.2.1 Climate[1]

The South Central Texas Region lies in three climatic divisions of Texas: the Edwards Plateau, the South Central, and the Upper Coast. The climate of the region is classified as humid subtropical. Summers are usually hot and humid, while winters are often mild and dry. The hot weather is rather persistent from late May through September, accompanied by prevailing southeasterly winds. There is little change in the day-to-day summer weather, except for the occasional thunderstorm, which produces much of the annual precipitation within the region. The cool season, beginning about the first of November and extending through March, is also typically the driest season of the year. Winters are ordinarily short and mild, with most of the precipitation falling as drizzle or light rain. Any accumulation of snow is a rare occurrence. Polar air masses, which penetrate the region in winter, bring northerly winds and sharp drops in temperature for short periods of time.

In the coastal region, the climate is dominated by proximity to the Gulf of Mexico and characterized by prevailing southeasterly winds. During the long humid summers, high daytime temperatures, which are common in inland areas, are moderated in coastal areas by the Gulf breeze.

[1] Texas Water Development Board (TWDB) "Continuing Water Resources Planning and Development for Texas," May 1977.

Table 1-1.
South Central Texas Region – List of Counties
Location by River Basin and Edwards Aquifer Area

County	Edwards Aquifer Area	Nueces Basin	San Antonio Basin	Guadalupe Basin	Lower Colorado Basin	Colorado-Lavaca Coastal Basin	Lavaca Basin	Lavaca-Guadalupe Coastal Basin	San Antonio-Nueces Coastal Basin	Rio Grande
Atascosa	X	X	X							
Bexar	X	X	X							
Caldwell	X			X	X					
Calhoun				X		X		X	X	
Comal	X		X	X						
DeWitt			X	X			X	X		
Dimmit		X								X
Frio		X								
Goliad			X	X					X	
Gonzales				X			X			
Guadalupe	X		X	X						
Hays (Part)	X			X						
Karnes		X	X	X					X	
Kendall			X	X	X					
LaSalle		X								
Medina	X	X	X							
Refugio			X						X	
Uvalde	X	X								
Victoria			X	X			X	X		
Wilson		X	X	X						
Zavala		X								

An X in the column indicates that all or part of the county is located in the River or Coastal Basin named in the column heading.

Mean annual precipitation in the region ranges from a high of 38 inches per year in DeWitt County in the eastern part of the region, to a low of 23 inches per year in the Nueces River Basin in the west (Table 1-2). There is a general trend of decreasing precipitation from the eastern portions of the region to western portions. There is also a general trend of increasing precipitation from inland areas to coastal areas.

Table 1-2.
Climatological Data for the
South Central Texas Region

	Precipitation			Temperature					Annual Net Reservoir Surface Evaporation (inches)
					Mean Daily Minimum		Mean Daily Maximum		
River Basin	***Mean Annual (inches)***	***Wettest Month(s)***	***Driest Month(s)***	***Mean Annual (°F)***	***January (°F)***	***July (°F)***	***January (°F)***	***July (°F)***	
Rio Grande	25	Sept.	Mar.	74	48	74	71	96	65
Nueces	23	May, Sept.	Mar.	71	40	72	65	98	45
San Antonio	30	Sept.	Mar., Dec.	70	41	74	64	96	31
Guadalupe	32	May, Sept.	Mar.	79	37	71	60	95	37
Colorado	34	May, Sept.	Jan.	68	39	74	60	96	35
Lavaca	38	May, Sept.	Mar., July	70	41	72	65	98	24
Lavaca-Guadalupe	37	Sept.	Mar., July	70	44	76	64	94	25
San Antonio-Nueces	33	Sept.	Mar.	71	43	73	65	96	30
Colorado-Lavaca	41	Sept.	Mar., July	70	43	78	64	91	20

Source: Texas Water Development Board, “Continuing Water Resources Planning and Development for Texas,” May 1977.

Although mean annual temperatures are basically uniform throughout the region, there are some marked seasonal variations, which lead to widely varied values for annual net reservoir surface evaporation. The values for annual net reservoir surface evaporation range from a high of 65 inches per year, for the portion of Dimmit County located in the Rio Grande River Basin, to a low of 24 inches per year, for the portion of DeWitt County that lies in the Lavaca River Basin (Table 1-2).

The South Central Texas Region is subject to the threat of hurricanes each year from mid-June through the end of October, and in those parts of the region along and near the coastline, the hazard of hurricane tides is prevalent. Although hurricane winds and tornadoes spawned by hurricanes cause extensive damage and occasional loss of life, surveys of hurricanes reaching the Texas Coast indicate that storm tides cause by far the greatest destruction and largest number of deaths. Elsewhere, in the inland areas of the region, the greatest concern with regard to hurricanes is the damage that results from winds and flooding. Records dating back to 1871 show that, on average, a tropical storm or hurricane has affected the region once every 3 years.

1.2.2 General Geology[2]

The Hill Country area of the South Central Texas Region is underlain by Cretaceous Age limestone, which forms the Edwards Plateau. East and south of the Plateau are upper Cretaceous chalk, limestone, dolomite, and clay, with the extensive Balcones Fault Zone System marking the boundary between the Edwards Plateau and the Gulf Coastal Region. The entire sequence dips gently toward the southeast.

A Tertiary Age sequence of southeasterly dipping sand, silts, clay, glauconite, volcanic ash, and lignite overlie the Cretaceous Age strata. The primary water-bearing unit of this sequence is the Carrizo Aquifer. A sequence of clay, sand, caliche, and conglomerate of the Pliocene Age Goliad Formation underlie the coastal areas of the region.

Overlying the Goliad Formation is the Quaternary Age Lissie Formation, which consists of sand, silt, clay and minor amounts of gravel. Clay, silt, and fine-grained sand of the Beaumont Formation overlie the Lissie Formation. Throughout the region, alluvial sediments of Recent Age occur along streams and coastal areas.

1.2.3 Vegetational Areas[3]

Biologically, the South Central Texas Region is a region of transition from the lowland forests of the southeastern United States to the arid grasslands of the western uplands and tropical thorn scrub to the south. The essence of this landscape consists of dendritic networks of wooded stream corridors populated by typically eastern species that dissect upland grasslands, and savannahs that harbor western species. The vegetational areas containing portions of the South Central Texas Region are the Edwards Plateau, South Texas Plains, Blackland Prairies,

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[2] TWDB, Op. Cit., May 1977.

[3] HDR Engineering, Inc. (HDR), et al., "Trans-Texas Water Program, West Central Study Area, Phase I Interim Report," Volume 2, San Antonio River Authority, et al., May 1994.

Gulf Prairies and Marshes, and the Post Oak Savannah (Figure 1-1). Each area is described below.

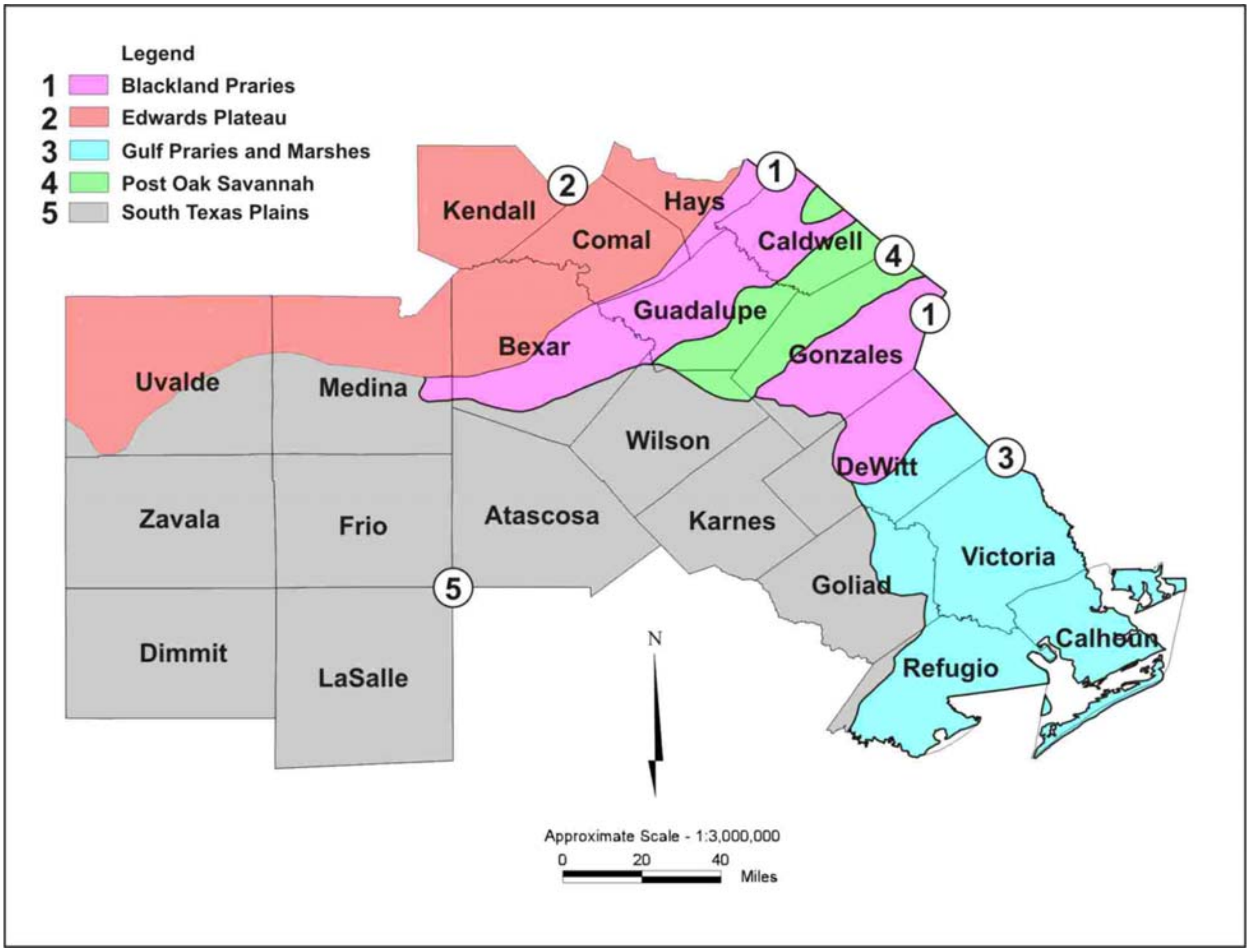


Figure 1-1. Eco-Regions — South Central Texas Region

1.2.3.1 Edwards Plateau

In the South Central Texas Region, the Edwards Plateau vegetational area includes all of Kendall County, the northern portions of Uvalde, Medina, Bexar, and Comal Counties, and the western portion of Hays County located within the planning area. This limestone-based area is characterized by springfed, perennially flowing streams that originate in its interior and flow across the Balcones Escarpment, which bounds it on the south and east. This area is also characterized by the occurrence of numerous ephemeral streams that are important conduits of storm runoff, which contributes to the recharge of the Edwards Aquifer. The soils are shallow, ranging from sands to clays, and are calcareous in reaction. This area is predominantly rangeland, with cultivation confined to limited areas having deeper soils.

Noteworthy is the growth of Bald cypress (*Taxodium distichum*) along the perennially flowing streams. Separated by many miles from cypress growth of the moist Southern Forest Belt, they constitute one of Texas' several "islands" of vegetation.

The principal grasses of the clay soils are several species of bluestem (*Schizachyrium* and *Andropogon* spp.), gramas (*Bouteloua* spp.), Indiangrass (*Sorghastrum nutans*), common curlymesquite (*Hilaria belangeri*), buffalograss (*Buchloe dactyloides)*, and Canadian wild rye (*Elymus canadensis*). The rocky areas support tall or mid-grasses with an overstory of live oak (*Quercus virginiana*) and other oaks (*Q. fusiformis, Q. buckleyi, Q. sinuata* var. *breviloba*), cedar elm (*Ulmus crassifolia*) and mesquite (*Prosopis glandulosa*). The heavy clay soils have a mixture of buffalograss, sideoats grama (*Bouteloua curtipendula*), and mesquite.

1.2.3.2 South Texas Plains

South of San Antonio, including all or parts of Uvalde, Zavala, Dimmit, Medina, Frio, LaSalle, Bexar, Atascosa, Wilson, Karnes, DeWitt, Goliad, and Refugio Counties, lies the South Texas Plains vegetational area, which is characterized by subtropical dryland vegetation consisting of small trees, shrubs, cactus, weeds and grasses. Principal plants are honey mesquite (*Prosopis glandulosa* var. *torreyana*), live oak (*Quercus virginiana*), post oak (*Q. stellata*), several members of the cactus family (Cactaceae), blackbrush acacia (*Acacia rigidula*), guajillo (*Acacia berlandieri*), huisache (*Acacia farnesiana*) and others that often grow very densely. The original vegetation was mainly perennial warm-season bunchgrass in post oak, live oak, and mesquite savannahs. Other brush species form dense thickets on the ridges and along streams. Long-continued grazing, as well as the control of wildfires, has contributed to the dense cover of brush. Most of the desirable grasses have persisted under the protection of brush and cacti.

There are distinct differences in the original plant communities on various soils. Dominant grasses on the sandy loam soils are seacoast bluestem (*Schizachyrium scoparium* var. *littoralis*), bristlegrasses (*Setaria* spp.), and silver bluestem (*Bothriochloa saccharoides*). Dominant grasses on the clay and clay loams are silver bluestem, Arizona cottontop (*Trichachne californica*), buffalograss, common curlymesquite, bristlegrasses, gramas, and Texas wintergrass (*Stipa leucotricha*). Gulf cordgrass (*Spartina* spp.) and seashore saltgrass (*Distichlis spicata*) characterize low saline areas. In the post oak and live oak savannahs, the grasses are mainly seacoast bluestem, Indiangrass, and switchgrass (*Panicum virgatum*).

1.2.3.3 Blackland Prairies

This area, including parts of Bexar, Comal, Guadalupe, Hays, Caldwell, Gonzales, and DeWitt Counties, while called a "prairie," has timber along the streams, including a variety of oaks, pecan (*Carya illinoinensis*), cedar elm and mesquite. In its native state, it was largely a grassy plain.

Most of this fertile area has been cultivated, and only small acreages of meadowland remain in original vegetation. In heavily grazed pastures, buffalograss, Texas grama (*Bouteloua rigidiseta*) and other less-productive grasses have replaced the tall bunchgrass. Mesquite and other woody plants have invaded the grasslands.

The original grass vegetation included big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium var. frequens*), Indiangrass, switchgrass, sideoats grama, hairy grama (*Bouteloua hirsuta*), tall dropseed (*Sporobolus asper*), Texas wintergrass and buffalograss. Non-grass vegetation is largely legumes and composites.

1.2.3.4 Gulf Prairies and Marshes

The Gulf Prairies and Marshes vegetational area includes all or parts of Victoria, DeWitt, Goliad, Refugio, and Calhoun Counties. There are two subunits: (1) the marsh and salt grasses immediately at tidewater; and (2) a little farther inland, a strip of bluestems and tall grasses, with some gramas in the western part. Many of these grasses make excellent grazing. Oaks, elm, and other hardwoods grow to some extent, especially along streams, and the area has some post oak and brushy extensions along its borders. Much of the Gulf Prairies is fertile farmland.

Principal grasses of the Gulf Prairies are tall bunchgrasses, including big bluestem, little bluestem, seacoast bluestem, Indiangrass, eastern gamagrass (*Tripsacum dactyloides*), Texas wintergrass, switchgrass, and gulf cordgrass. Seashore saltgrass occurs on most saline sites. Heavy grazing has changed the range vegetation in many cases so that the predominant grasses are less desirable broomsedge (*Andropogon virginicus*), smutgrass (*Sporobolus indicus*), threeawns (*Aristida* spp.) and many other inferior grasses. The other plants that have invaded the productive grasslands include oak underbrush, huisache, mesquite, pricklypear (*Opuntia* spp.), ragweed (*Ambrosia psilostachya*), broomweed (*Xanthocephalum* spp.), and others.

1.2.3.5 Post Oak Savannah

This secondary forest region, also called the Post Oak Belt, includes parts of Guadalupe, Caldwell, Wilson, and Gonzales Counties. It is immediately west of the primary forest region, with less annual rainfall and a little higher elevation. Principal trees are post oak, blackjack oak (*Quercus marilandica*) and cedar elm. Pecans, walnuts (*Juglans* spp.) and other kinds of water-demanding trees grow along streams. The southwestern extension of this belt is often poorly defined, with large areas of prairie.

The original vegetation consisted mainly of little bluestem, big bluestem, Indiangrass, switchgrass, silver bluestem, Texas wintergrass, post oak and blackjack oak. The area is still largely native or improved grasslands, with farms located throughout. Intensive grazing has contributed to dense stands of a woody understory of yaupon (*Ilex vomitoria*) and oak brush, and mesquite has become a serious problem. In addition, the control of wildfires has affected the encroachment of brush species on Savannah range lands. Such plants as broomsedge, broomweed, and ragweed have replaced good forage plants.

1.2.4 Natural Resources

1.2.4.1 Water Resources

The South Central Texas Region includes parts of six major river basins (Rio Grande, Nueces, San Antonio, Guadalupe, Lavaca, and Lower Colorado) and overlies the Edwards and Gulf Coast Aquifers, and southern parts of the Trinity, Carrizo, and Edwards-Trinity (Plateau) Aquifers. In addition to these water resources, the area also overlies two minor aquifers (Queen City and Sparta Aquifers). Details about these water resources are presented in Sections 1.7 and 3.

Springs also serve as a significant water resource in the South Central Texas Region. The two most noteworthy springs are the Comal and San Marcos Springs, which both contribute to flow in the Guadalupe River. The San Marcos Springs have the greatest flow dependability and environmental stability of any spring system in the southwestern United States. Constancy of its springflow is apparently key to the unique ecosystem found in the uppermost San Marcos River. Comal Springs, located in New Braunfels, serve as the source for the Comal River, which is a tributary of the Guadalupe River. Unlike the San Marcos Springs, Comal Springs is more responsive to drought conditions and ceased flowing in June of 1956 in response to severe drought conditions. In addition, numerous springs in northern Uvalde and Medina Counties provide surface flows that recharge the Edwards Aquifer and a few springs, such as Leona Springs and Soldier Springs at Uvalde, flow from below the Edwards Aquifer recharge zone providing surface flows for many miles downstream.

1.2.4.2 Fish and Wildlife Resources

The streams and reservoirs of the South Central Texas Region encompass habitats that range from the clear, rocky headwaters of the Guadalupe and Nueces Rivers on the Edwards Plateau to the sluggish, turbid river reaches of the coastal plains, all supporting fish communities typical of warm, carbonate dominated hard waters. These include gar, minnows, topminnows, sunfishes and bass, catfish, and a few species of darters and suckers. Although strongly dependant on the physical habitat factors present, typical species include the common carp, red shiner, blacktail shiner, topminnow, longear and bluegill sunfish, largemouth and Guadalupe bass, channel catfish, bullheads, dusky darter, bigscale logperch, and grey redhorse. The Guadalupe Estuary, at the mouth of the Guadalupe River, is habitat to brown and white shrimp, blue crabs, eastern oysters, red drum, spotted seatrout, black drum, flounder, mullet, Atlantic croaker, sharks, and kingfish.

Common types of wildlife found in the area include white-tailed deer, raccoons, ringtails, gray foxes, coyotes, bobcats, and several species of skunks. Wintering songbirds such as robins and cedar waxwings may also be found. In addition, a growing population of endangered whooping cranes winters in and near the Aransas National Wildlife Refuge which is located on Blackjack Peninsula and Matagorda Island adjacent to San Antonio Bay.

A key concern in the South Central Texas Region is that of threatened and endangered species. There are a number of species listed in the planning region by the U.S. Fish and Wildlife Service or the Texas Parks and Wildlife Department as threatened or endangered. These species are listed by county in Appendix H with notations concerning their habitat preferences and protected status, if any.

1.2.4.3 Agricultural Resources

Of the 12.8 million acres of land area in the planning region, over 10.65 million acres (83 percent) are classified as farmland and ranchland (Table 1-3). In 2002, there were 23,942 farms and ranches in the region with an average size of 775 acres. Of the 10.65 million acres of farmland, over 2.73 million acres were classified as cropland, of which about 1.06 million acres were harvested in 2002. Approximately one-tenth (262,529 acres) of the total cropland in the region was reported to be irrigated in 2002.[4] The leading irrigation counties are located in the western part of the region and include Uvalde, Frio, Medina, Atascosa, and Zavala. Major

Table 1-3.
Agricultural Resources — 2002
South Central Texas Region

County	*Total Land Area (acres)*	*Farms and Ranches (number)*	*Land in Farms and Ranches (acres)*	*Average Size (acres)*	*Total Cropland (acres)*	*Harvested Cropland (acres)*	*Irrigated Land (acres)*
Atascosa	788,480	1,539	669,890	435	222,603	55,452	21,878
Bexar	798,080	2,385	441,206	185	155,900	74,204	19,015
Caldwell	349,440	1,402	304,844	217	107,126	43,961	1,866
Calhoun	327,680	328	247,827	756	94,647	48,600	4,712
Comal	359,680	852	203,291	239	37,231	12,495	373
De Witt	581,760	1,786	576,896	323	166,017	47,628	3,481
Dimmit	851,840	268	570,684	2,129	41,617	4,053	2,854
Frio	725,120	537	603,119	1,123	151,591	45,749	32,562
Goliad	546,560	984	506,019	514	113,153	26,832	924
Gonzales	683,520	1,816	695,774	383	183,539	53,768	4,944
Guadalupe	455,040	2,442	384,824	158	183,601	101,367	3,025
Hays (part)[1]	239,360	553	139,176	252	28,961	8,172	194
Karnes	480,000	1,157	474,806	410	164,746	52,272	2,042
Kendall	424,320	967	326,956	338	41,507	10,381	811
LaSalle	952,960	315	558,559	1,773	89,124	6,798	5,744
Medina	849,920	1,951	804,941	413	236,096	123,848	55,516
Refugio	492,800	274	505,954	1,847	106,678	73,921	2,600
Uvalde	996,480	686	968,866	1,412	154,086	77,882	54,725
Victoria	565,120	1,286	513,828	400	166,089	85,578	4,702
Wilson	516,480	2,157	446,157	207	197,052	75,049	13,448
Zavala	831,360	257	707,383	2,752	96,651	32,135	27,113
Total	**12,816,000**	**23,942**	**10,651,000**	**775**	**2,738,015**	**1,060,145**	**262,529**

[1] Estimate for that portion of Hays County located in the planning region.

Source: 2002 Census of Agriculture, Vol. 1 Geographic Area Series, "Table 1: County Summary Highlights — 2002."

[4] 2002 Census of Agriculture, Volume 1 Geographic Area Series, "Table 1. County Summary Highlights: 2002."

irrigated crops are corn, cotton, grain sorghum, wheat, rice, soybeans, and vegetables. Cow-calf operations are the predominant type of livestock industry, although beef cattle, hogs and pigs, sheep and lambs, and poultry are also produced. (Agricultural production and livestock production are discussed in greater detail in Sections 1.4.2 and 1.4.3, respectively.)

1.2.5 Major Water Demand Centers

In the South Central Texas Region there are four major water demand centers. These centers are the Interstate Highway 35 (IH-35) corridor from San Antonio to San Marcos, the Edwards Aquifer region west of the City of San Antonio, the Winter Garden area south of the Edwards Aquifer area, and the Coastal area. The San Antonio, New Braunfels, and San Marcos corridor along IH-35 is one of the fastest growing areas in Texas. In the next 60 years, its water use will follow the same trend as population growth, with most of the demand being for municipal use.

The Edwards Aquifer region west of San Antonio, including Uvalde and Medina Counties, is a major demand center for water to be used for irrigated agriculture. The Winter Garden area, including Zavala, Dimmit, and Atascosa Counties, is also a major demand center for water for irrigated agriculture. The Coastal area, including the cities of Victoria and Port Lavaca, are major demand centers for water for industrial purposes, with significant demand for irrigation in Calhoun County.

1.3 Population and Demography

1.3.1 Historical and Recent Trends in Population

According to the Bureau of the Census, the South Central Texas Region population has increased from 806,770 in 1950 to 2,042,221 in 2000, an increase of 1,235,451 or 2.5 times (Table 1-4). The largest percentage increase occurred between the years 1950 and 1960 (25.8 percent), while the smallest occurred between 1960 and 1970 (16.2 percent). Between the period 1950 to 2000, 15 counties had a positive annual growth rate, while six counties (DeWitt, Dimmit, Gonzales, Karnes, LaSalle, and Refugio) had a negative annual growth rate. Historically, the fastest growing counties in the region were Hays (3.30 percent), Comal (3.17 percent), Kendall (3.00 percent), and Guadalupe (2.54 percent), while the slowest growing counties were Zavala (0.07 percent), Goliad (0.22 percent), Frio (0.91 percent), and Uvalde

(0.97 percent). Section 2.1 summarizes population projections through the year 2060 for the South Central Texas Region.

Table 1-4.
Population Growth — 1950 to 2000
South Central Texas Region

County	Year						Growth Rate[1] (%)
	1950	1960	1970	1980	1990	2000	
Atascosa	20,048	18,828	18,696	25,055	30,533	38,628	1.32
Bexar	500,460	687,151	830,460	988,800	1,185,394	1,392,931	2.07
Caldwell	19,350	17,222	21,178	23,637	26,392	32,194	1.02
Calhoun	9,222	16,592	17,831	19,574	19,053	20,647	1.63
Comal	16,357	19,844	24,165	36,446	51,832	78,021	3.17
DeWitt	22,973	20,683	18,660	18,903	18,840	20,013	-0.28
Dimmit	10,654	10,095	9,039	11,367	10,433	10,248	-0.08
Frio	10,357	10,112	11,159	13,785	13,472	16,252	0.91
Goliad	6,219	5,429	4,869	5,193	5,980	6,928	0.22
Gonzales	21,164	17,845	16,375	16,883	17,205	18,628	-0.25
Guadalupe	25,392	29,017	33,554	46,708	64,873	89,023	2.54
Hays (part)[2]	14,272	15,947	22,114	32,475	52,491	72,499	3.30
Karnes	17,139	14,995	13,462	13,593	12,455	15,446	-0.21
Kendall	5,423	5,889	6,964	10,635	14,589	23,743	3.00
LaSalle	7,485	5,972	5,014	5,514	5,254	5,866	-0.49
Medina	17,013	18,904	20,249	23,164	27,312	39,304	1.69
Refugio	10,113	10,975	9,494	9,289	7,976	7,828	-0.51
Uvalde	16,015	16,814	17,348	22,441	23,340	25,926	0.97
Victoria	31,241	46,475	53,766	68,807	74,361	84,088	2.00
Wilson	14,672	13,267	13,041	16,756	22,650	32,408	1.60
Zavala	11,201	12,696	11,370	11,666	12,162	11,600	0.07
Total	**806,770**	**1,014,752**	**1,178,808**	**1,420,691**	**1,696,597**	**2,042,221**	1.87

[1] Compound annual growth rate.
[2] Estimate that 80 percent of the total county population resides within the planning area.

Source: Bureau of the Census, Decadal Censuses of 1950, 1960, 1970, 1980, 1990, and 2000, U.S. Department of Commerce.

There are 111 cities or other water supply entities in the South Central Texas Region for which the TWDB has made population and water demand projections. Of the 111 cities and entities, 44 have a population greater than 5,000. These entities are relatively equally distributed among the 21 counties in the planning region and are located in three commonly used regional references (Coastal, Hill Country, and Winter Garden) (Table 1-5). Bexar County contains 14 entities having a population of 5,000 or more, including San Antonio and its surrounding suburbs. Four counties, Goliad, Karnes, La Salle, and Refugio, do not have an entity of 5,000 or greater.

1.3.2 Demographic Characteristics

In 2000, 81 percent of the South Central Texas Region population resided in urban areas, while only 19 percent resided in rural areas (Figure 1-2). LaSalle County had the lowest population in 2000, with 5,866 residents (averaging 3.9 persons per square mile), while Bexar County had the highest population in the region with 1,392,931 residents (averaging 1,117 persons per square mile) (Table 1-6).

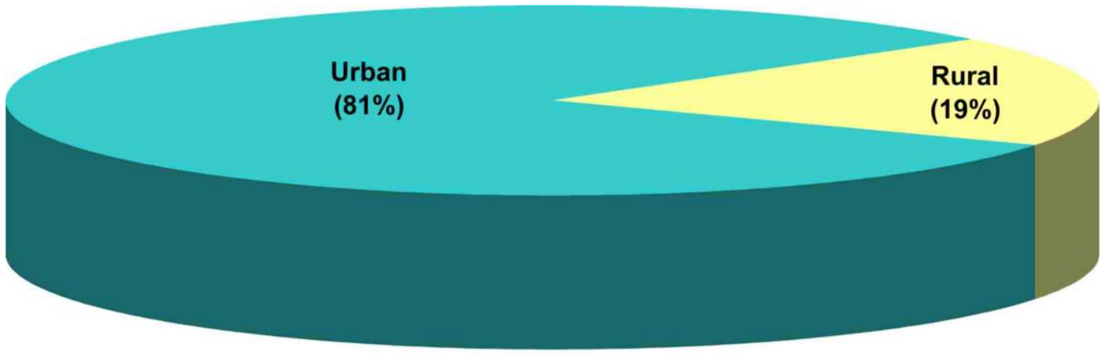
Age distribution across the region is characterized by a relatively young population. The two age groups that include the highest percentage of the population are under 18 years of age (28.2 percent) and from 34 to 44 years of age (14.9 percent) (Figure 1-3). The age groups with the lowest percentage of the population are ages 55 to 64 (8.7 percent) and ages 18 to 24 (9.3 percent) (Figure 1-3).

The regional population can also be characterized by its level of education. Of those residents in the South Central Texas Region who are 25 years of age are older, 68.2 percent have at least a high school diploma, while 31.8 percent do not. The two largest groups rated according to educational achievement are those who have completed high school, but have not gone on to college (29.0 percent) and those who have completed some college education, but have no degree (20.0 percent). Only 4.7 percent of the population who are 25 years or older have a graduate degree (Figure 1-4).

Table 1-5.
Major Entities in the
South Central Texas Region*

City Name	*County Name*	*Regional Classification*	*City Name*	*County Name*	*Regional Classification*
Alamo Heights	Bexar	Hill Country	Leon Valley	Bexar	Hill Country
Atascosa Rural WSC	Bexar	Hill Country	Live Oak	Bexar	Hill Country
Benton City WSC	Atascosa	Winter Garden	Lockhart	Caldwell	Hill Country
Bexar Met Water District	Bexar	Hill Country	Luling	Caldwell	Hill Country
Boerne	Kendall	Hill Country	McCoy WSC	Atascosa	Winter Garden
Canyon Lake WSC	Comal	Hill Country	New Braunfels	Comal	Hill Country
Carrizo Springs	Dimmit	Winter Garden	Pearsall	Frio	Winter Garden
Converse	Bexar	Hill Country	Pleasanton	Atascosa	Winter Garden
Crystal City	Zavala	Winter Garden	Port Lavaca	Calhoun	Coastal
Crystal Clear WSC	Guadalupe	Hill Country	San Antonio	Bexar	Hill Country
Cuero	DeWitt	Coastal	San Marcos	Hays	Hill Country
East Central WSC	Bexar	Hill Country	Schertz	Guadalupe	Hill Country
East Medina SUD	Medina	Hill Country	Seguin	Guadalupe	Hill Country
Floresville	Wilson	Winter Garden	Springs Hill WSC	Guadalupe	Hill Country
Goforth WSC	Hays	Hill Country	SS WSC	Wilson	Winter Garden
Gonzales	Gonzales	Coastal	Terrell Hills	Bexar	Hill Country
Gonzales County WSC	Gonzales	Coastal	Universal City	Bexar	Hill Country
Green Valley SUD	Guadalupe	Hill Country	Uvalde	Uvalde	Winter Garden
Hondo	Medina	Hill Country	Victoria	Victoria	Coastal
Kirby	Bexar	Hill Country	Water Services Inc.	Bexar	Hill Country
Kyle	Hays	Hill Country	Wimberley WSC	Hays	Hill Country
Lackland AFB	Bexar	Hill Country	Windcrest	Bexar	Hill Country

* Entities with population of 5,000 or more in 2000.



Source: U.S. Bureau; 2000 U.S. Census Data C90STF3A

Figure 1-2. Percentages of Population Residing in Urban and Rural Areas (2000) South Central Texas Region

Table 1-6. County Population and Area South Central Texas Region

County	Population (2000)	Area (sq. mi.)	County	Population (2000)	Area (sq. mi.)
Atascosa	38,628	1,232	Hays (part)	72,499	374
Bexar	1,392,931	1,247	Karnes	15,446	750
Caldwell	32,194	546	Kendall	23,743	663
Calhoun	20,647	512	LaSalle	5,866	1,489
Comal	78,021	562	Medina	39,304	1,328
DeWitt	20,013	909	Refugio	7,828	770
Dimmit	10,248	1,331	Uvalde	25,926	1,557
Frio	16,252	1,133	Victoria	84,088	883
Goliad	6,928	854	Wilson	32,408	807
Gonzales	18,628	1,068	Zavala	11,600	1,299
Guadalupe	89,023	711	Total	2,042,221	20,025

Source: U.S. Census Bureau, U.S. Department of Commerce.

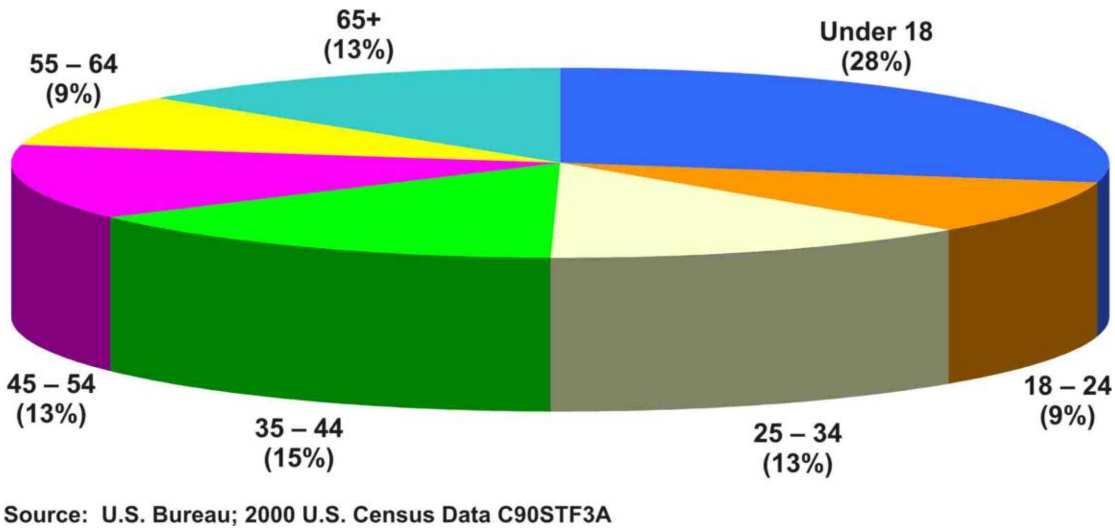


Figure 1-3. Age Distribution of the Population (2000)
South Central Texas Region

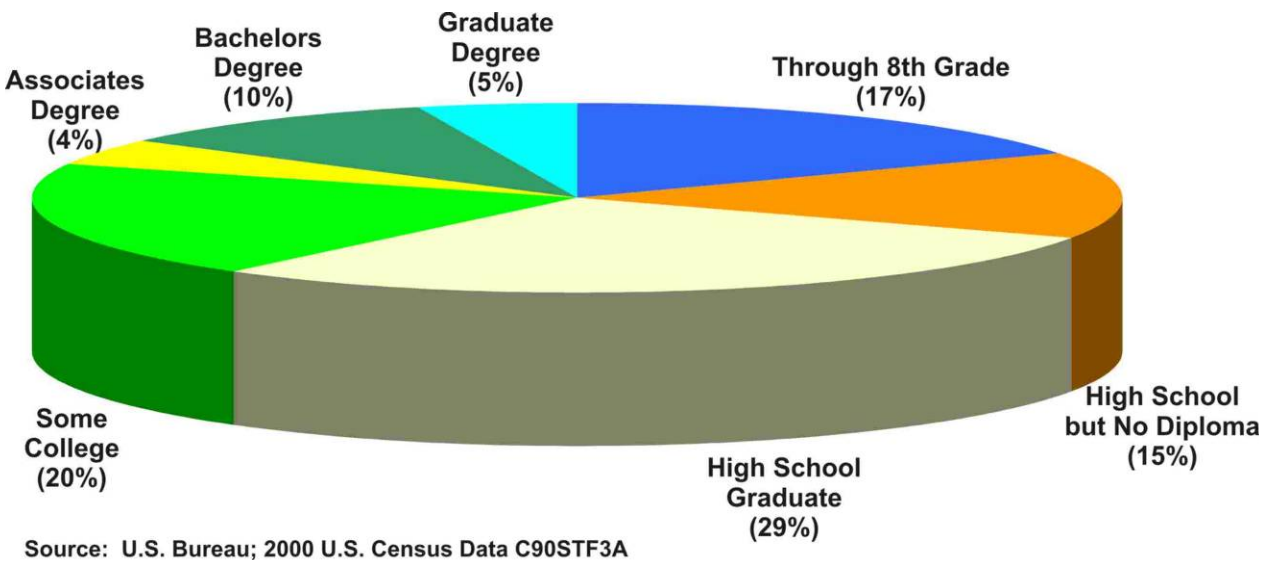


Figure 1-4. Level of Educational Achievement (2000)
South Central Texas Region

1.4 Economy — Major Sectors and Industries

1.4.1 Summary of the South Central Texas Regional Economy[5]

The South Central Texas Region has an economic base centered on agricultural production, livestock production, mining, manufacturing, and trades and services. The region has experienced economic ups and downs throughout the past decade, but all sectors of the economy, with the exception of the mining sector, have experienced solid growth in recent years. Paralleling economic growth, employment in the diversified regional economy is supported by a strong trades and services sector, which accounts for approximately 76 percent of the value of output and a thriving tourism industry in San Antonio. Fabricated metal products, industrial machinery, petrochemicals, and food processing form the core of the manufacturing sector, which accounts for approximately 21 percent of the value of output in the South Central Texas Region. Beef cattle, corn, and grain sorghum are the dominant agricultural enterprises, although vegetables produced in the Winter Garden area add diversity to the agricultural sector. More detailed summaries of the agricultural, livestock, mining, manufacturing, and trades and services sectors are presented in the following sections.

1.4.2 Agricultural Production

It is estimated that over 2.7 million acres in the South Central Texas Region were used in crop production in 2002. Of this total, only 262,529 acres (9.6 percent) were irrigated while the remaining 90.4 percent of the total cropland was farmed using dryland techniques. The leading irrigation counties are found primarily in the western part of the region and include Uvalde, Frio, Medina, Atascosa, and Zavala.

According to the 2002 Census of Agriculture, all crops grown in the South Central Texas Region had a market value of over $271 million in 2002. The leading agricultural producing counties in the region, by market value of products, are Bexar, Frio, Uvalde, Medina, and Gonzales. The major crops grown in the region include corn, grain sorghum, wheat, soybeans and cotton (Table 1-7).

[5] Information summarized from reports by the Texas Comptroller's Office.

Table 1-7.
Summary of Farm Production Data – 2002
South Central Texas Region

County	Cropland: Total Cropland (acres)	Cropland: Irrigated Land (acres)	Cropland: Non-Irrigated Land (acres)	Market Value of all Crops ($1,000)	Selected Crops Harvested: Corn (bushels)	Grain Sorghum (bushels)	Wheat (bushels)	Rice (100 lbs)	Cotton (bales)	Soybeans (bushels)	Hay, Alfalfa, Other (tons)
Atascosa	222,603	21,878	200,725	17,254	238,766	150,130	91,564	0	(D)	0	55,595
Bexar	155,900	19,015	136,885	59,304	890,413	467,700	204,263	0	1,969	905	71,886
Caldwell	107,126	1866	105,260	4,193	283,140	420,176	28,419	0	2,326	0	51,190
Calhoun	94,647	4,712	89,935	9,183	759,918	517,415	0	159,161	20,287	117,455	8,482
Comal	37,231	373	36,858	1,492	64,018	51,736	11,829	0	(D)	0	17,240
DeWitt	166,017	3481	162,536	2,286	485,198	27,676	4,279	0	178	(D)	80,899
Dimmit	41,617	2,854	38,763	2,526	(D)	29,721	0	0	(D)	(D)	3,418
Frio	151,591	32,562	119,029	32,033	239,680	100,518	59,524	0	1,807	0	31,165
Goliad	113,153	924	112,229	1,722	185,893	85,009	0	0	2,275	(D)	34,044
Gonzales	183,539	4,944	178,595	21,669	228,937	62,452	889	0	0	0	88,915
Guadalupe	183,601	3,025	180,576	16,375	1,094,764	1,178,681	238,586	0	500	0	91,277
Hays (part)[1]	28,961	194	28,767	1,993	53,643	33,094	45,039	0	0	0	8,611
Karnes	164,746	2,042	162,704	2,681	364,621	112,888	37,032	0	2,293	0	66,111
Kendall	41,507	811	40,696	970	0	0	4,317	0	0	0	16,786
LaSalle	89,124	5,744	83,380	2,796	107,794	11,498	(D)	0	0	0	8,690
Medina	236,096	55,516	180,580	23,171	2,907,941	1,279,477	552,054	0	9,524	0	73,011
Refugio	106,678	2,600	104,078	12,547	590,411	1,388,470	0	0	39,419	(D)	5,613
Uvalde	154,086	54,725	99,361	27,309	1,955,489	759,756	550,197	0	16,654	0	24,625
Victoria	166,089	4,702	161,387	13,958	1,766,516	941,824	0	(D)	15,696	320,840	36,486
Wilson	197,052	13,448	183,604	7,598	573,917	682,027	57,880	0	(D)	602	100,354
Zavala	96,651	27,113	69,538	10,816	626,612	281,431	162,061	0	9,402	0	8,926
Total	**2,738,015**	**262,529**	**2,475,486**	**271,876**	**13,417,671+(D)**	**8,581,679**	**2,047,933+(D)**	**159,161+(D)**	**122,330+(D)**	**439,802+(D)**	**883,324**

[1] Estimate for that portion of Hays County located in the planning region.
(D) – Withheld to avoid disclosing data for individual producers.

Source: 2002 Census of Agriculture, Volume 1 Geographic Area Series, "Table 1. County Summary Highlights: 2002."

Corn and grain sorghum have historically been the leading crops in the region. In 2002, it was estimated that over 13 million bushels of corn were harvested in the South Central Texas Region, having a market value of $34.5 million. The leading corn producing counties in the region are Medina, Uvalde, Victoria, and Guadalupe (Table 1-7).

Grain sorghum also contributes significantly to the agricultural sector. In 2002, it was estimated that over 8 million bushels of grain sorghum were harvested in the region, having a market value of $20.1 million. The leading grain sorghum producing counties in the region are Refugio, Medina, Guadalupe, and Victoria (Table 1-7).

Although wheat production is not as widespread as corn and grain sorghum production, it is still an important part of the regional agricultural production with over 2 million bushels of wheat harvested in 2002, with a market value of close to $6.2 million. The leading wheat producing counties in the region are Medina, Uvalde, Guadalupe, and Bexar (Table 1-7).

Because of favorable climatic and soil conditions, the coastal counties of Calhoun and Victoria are able to produce rice. In 2002, these two counties combined produced over 159,000 hundredweight (cwt) of rice which had a market value of over $660,000 (Table 1-7).

Cotton production is widespread throughout the region and is the highest valued crop produced in the region. In 2002, the 17 counties in which cotton is produced combined to harvest over 122,000 bales with a market value of over $50 million (Table 1-7).

The majority of soybean production in the region occurs in the area extending from the Gulf Coast to DeWitt and Karnes Counties. The two leading soybean producing counties are Calhoun and Victoria, while all counties engaged in soybean production combined to harvest over 439,000 bushels of soybeans with a market value of approximately $2.2 million in 2002 (Table 1-7).

1.4.3 Livestock Production

According to the 2002 Census of Agriculture, livestock marketed in the South Central Texas region had a market value of over $707 million, or about 2.6 times the value of crop production. Major types of livestock produced in the area include cattle and calves, beef cattle, and sheep and lambs. Layers, pullets, and broilers also contribute significantly to livestock production, with Gonzales County producing over 99 percent of these types of livestock within the region. In 2002, the leading livestock producing counties in the region by market value were Gonzales, Uvalde, Frio, and Zavala Counties (Table 1-8).

Table 1-8.
Summary of Livestock Production Data — 2002
South Central Texas Region

County	Market Value of Livestock ($1,000)	Livestock and Poultry						
		Cattle & Calves (Number)	Beef Cows (Number)	Milk Cows (Number)	Hogs & Pigs (Number)	Sheep & Lambs (Number)	Layers & Pullets (Number)	Broilers (Number)
Atascosa	34,554	95,693	42,765	1,259	629	846	(D)	75
Bexar	21,413	52,988	(D)	(D)	3,412	2,778	2,519	1,390
Caldwell	30,898	50,022	29,169	0	1,182	945	(D)	(D)
Calhoun	9,710	23,892	14,627	0	10	96	175	0
Comal	4,138	14,582	8,521	0	505	3,379	1,148	13
DeWitt	27,237	117,113	71,133	488	2,253	448	(D)	(D)
Dimmit	24,962	31,330	11,444	0	0	(D)	142	(D)
Frio	38,933	57,554	23,291	0	127	(D)	116	0
Goliad	15,211	63,398	40,201	0	69	162	859	252
Gonzales	255,904	161,794	(D)	(D)	1,540	1,157	3,988,343	63,408,932
Guadalupe	20,831	60,032	36,476	784	1,498	3,673	88,660	(D)
Hays (part)[1]	5,313	13,082	5,684	2	195	1,619	1,117	135
Karnes	15,563	74,623	(D)	(D)	21	327	(D)	0
Kendall	6,052	13,962	8,519	10	764	13,483	1,095	95
LaSalle	20,377	32,684	11,494	13	(D)	0	(D)	(D)
Medina	37,571	73,794	34,005	297	454	2,043	2,570	370
Refugio	8,872	41,239	(D)	(D)	22	71	63	0
Uvalde	41,726	64,325	18,915	26	314	22,243	948	(D)
Victoria	15,106	69,544	47,731	49	236	305	731	9
Wilson	35,109	97,059	47,699	3,142	1,344	743	1,409	15
Zavala	37,878	55,034	(D)	(D)	(D)	435	190	0
Total	**707,358**	**1,263,744**	**451,674+(D)**	**6,070+(D)**	**14,575+(D)**	**54,753+(D)**	**4,090,085+(D)**	**63,411,286+(D)**

[1] Estimates that 50 percent of all livestock production in Hays County occurs in the planning region.
(D) – Withheld to avoid disclosing data for individual producers.

Source: 2002 Census of Agriculture, Volume 1 Geographic Area Series, "Table 1. County Summary Highlights: 2002."

1.4.4 Mining

The South Central Texas Region contains many sand and gravel quarries and is also rich in petroleum products including oil, natural gas, and lignite. Much of the stone quarried is used in the production of cement. The leading cement producing areas in the region are located in Bexar and Hays Counties. Most of the stone, gravel, and sand mining activities are located in Bexar, Comal, Gonzales, and Victoria Counties.

The region also derives a significant portion of its mining income from oil and gas activities. All but two counties (Comal and Hays) derived some of their revenues from oil and gas production in 1998. Oil and gas production in the remaining 19 counties generated over $290 million in 1998 and provided approximately 3,500 jobs in the region. The leading oil and gas producing counties in the region are Refugio, Goliad, Victoria, Atascosa, and DeWitt.

1.4.5 Manufacturing[6]

In 1997, manufacturing facilities contributed over $12 billion in sales and provided 58,746 jobs in the South Central Texas Region (Table 1-9).[7] The leading manufacturing counties, by value of shipments, in the region are Bexar, Calhoun, Guadalupe, and Victoria. The leading types of manufacturing plants in the region (in 1997) were printing and related support activities; fabricated metal products; miscellaneous products; and food products.

1.4.6 Trades and Services[8]

In 1997, wholesale trade, retail trade, and services contributed over $43 billion in sales or receipts and provided 377,114 jobs in the South Central Texas Region (Table 1-10).[9] Wholesale trade accounted for 34.1 percent of the total sales or receipts and provided 8.3 percent of the jobs within the trades and services classification in 1997. The leading type of wholesale trade within the South Central Texas Region is durable goods, which includes automobile parts and supplies; lumber and construction materials, and machinery, equipment, and supplies. In 1997, the leading counties in wholesale trade were Bexar, Victoria, Guadalupe, and Comal.

[6] Source: 1997 Census of Manufacturing, U.S. Department of Commerce.
[7] Data for 1997 are the most recent data available.
[8] Source: 1997 Economic Census, U.S. Department of Commerce.
[9] Data for 1997 are the most recent data available.

Table 1-9.
Summary of Manufacturing Activity — 1997
South Central Texas Region

County	***Total Number of Establishments***	***Total Number of Employees***	***Value of Shipments (million dollars)***
Atascosa	0	0	0
Bexar	1,101	35,919	5,565
Caldwell	18	556	39
Calhoun	20	3,815	2,689
Comal	84	4,016	559
DeWitt	24	721	88
Dimmit	0	0	0
Frio	0	0	0
Goliad	0	0	0
Gonzales	19	747	174
Guadalupe	90	5,592	1,320
Hays (part)[1]	97	3,050	429
Karnes	0	0	0
Kendall	0	0	0
LaSalle	0	0	0
Medina	23	556	50
Refugio	0	0	0
Uvalde	17	710	51
Victoria	71	3,064	1,245
Wilson	0	0	0
Zavala	0	0	0
Region Total	**1,564**	**58,746**	**12,209**

[1] Estimated that 90 percent of Hays County's total manufacturing industry is located within the planning region.

Source: 1997 Economic Census, U.S. Department of Commerce.

Table 1-10.
Trades and Services Industry — 1997
South Central Texas Region

County	***Total Number of Establishments***	***Total Number of Employees***	***Value of Shipments (million dollars)***
Atascosa	314	3,295	343
Bexar	19,835	305,740	35,331
Caldwell	277	2,774	239
Calhoun	277	2,273	234
Comal	1,181	9,872	1,235
DeWitt	235	1,796	221
Dimmit	102	766	75
Frio	152	1,271	108
Goliad	58	390	29
Gonzales	239	1,807	279
Guadalupe	797	7,461	989
Hays (part)[1]	843	8,186	835
Karnes	151	1,158	125
Kendall	362	3,392	529
LaSalle	58	351	25
Medina	331	2,539	343
Refugio	102	744	82
Uvalde	372	2,896	410
Victoria	1,504	17,745	1,943
Wilson	195	1,624	171
Zavala	55	1,034	43
Region Total	**27,440**	**377,114**	**43,589**

[1] Estimated that 70 percent of Hays County's trades and services industry is located within the planning region.

Source: 1997 Economic Census, U.S. Department of Commerce.

Retail trade accounted for 36.9 percent of the total sales or receipts and provided 23.8 percent of the jobs within the trades and services classification in 1997. The leading types of retail trade within the South Central Texas Region are apparel and accessory stores, gas stations, motor vehicle and parts stores, and food and beverage stores. In 1997, the leading counties in retail trade were Bexar, Victoria, Hays, and Comal.

Services accounted for 29.0 percent of the total sales or receipts and provided 67.9 percent of the jobs within the trades and services classification in 1997. The leading types of services within the South Central Texas Region are healthcare and social services, professional and technical services, and accommodation and food services.

1.5 Water Uses[10]

Water use in 2000 within the South Central Texas Region is summarized for each of the river and coastal basin areas of the region in the following paragraphs.

In 2000, total water use in that part of the Rio Grande Basin located in the South Central Texas Region (part of Dimmit County) was approximately 107 acre-feet (acft) of which 2 acft (2 percent) was used for municipal-type (household) purposes, while the remaining 105 acft was for livestock watering.

In the South Central Texas Region portion of the Nueces River Basin, groundwater resources supply about 90 percent of the water used for all purposes in the basin, with surface water resources supplying the remaining 10 percent. In 2000, total water use within the South Central Texas Region of the basin was 367,959 acft. Irrigated agriculture accounts for nearly 87 percent of all the water used in that portion of the Nueces River Basin located in the planning region, while municipal water use accounts for only about 8 percent.

In the San Antonio River Basin, groundwater resources supply about 91 percent of the water used for all purposes, with surface water resources supplying the remaining 9 percent. In 2000, water use for municipal, industrial, and agricultural purposes within the South Central Texas Region totaled 336,944 acft. Municipal water use accounts for about 73 percent of all water use in that portion of the basin located in the planning region, with water used for irrigated agriculture accounting for about 13 percent. Groundwater resources supply about 99 percent of

[10] Data provided by the TWDB.

the water for municipal use in the basin and about 72 percent of the water used for irrigated agriculture.

In the Guadalupe River Basin, groundwater resources supply about 30 percent of the water used for all purposes, with surface water resources supplying the remaining 70 percent. Total basin water use in 2000 was 120,931 acft within the South Central Texas Region. Municipal is the largest water use category in that part of the basin located within the planning region, accounting for more than 45 percent of the total water use, followed by manufacturing, which accounts for about 29 percent.

In 2000, total water use in that part of the Lower Colorado River Basin located in the South Central Texas Region (parts of Caldwell and Kendall Counties) was approximately 562 acft. Of this total, 365 acft (64.9 percent) was used for municipal purposes, 15 acft (2.7 percent) for irrigation purposes, 13 acft (2.3 percent) for mining purposes, and the remaining 169 acft for livestock purposes.

Total basin water use in 2000 for the South Central Texas portion of the Lavaca River Basin was 867 acft. Municipal water use accounts for about 59.2 percent of all water use in that portion of the basin located in the planning region, followed by livestock use, which accounts for 35.8 percent.

In 2000, water use for municipal, industrial, and livestock purposes in that portion of the Colorado-Lavaca Coastal Basin located in the South Central Texas Region totaled 20,128 acft. Industrial water use is the largest in that part of the basin located within the planning area, accounting for nearly 99 percent of all water used.

In the South Central Texas portion of the Lavaca-Guadalupe Coastal Basin, annual water use totaled 45,692 acft in 2000. The largest water-using category in that part of the basin located within the planning region is manufacturing, which accounts for about 51 percent of all water used.

In the South Central Texas portion of the San Antonio-Nueces Coastal Basin, annual water use totaled about 3,162 acft in 2000. The largest water use category in that part of the basin located within the planning region is municipal, which accounts for about 40 percent of all water used.

1.6 Wholesale Water Providers

The Texas Water Development Board's (TWDB) definition of a Wholesale Water Provider (WWP) is as follows:

> "A WWP is any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acft of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan."

Under this definition, the list of WWPs for the South Central Texas Region is as follows:

- Regional Water Provider for Bexar County
- San Antonio Water System (SAWS)
- Bexar Metropolitan Water District (Bexar Met)
- Guadalupe-Blanco River Authority (GBRA)
- Canyon Regional Water Authority (CRWA)
- Schertz-Seguin Local Government Corporation (SSLGC)
- Springs Hill Water Supply Corporation (WSC).

Each wholesale water provider is briefly described in the following sections. Detailed water demand projections for each wholesale water provider are presented in Section 2.10.

1.6.1 Regional Water Provider for Bexar County

Bexar County represents the major municipal demand center of the South Central Texas Region and encompasses not only the City of San Antonio, but numerous suburban cities and communities (water user groups). It is apparent that the most economical development of additional water supplies to meet the present and future needs of Bexar County can best be accomplished on a regional, rather than on a provider-by-provider basis. Development of additional water supplies for Bexar County will most likely be accomplished strategy by strategy, with a single sponsor or varying groups of sponsors involved in the cooperative implementation of each major strategy. Hence, for the purposes of this regional water plan, the concept of a wholesale water provider identified as the Regional Water Provider for Bexar County is employed. Designation of a Regional Water Provider for Bexar County accounts for the fact that water management strategies may be developed by individual sponsors and/or coalitions of sponsors. Furthermore, it ensures the flexibility necessary to facilitate activities of identified wholesale water providers, water user groups, and others in their independent or collective efforts to develop additional water supplies for Bexar County.

Bexar County's current water supply is obtained from the Edwards, Carrizo, and Trinity Aquifers, as well as Victor Braunig Lake, Calaveras Lake, the Medina Lake System, direct reuse, and run-of-river rights. Supplies from Canyon Reservoir will also be available in Bexar County in the immediate future.

1.6.2 San Antonio Water System

The San Antonio Water System (SAWS) is a public utility owned by the City of San Antonio, and its primary water supply source is the Edwards Aquifer. SAWS has 260,000 separate customers, and serves approximately 1 million people in the urbanized portion of Bexar County. The water supply service area includes most, but not all, of the City of San Antonio, several suburban municipalities, and adjacent areas of Bexar County. In addition to serving its own retail customers, SAWS also provides wholesale water supplies to several utility systems within Bexar County (Section 2.10). SAWS is in the process of developing supplies from other sources, including groundwater from the Carrizo, Simsboro, Trinity, and Gulf Coast Aquifers and surface water from both the Guadalupe-San Antonio and the Colorado River Basins.

1.6.3 Bexar Metropolitan Water District

Created in 1945 by the Texas State Legislature, Bexar Metropolitan Water District (BMWD) serves a population of more than 250,000 in the City of San Antonio and other areas in Bexar, Atascosa, and Medina Counties. It is the second-largest water supplier in Bexar County and, at present, obtains most of its water from the Edwards Aquifer with additional supplies from the Trinity and Carrizo Aquifers, the Medina Lake System, and run-of-river water rights on the Medina River. BMWD is in the process of developing supplies from other sources including additional groundwater from the Carrizo and Trinity Aquifers and surface water from the Guadalupe-San Antonio River Basin.

1.6.4 Guadalupe-Blanco River Authority

The Guadalupe-Blanco River Authority (GBRA) was created by the Texas Legislature in 1933 for the purposes of developing, storing, preserving, and distributing the waters of the Guadalupe River Basin for all useful purposes. GBRA is a regional entity serving Hays, Comal, Guadalupe, Caldwell, Gonzales, DeWitt, Victoria, Kendall, Refugio, and Calhoun Counties. GBRA's activities include supplying hydroelectric power through operations of six hydroelectric dams located on the Guadalupe River in Guadalupe and Gonzales Counties, supplying potable water, treatment of wastewater, and supplying raw water through management of substantial run-of-river rights and storage rights in Canyon Reservoir. GBRA is in the process of contracting water supplies from existing reliable sources, and developing transmission and treatment facilities to deliver these supplies to customers.

1.6.5 Canyon Regional Water Authority

Canyon Regional Water Authority (CRWA) is a subdivision of the State of Texas created by the Texas Legislature in 1989. CRWA is the water planning and development agency for water purveyors that serve large areas of Guadalupe County and portions of Bexar, Hays, Caldwell, Wilson, and Comal Counties. It works as a partnership of 12 water supply corporations, cities, and districts responsible for acquiring, treating, and transporting potable water (Section 2.10). CRWA owns and operates treatment plants at Lake Dunlap on the Guadalupe River and in far western Caldwell County near the San Marcos River for surface water purchased from the GBRA. CRWA's sources of supply also include groundwater pumped from the Edwards Aquifer, however, CRWA is encouraging development of alternative sources for users not located directly over the aquifer. In addition, CRWA is pursuing the development of additional water supplies based on the conjunctive use of surface water and groundwater.

1.6.6 Schertz-Seguin Local Government Corporation

The Cities of Schertz, located partially in Guadalupe County and partially in Bexar County, and Seguin, located in Guadalupe County, have joined to create the Schertz-Seguin Local Government Corporation (SSLGC). This Corporation is responsible for creating and operating a wholesale water supply system to serve the long-term needs of these two communities. In addition the Corporation sells water to the City of Selma, City of Universal City, and Springs Hill WSC (Section 2.10). The Carrizo Aquifer in Gonzales County is the current source of supply for SSLGC.

1.6.7 Springs Hill WSC

Springs Hill Water Supply Corporation (WSC) is a retail and wholesale water supplier serving customers located primarily in Guadalupe County. In addition to serving its own customers, Springs Hill WSC also supplies water to the City of La Vernia (via CRWA), Crystal

Clear WSC, and East Central WSC (via CRWA). Springs Hill WSC's current water supply sources include water from Canyon Reservoir (supplied by GBRA and CRWA), and the Carrizo Aquifer (self-supplied and purchased from SSLGC) (Section 2.10).

1.7 Water Resources and Quality Considerations

1.7.1 Groundwater[11]

There are five major and two minor aquifers supplying water to the South Central Texas Region. The five major aquifers are the Edwards, Carrizo, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers (Figure 1-5). The two minor aquifers are the Sparta and Queen City Aquifers. Each aquifer is described and a general assessment of water quality is provided in the following subsections. A summary of estimated groundwater supplies is presented in Section 3.

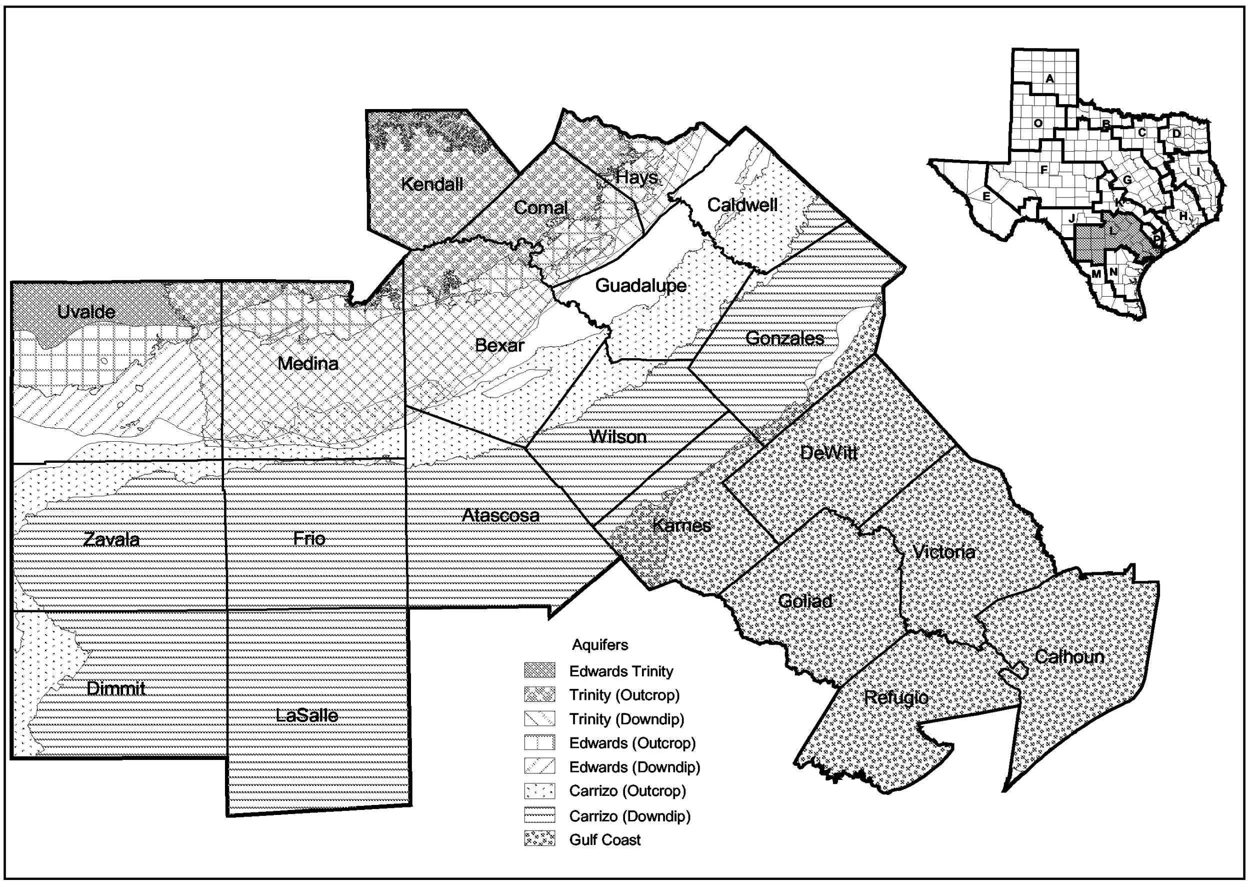


Figure 1-5. Major Aquifers — South Central Texas Region

[11] "Ground-water Availability in Texas," Texas Department of Water Resources, Austin, Texas, September 1979.

1.7.1.1 Edwards-Balcones Fault Zone Aquifer (Edwards Aquifer)

The Edwards Aquifer underlies parts of seven counties (Uvalde, Medina, Bexar, Atascosa, Comal, Guadalupe, and Hays) in the South Central Texas Region. The aquifer forms a narrow belt extending from a groundwater divide in 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 the Austin regions. The name Edwards-BFZ distinguishes this aquifer from the Edwards-Trinity (Plateau) and the Edwards-Trinity (High Plains) Aquifers, however, in this document, it will be referred to as the Edwards Aquifer (Figure 1-5).

The Edwards Aquifer supplied approximately 44 percent of the total water used in the South Central Texas Region in 2000. Water demands of the area that is now being supplied from the Edwards Aquifer are growing at a rate of approximately 1.7 percent per year. Present levels of use cannot be sustained during a repeat of the drought of record without interruption of flow at Comal Springs. Maintenance of adequate levels of flows at Comal and San Marcos Springs are desirable to support habitats of endangered species and provide for downstream water rights.

Water from the aquifer is primarily used for municipal, irrigation, and industrial purposes. In 2003, approximately 65 percent of the total water pumped from the aquifer in the region was used for municipal supply, with 22.5 percent used for irrigation purposes and 8.5 percent used for industrial purposes.[12] San Antonio, which presently obtains the vast majority of its municipal water supply from the aquifer, is the largest city in the United States and one of the largest in the world that has relied on a single groundwater source. The Edwards Aquifer also supplies water to industries in the San Antonio area and is the source of flow from Comal, San Marcos, Leona, San Antonio, and San Pedro Springs. Both the Guadalupe and San Antonio Rivers are supplied with base flows from springs, which, in turn, are used downstream for municipal, industrial, and agricultural purposes.

The aquifer, composed predominantly of limestone formed during the early Cretaceous Period, exists under water-table conditions in the outcrop and under artesian conditions where it is confined below the overlying Del Rio Clay. The Aquifer consists of the Georgetown Limestone, formations of the Edwards Group (the primary water-bearing unit) and their

[12] Edwards Aquifer Authority," Hydrologic Data Report for 2003," June 2004.

equivalents, and the Comanche Peak Limestone where it exists. Saturated thickness ranges from 200 to 600 feet.

Recharge to the aquifer occurs primarily by the downward percolation of surface water from streams draining off of the Edwards Plateau to the north and west and by direct infiltration of precipitation on the outcrop. This recharge reaches the aquifer through crevices, faults, and sinkholes in the unsaturated zone. Unknown amounts of groundwater enter the aquifer as lateral underflow from the Glen Rose Formation. Water in the aquifer generally moves from the recharge zone toward natural discharge points such as Comal and San Marcos Springs. Water is withdrawn through hundreds of wells, particularly municipal and industrial wells in Bexar, Comal, and Hays Counties, and irrigation wells in Bexar, Medina, and Uvalde Counties.

In the updip portion, groundwater moving through the aquifer system has dissolved large volumes of rock to create highly permeable solution zones and channels that facilitate rapid flow and relatively high storage capacity within the aquifer. Highly fractured strata in fault zones have also been preferentially dissolved to form conduits capable of transmitting large amounts of water. Due to its extensive honeycombed and cavernous character, the aquifer yields moderate to large quantities of water to wells, with some wells yielding in excess of 16,000 gallons per minute (gpm) (35.6 cfs, 25,810 acft/yr). One well drilled in Bexar County flowed 24,000 gpm (53.5 cfs, 38,720 acft/yr) from a 30-inch diameter pipe. The aquifer is significantly less permeable farther downdip where the concentration of dissolved solids in the water exceeds 1,000 milligrams per liter (mg/L).

Due to its highly permeable nature in the fresh-water zone, the Edwards Aquifer responds quickly to changes and extremes of stress placed on the system. This is indicated by rapid water-level fluctuations during relatively short periods of time. During times of high rainfall and recharge, the Edwards Aquifer is able to supply significant quantities of water for municipal, industrial, and irrigation uses, as well as sustain springflows. However, under conditions of below-average rainfall or drought, when discharge and withdrawals exceed recharge, springflows may decline to levels that are unacceptable to both environmental and downstream water rights concerns.

Operations of the largest existing surface water supply sources in the South Central Texas Region are linked to the Edwards Aquifer. Dependable supplies from Canyon Reservoir for municipal and industrial customers are a function of springflows from the Edwards Aquifer, since releases from Canyon Reservoir are necessary to meet downstream senior water rights when springflows drop below certain levels. Storage in the Medina Lake System contributes significantly to recharge of the Edwards Aquifer, and reservoirs used to provide cooling for steam-electric power generation (Coleto Creek, Calaveras, and Braunig) are dependent to some degree upon springflows and/or treated municipal effluent, which originated from the Edwards Aquifer. Surface water supplies available to the region are also a function of recharge to and withdrawal from the Edwards and other aquifers, as well as the quantities of streamflows permitted for use in counties of the Nueces River Basin outside the South Central Texas Region.

An important management issue for the Edwards Aquifer includes establishing levels of groundwater withdrawals to ensure adequate water levels and at least minimum springflows. In the three river basin area where the Edwards Aquifer is located, growing demands are increasing the competition for scarce water resources. Aquifer recharge and pumpage affect streamflows and springflows, which in turn affect endangered species at and below the springs, streamflows for downstream water rights holders, instream flows for fish and wildlife, and freshwater inflows to the Guadalupe Estuary.

In 1959, after the severe drought from 1950 to 1957 that lowered water levels in the aquifer to record lows and caused Comal Springs in Comal County to go dry for several months, the Texas Legislature created the Edwards Underground Water District. The district included Bexar, Comal, Hays, Medina, and Uvalde Counties and was charged with conserving, protecting, and recharging the underground water-bearing formations within the district and preventing waste and pollution of such underground water. In 1989, Medina and Uvalde Counties withdrew from the district and each formed a countywide district. In 1993, while under threat of federal intervention for alleged failure to protect federally protected species that rely on springflows from the Edwards Aquifer, the Texas Legislature enacted Senate Bill 1477.

Senate Bill 1477 abolished the Edwards Underground Water District and created a new entity, the Edwards Aquifer Authority. Senate Bill 1477 directs the Authority to implement a comprehensive management plan for the aquifer that regulates pumpage, while taking into consideration the interests and needs of all the individuals and entities that rely on the aquifer as a water source, and maintains the delicate relationship between springflows and the environment.

A "bad water" line generally runs west-east through southern Uvalde and Medina Counties, the northern tip of Atascosa County, Southeastern Bexar, Comal, and Hays Counties, and the western tip of Guadalupe County.[13] South and southeast of the “bad water” line, the aquifer contains water having more than 1,000 milligrams per liter of dissolved solids. The potential for movement of this poor quality water into the fresh water zone, as fresh water levels are lowered during periods of low recharge and high pumpage, is considered a threat to the quality of water in the fresh water zone of the aquifer, and consequently may be a threat to the water supplies of these who depend upon the aquifer.

1.7.1.2 Carrizo-Wilcox Aquifer (Carrizo Aquifer)

The Wilcox Group, including the Calvert Bluff, Simsboro, and Hooper Formations, and the overlying Carrizo Formation of the Claiborne Group, form a hydrologically connected system known as the Carrizo-Wilcox Aquifer, which is referred to in this study as the Carrizo 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, 13 of which are located in the South Central Texas Region. The Carrizo Sand and Wilcox Group outcrop along a narrow band that is located about 130 miles inland from the Gulf of Mexico at the eastern edge of the South Central Texas Region and about 200 miles inland at the western edge. The aquifer dips beneath the land surface toward the coast.

The Carrizo Aquifer is predominantly composed of sand locally interbedded with gravel, silt, clay, and lignite deposited during the Tertiary Period. Water-bearing thickness of the aquifer ranges from 200 feet in Dimmit County to more than 1,500 feet in the downdip artesian portion in Atascosa County. Where it is found at the surface, the aquifer exists under water-table conditions and, in the subsurface, is under artesian conditions. Yields of wells are commonly 500 gpm (1.1 cfs, 810 acft/yr), and some may reach 3,000 gpm (6.7 cfs, 4,840 acft/yr) downdip where the aquifer is under artesian conditions. Some of the greatest yields are produced from the Carrizo Sand in the southern, or Winter Garden, area of the aquifer.

Historically, municipal and irrigation pumpage account for about 35 percent and 51 percent, respectively, of total pumpage from the Carrizo Aquifer within the region, with irrigation being the predominant use in the Winter Garden region. Significant water-level

[13] “Groundwater Resources, and Model Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas,” Texas Department of Water Resources, Klemt, William B., Tommy R. Knowles, Glenward R. Elder, and Thomas W. Sieb, Report 239, Austin, Texas, October 1979.

declines have occurred in the semiarid Winter Garden portion of the Carrizo Aquifer, as the region is heavily dependent on groundwater for irrigation. Since 1920, water levels have declined 100 feet in much of the area and more than 250 feet in the Crystal City area of Zavala County.

In the South Central Texas Region, water from the Carrizo Aquifer is fresh to slightly saline. In the outcrop, the water is hard yet usually low in dissolved solids. Downdip, the water is softer, has a higher temperature, and contains more dissolved solids. A downdip "bad water" line generally runs northeast-southwest through the southeast portion of La Salle and McMullen Counties, the northeast portion of Live Oak and Karnes Counties, and southeast Gonzales County. Southeast of the "bad water" line the groundwater has more than 1,000 mg/L of total dissolved solids. Localized contamination of the aquifer in the Winter Garden region is attributed to direct infiltration of oil field brines on the surface and to downward leakage of saline water from the overlying Bigford Formation. Some recently sampled wells in Dimmit and Zavala Counties were found to contain high concentrations of dissolved solids, chloride, and/or sulfate. Downward leakage of more highly-mineralized water from overlying strata through the uncemented annular space between the well casings and boreholes of such wells is considered to be the most likely cause. Nitrate and gross alpha above maximum concentration limits have been observed in the Winter Garden District. Caldwell and Gonzales Counties have areas where water from the aquifer is high in iron and manganese. The Calvert Bluff, Simsboro, and Hooper formations of the Wilcox group all contain mean iron concentrations greater than the secondary drinking water standard of 0.3 mg/L. Water from all three formations is hard to very hard. Mean concentrations of sulfate and chloride are below regulatory standards in all three formations.

1.7.1.3 Trinity Aquifer

The Trinity Aquifer provides water to all or parts of 55 counties in Texas, including six counties (Hays, Comal, Kendall, Bexar, Medina, and Uvalde) in the South Central Texas Region. The Trinity Aquifer consists of early Cretaceous Age formations of the Trinity Group that are organized into the lower Trinity Aquifer (Hosston Sand and Sligo Limestone), the middle Trinity Aquifer (lower Glen Rose Limestone, the Hensell Sand, and Cow Creek Limestone), and the upper Trinity Aquifer (upper Glen Rose Limestone).[14] Because of its depth and poor quality, the

[14] "Groundwater Availability of the Lower Cretaceous Formations in the Hill Country of South-Central Texas," Texas Department of Water Resources, Austin, Texas, 1983.

lower Trinity has not been extensively developed. The middle Trinity is the most widely used part of the aquifer in the South Central Texas Region. The upper Trinity yields are low due to low porosity and permeability, and water quality is poor due to the presence of evaporate beds.

Trinity well yields are rarely more than 100 gpm (0.22 cfs, 160 acft/yr) in the South Central Texas Region although the SAWS is presently obtaining an average of about 500 gpm from several Trinity wells in northern Bexar County. At the present time, the aquifer is being stressed due to rapid growth in the number of wells being drilled to supply new homes and commercial establishments. Due to the heavy demands being placed upon the aquifer in relation to supplies available, much of the area underlain by the Trinity Aquifer in the Hill Country has been included in a Priority Groundwater Management Area.

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 for municipal supplies. In the southern Hill Country region, the primary contribution to poor quality is wells that have not been adequately cased through the evaporite beds in the upper part of the Glen Rose. Water quality naturally deteriorates in the downdip direction within all the Trinity water-bearing units. A downdip “bad water” line for the Trinity Aquifer generally trends east-west through southern Uvalde and Medina Counties, then trends southeast-northwest through central Bexar County and the southeast edge of Comal and Hays Counties. South and southeast of this “bad water” line, the groundwater contains greater than 1,000 mg/L of total dissolved solids. Average concentrations of nitrates, fluorides, chlorides, and sulfates are below regulatory standards. However, localized areas of nitrate pollution due to human or animal waste, and ranching and farming activities have been identified in parts of Kendall and Hays Counties.

1.7.1.4 Gulf Coast Aquifer

The Gulf Coast Aquifer forms a wide belt along the Gulf of Mexico from Florida to Mexico. In Texas, the aquifer provides water to all or parts of 54 counties, including all or parts of seven coastal counties (Karnes, Gonzales, DeWitt, Goliad, Victoria, Refugio, and Calhoun) in the South Central Texas Region. Municipal and irrigation uses have historically accounted for 90 percent of the total pumpage for the aquifer in the planning region.

The aquifer consists of complex interbedded clays, silts, sands, and gravels of the Cenozoic Age, which are hydrologically connected to form a large, leaky artesian aquifer system. This system is comprised of four major components consisting of the following generally recognized water-producing formations. The deepest is the Catahoula, which contains groundwater near the outcrop in relatively restricted sand layers. Above the Catahoula, is the Jasper Aquifer, primarily contained within the Oakville Sandstone. The Burkeville confining layer separates the Jasper from the overlying Evangeline Aquifer, which is contained within the Fleming and Goliad Sands. The Chicot Aquifer, or upper component of the Gulf Coast Aquifer system, consists of the Lissie, Willis, Bentley, Montgomery, and Beaumont Formations, and overlying alluvial deposits. Not all formations are present throughout the system, and nomenclature often differs from one end of the system to the other. In the South Central Texas Region, saturated thickness ranges from 500 feet in Karnes County to about 1,500 feet in Victoria County. Average well yields are about 1,600 gpm. Water quality tends to deteriorate from about 500 mg/L of dissolved solids in Karnes County to over 1,000 mg/L near the coast. Water levels have declined in local areas where significant withdrawals have been made for municipal, industrial, and irrigation purposes. As water levels decline, the threats of land subsidence and salt-water intrusion increase.

In the Gulf Coast Aquifer, 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. From the San Antonio River Basin southwestward to Mexico, quality deterioration is evident in the form of increased chloride concentration and salt-water encroachment along the coast. Little of this groundwater is suitable for prolonged irrigation use due to either high salinity, or alkalinity, or both. The downdip extent of fresh water in the Gulf Coast Aquifer is approximately equal to or somewhat inland from the coast line of the Gulf of Mexico. Elevated levels of TAS, chloride, and/or arsenic can occur locally (e.g., Karnes, Refugio, and Calhoun Counties) necessitating more advanced treatment processes.

1.7.1.5 Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) Aquifer provides water to the northern portions of Uvalde and Kendall Counties in the South Central Texas Region. The aquifer consists of saturated sediments of lower Cretaceous Age Trinity Group, including the Fredericksburg Group and

Washita Group.[15] The Glen Rose Limestone is the primary unit in the Edwards-Trinity (Plateau) Aquifer in the southern areas of its extent. This unit is estimated to have a thickness of up to 300 feet in these southern areas of its extent.

The aquifer generally exists under water-table conditions, however, where the Trinity (Plateau) Aquifer 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 gpm where saturated thickness is thin to more than 1,000 gpm where wells are completed in jointed and cavernous limestone. Water quality ranges from fresh to slightly saline. The water is generally hard and varies in concentrations of calcium, magnesium, and bicarbonate. Average concentrations of nitrate, fluoride, chloride, and sulfates are below regulatory drinking water standards.

1.7.1.6 Sparta Aquifer

The Sparta Aquifer extends in a narrow band from the Frio River in South Texas northeastward to the Louisiana border, and underlies parts of five counties (Frio, LaSalle, Atascosa, Wilson, and Gonzales) in the South Central Texas Region. 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 being produced from the interval. The Sparta provides water for domestic and livestock supply throughout its extent in the region.

The Sparta Formation, part of the Claiborne Group deposited during the Tertiary, consists of sand and interbedded clay with massive sand beds in the basal section. These beds gently dip to the south and southeast toward the Gulf Coast and reach a total thickness of up to 300 feet. Usable quality water is commonly found within the outcrop and for a few miles downdip and in some areas may occur down to depths approaching 2,000 feet. Yields of individual wells are generally less than 100 gpm, although some wells average 400 to 500 gpm, and a few wells produce as much as 1,200 gpm. Water occurs under water-table conditions in the outcrop and under artesian conditions downdip where the Sparta is covered by younger, non water-bearing rocks.

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[15] Barker, Rene A., and Ann F. Ardis, Hydrogeologic Framework of the Edwards-Trinity Aquifer System, West Central Texas, USGS Professional Paper 1421-B, 1996.

The Sparta Aquifer produces water of excellent quality throughout most of its extent in the South Central Texas Region; however, water quality deteriorates with depth due to high chlorides and dissolved solids in the downdip direction. The extent of downdip fresh water in the Sparta Aquifer generally runs along a line trending southwest-northeast from northern La Salle and McMullen Counties through southeast Atascosa and Wilson Counties to central Gonzales County. In some locations, water within the aquifer may contain iron concentrations in excess of secondary drinking water standards.

1.7.1.7 Queen City Aquifer

The Queen City Aquifer extends across Texas from the Frio River in South Texas northeastward into Louisiana and underlies six counties (Frio, LaSalle, Atascosa, Wilson, Gonzales, and Caldwell) in the South Central Texas Region. 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. The aquifer provides water for domestic and livestock purposes throughout most of its extent and water for irrigation in Wilson County.

Sand, loosely cemented sandstone, and interbedded clay units of the Queen City Formation of the Tertiary Claiborne Group make up the aquifer. These rocks dip gently to the south and southeast toward the Gulf Coast. Total aquifer thickness is usually less than 500 feet. In the outcrop area, water occurs under water-table conditions, while in the downdip subsurface, where the Queen City is covered by younger, non-water-bearing rocks, the water is under artesian conditions. Yields of individual wells are commonly low, but a few exceed 400 gpm.

Water of excellent quality is generally found within the outcrop and for a few miles downdip, but water quality deteriorates with depth in the downdip direction due to high chlorides and dissolved solids. The extent of downdip fresh water in the Queen City Aquifer is approximately the same as the Sparta Aquifer in the previous subsection. Queen City Aquifer groundwater contains relatively high iron concentrations in some locations.

1.7.2 Surface Water

The South Central Texas Region includes parts of the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins and parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins (Figure 1-6). Existing surface water supplies of the region include those derived from storage reservoirs and run-of-river water rights. The geographical characteristics of the various river basins are described in the following subsections, along with major reservoirs and/or water rights. In addition, general information is provided regarding water quality characteristics and specific notation is made of stream segments on the 2004 draft list prepared by the Texas Commission on Environmental Quality (TCEQ) pursuant to Section 303(d) of the Federal Clear Water Act. Existing surface water supplies available during drought are summarized in Section 3.

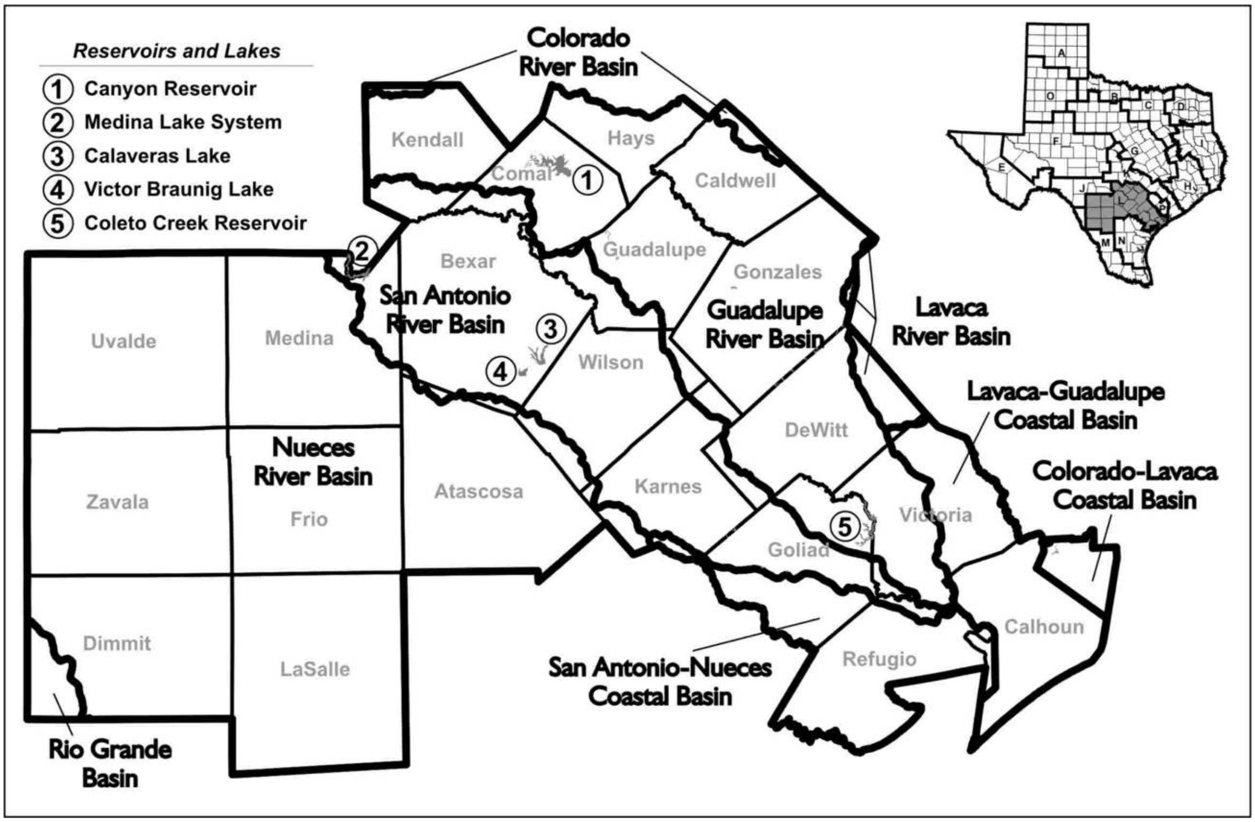

Figure 1-6. River Basins, Coastal Basins, and Reservoirs of the South Central Texas Region

1.7.2.1 Rio Grande Basin

The southwestern corner of Dimmit County, an area of approximately 164 square miles, is located in the Rio Grande Basin and in the South Central Texas Region. The only surface water presently available to this area is that which can be captured in stock tanks.

1.7.2.2 Nueces River Basin

The Nueces River Basin is bounded on the north and east by the Colorado, San Antonio, and Guadalupe River Basins and the San Antonio-Nueces Coastal Basin, and on the west and south by the Rio Grande Basin and the Nueces-Rio Grande Coastal Basin. Total drainage area of the basin is about 16,920 square miles above Calallen Dam, of which 8,973 square miles are located in the south central Texas planning region. The Nueces River rises in Edwards County and flows 371 river miles from the gage at Laguna in Uvalde County to Nueces Bay on the Gulf of Mexico near Corpus Christi. Principal tributaries of the Nueces River are the Frio and Atascosa Rivers. Major population centers located in the basin include the cities of Uvalde (Uvalde County), Crystal City (Zavala County), Pearsall (Frio County), Pleasanton (Atascosa County), Hondo (Medina County), and Carrizo Springs (Dimmit County). Major water rights in the Nueces River Basin within the South Central Texas Region include those held by the Zavala-Dimmit County WCID #1, which total 28,000 acft/yr.

Water quality in the upper portion of the Nueces River Basin in the less-inhabited reaches is good, except for relatively high nitrate-nitrogen levels occurring naturally in the spring-fed streams. A substantial part of the flow of the upper Nueces River and its tributaries upstream of the Edwards Aquifer recharge zone enters the fractured and cavernous limestone formation of the Edwards Aquifer. As a result, streamflows in the Nueces River Basin downstream from the recharge zone consist almost entirely of stormwater. During low-flow conditions, chloride, sulfate, and total dissolved solids levels increase due to natural and man-made activities. The Atascosa River has experienced elevated bacteria and depressed dissolved oxygen levels downstream of the City of Pleasanton. In addition, elevated nitrogen levels have been observed in the Sabinal River in southeastern Uvalde County and depressed dissolved oxygen levels have been observed in the Frio River in north center Uvalde County.

1.7.2.3 San Antonio River Basin

The San Antonio River Basin is bounded on the north and east by the Guadalupe River Basin and on the west and south by the Nueces River Basin and the San Antonio-Nueces Coastal Basin. Total drainage area of the basin is about 4,180 square miles, of which 3,506 square miles are located in the planning region. The San Antonio River has its source in large springs within and near the city limits of San Antonio. The river flows more than 230 river miles across the Coastal Plain to a junction with the Guadalupe River near the Gulf of Mexico. Its principal tributaries are the Medina River and Cibolo Creek, both spring-fed streams. Major population centers located in the basin include the cities of San Antonio (Bexar County), Universal City (Bexar County), Schertz (Bexar County), Live Oak (Bexar County), Leon Valley (Bexar County), Converse (Bexar County), Kirby (Bexar County), Alamo Heights (Bexar County), and Floresville (Wilson County). The largest water rights in the San Antonio River Basin are associated with major reservoirs including the Medina Lake System (66,750 acft/yr), Calaveras Lake (37,000 acft/yr), and Braunig Lake (12,000 acft/yr).

In the past, water quality in the San Antonio Basin varied from very good in the upper basin to relatively poor in the lower basin, particularly during periods of low flow. Since 1987, advanced water treatment has been instituted at the three major San Antonio area water recycling plants, Dos Rios, Leon Creek, and Salado Creek. As a result dissolved oxygen concentrations in the San Antonio River have been maintained well above the State stream standard of 5.0 mg/L and aquatic life has been significantly enhanced. However, certain water quality concerns remain in the basin. Elevated bacteria levels have occurred in the upper and lower segments of the San Antonio River and lower Cibolo, lower Leon, Salado, and Walzem Creeks. Depressed dissolved oxygen levels have been observed in lower Leon, upper Cibolo, and mid Cibolo Creeks. Finally, PCBs have been found in fish tissue in lower Leon Creek and a high priority has been assigned to initiating Total Maximum Daily Load (TMDL) studies.

1.7.2.4 Guadalupe River Basin

The Guadalupe River Basin is bounded on the north by the Colorado River Basin, on the east by the Lavaca River Basin and the Lavaca-Guadalupe Coastal Basin, and on the west and south by the Nueces and San Antonio River Basins. The Guadalupe River rises in the west-central part of Kerr County. A spring-fed stream, it flows eastward through the Hill Country until it issues from the Balcones Escarpment near New Braunfels. It then crosses the Coastal Plain to San Antonio Bay. Its total length is more than 430 river miles, and its drainage area is approximately 10,128 square miles above the Guadalupe River Saltwater Barrier and Diversion Dam, of which about 4,180 square miles are located within the San Antonio River Basin. Its principal tributaries are the San Marcos River, another spring fed stream, which joins the Guadalupe River in Gonzales County; the San Antonio River, which joins it just above its mouth on San Antonio Bay; and the Comal River, which joins it at New Braunfels. Comal Springs are the source of the Comal River, which flows about 2.5 miles before joining the Guadalupe River.

Major population centers located in the basin include the cities of Victoria (Victoria County), San Marcos (Hays County), New Braunfels (Comal County), Seguin (Guadalupe County), Lockhart (Caldwell County), Cuero (DeWitt County), Gonzales (Gonzales County), and Luling (Caldwell County). Major reservoirs in the Guadalupe River Basin include Canyon Reservoir with authorized diversions averaging 90,000 acft/yr and Coleto Creek Reservoir with permitted consumptive use of 12,500 acft/yr. In addition, there are groups of run-of-river water rights having significant authorized annual consumptive uses. These rights are held by the GBRA (172,501 acft/yr), Invista/DuPont (33,000 acft/yr), and the City of Victoria (20,000 acft/yr).

The Guadalupe River Basin is characterized by generally high quality throughout. Low dissolved oxygen concentrations are found sometimes in the Guadalupe River tidal segment as well as Elm and Sandies Creeks. Elevated levels of bacteria have occurred in Elm, Sandies, and Peach Creeks.

1.7.2.5 Lower Colorado River Basin

Only a small portion of Kendall and Caldwell Counties is located in that part of the Lower Colorado River Basin located inside the planning region. The total drainage area of the Colorado River Basin is 41,763 square miles, of which only 76 square miles are located in the planning region. The only surface water presently available to these two areas of the South Central Texas Region is from local stock tanks.

1.7.2.6 Lavaca River Basin

Small portions of DeWitt, Gonzales, and Victoria Counties are located in that part of the Lavaca River Basin inside the planning region. The total drainage area of the Lavaca River Basin is 2,309 square miles, of which 156 square miles are located in the planning region. The Lavaca-Navidad River Authority owns and operates Lake Texana and has contracts to provide 32,000 acft/yr of water to customers in the Colorado-Lavaca Coastal Basin, 41,840 acft/yr to Corpus Christi in the Nueces-Rio Grande Coastal Basin, and 594 acft/yr for use in the Lavaca-Guadalupe Coastal Basin.

1.7.2.7 Coastal Basins

Parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins are located within the South Central Texas Region. None of these coastal basins has large surface water projects. Because of limited surface water availability from local runoff and groundwater quality considerations, these basins generally rely on adjoining river basins to provide surface water to meet their needs. The Colorado-Lavaca Coastal Basin obtains 32,000 acft/yr of surface water from Lake Texana in the Lavaca River Basin. The Lavaca-Guadalupe Coastal Basin obtains approximately 69,000 acft/yr of imported surface water, the majority of which is supplied from the Guadalupe River. The San Antonio-Nueces Coastal Basin obtains approximately 26,000 acft/yr of imported surface water supplied from the Nueces River Basin.

The TCEQ routinely monitors the Victoria Barge Canal segment in the Lavaca-Guadalupe Coastal Basin, which has no known water quality problems. All water quality standards and uses are supported, although phosphorus and chlorophyll-a levels are occasionally elevated. At certain times during the year, the canal is very biologically productive, but other parameters do not indicate water quality instability. According to the TCEQ, water quality in the Mission and Aransas River tidal segments, located in the San Antonio-Nueces Coastal Basin, may experience elevated bacteria levels, but the rivers otherwise has good water quality.

1.7.3 Major Springs

According to selected references,[16,17] there are six major springs located within the planning area (Comal, San Marcos, Hueco, Leona, San Antonio, and San Pedro Springs).

> **Comal Springs:** Comal Springs is located in Landa Park, New Braunfels in Comal County. Comal Springs discharges water from the Edwards and associated limestones of the Edwards Aquifer and issues through the Comal Springs Fault. Senate Bill 1477, Section 1.14, limits the quantity of water that can be withdrawn from the Edwards Aquifer in each calendar year for the period ending December 31, 2007 to no more than 450,000 acft, and for the period beginning January 1, 2008 to no more than 400,000 acft. Section 1.14, Subsection h, specifies that the Edwards Aquifer Authority shall implement and enforce water management practices, procedures, and methods to ensure that not later than December 31, 2012, the continuous minimum spring flows of Comal and San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. Section 1.15 of Senate Bill 1477 provides that the Edwards Aquifer Authority (Authority) shall manage withdrawals and points of withdrawal from the aquifer by granting permits. Long-term average discharge from Comal Springs is about 280 cfs.

[16] TWDB, "Major and Historical Springs of Texas (Report #189)," March 1975.
[17] Brune, Gunnar, "Springs of Texas," Volume I, Branch-Smith, Inc., Fort Worth, Texas, 1981.

San Marcos Springs: San Marcos Springs is located 2 miles northeast of San Marcos, in Hays County. San Marcos Springs discharges water from the Edwards and associated limestones of the Edwards Aquifer and issues through the San Marcos Springs Fault. Senate Bill 1477, as described in the Comal Springs text above, also applies to San Marcos Springs. Long-term average discharge from San Marcos Springs is about 150 cfs.

Hueco Springs: Hueco Springs is located about 3 miles north of New Braunfels near the confluence of Elm Creek and the Guadalupe River in Comal County. There are two main springs issuing from a fault in the Edwards limestone at this location. Sources of water for these springs include the Edwards Aquifer and, possibly, underflow from the Guadalupe River. Long-term average discharge from Hueco Springs is about 40 cfs.

Leona Springs: Leona Springs consists of three groups of springs located from 1 to 6 miles southeast of Uvalde, in Uvalde County. These springs discharge water from the Edwards Aquifer. Long-term average discharge from Leona Springs is about 25 cfs.

San Antonio Springs: San Antonio Springs is located just above East Hildebrand Street in San Antonio, in Bexar County. San Antonio Springs discharge water from the Edwards Aquifer. Long-term average discharge from San Antonio Springs is about 20 cfs.

San Pedro Springs: San Pedro Springs is located in San Pedro Park, San Antonio in Bexar County. San Pedro Springs discharges water from the Edwards Aquifer. Long-term average discharge from San Pedro Springs is about 5 cfs.

Since present levels of withdrawals from the Edwards Aquifer are greater than the withdrawal rates specified in Senate Bill 1477, it will be necessary to either limit future withdrawals to those specified in Senate Bill 1477, or to increase recharge to the aquifer in sufficient quantities to meet the future needs of those who depend upon it for their water supplies. Therefore, actions specified by Senate Bill 1477 to limit withdrawals from the Edwards Aquifer and/or to supplement supplies from the aquifer directly affect water supplies of the South Central Texas Region. To the extent that pumping limits are imposed to limit withdrawals to those specified by Senate Bill 1477 in order to maintain flows at Comal and San Marcos Springs at levels sufficient to protect endangered and threatened species to the extent required by federal law, then those that now obtain water from the Edwards Aquifer will be required to obtain water from other sources to meet a part of the present needs and provide for growth.

1.8 Threats to Agricultural and Natural Resources

Pursuant to 31 TAC 357.7(a)(1)(L), the South Central Texas Regional Water Planning Group (SCTRWPG) identified the following threats to agriculture in the South Central Texas Regional Water Planning Area:

- A shortage of economically accessible fresh water of suitable quantity and quality for irrigation and for livestock drinking and sanitation purposes. For example, such a shortage could result from groundwater production at insufficiently sustainable rates and/or lack of control over groundwater production.
- Deterioration of water quality, such that the quantities available are not usable for irrigation or livestock drinking and sanitation. Increased salinity is an example of a water quality threat to agriculture.

The SCTRWPG identified the following threats to natural resources in the planning region:

- Reductions of quantity and/or quality of fresh water available to fish and wildlife.
- Changes to aquatic and riparian habitats associated with use of water from streams and aquifers.
- Temporary or permanent inundation of aquatic, riparian, and terrestrial habitats associated with surface water impoundment.

Technical evaluations of water management strategies (Section 4C, Volume II) include quantitative and/or qualitative discussion of how identified threats to agriculture or natural resources are expected to be addressed or affected by the water management strategy. Following is a summary of specific quantitative and/or qualitative measures used to meet this requirement:

- Application of Groundwater Availability Models (GAMs) to illustrate projected changes in regional aquifer levels during the planning period.
- Comparison of the Gross Business Effects (as provided by the TWDB) associated with failure to meet projected agricultural water needs with the costs of potential water management strategies available to the region.
- Applications of surface Water Availability Models (WAMs) and GAMs to quantify projected changes in streamflow, springflow, and/or freshwater inflows to bays and estuaries. Graphical and tabular summaries of projected changes focus on time series data, monthly medians, and/or frequency of occurrence.
- Qualitative assessment of potential changes in groundwater or surface water quality based on available information.
- Acreage temporarily or permanently inundated by a planned reservoir and the frequency of such inundation.

Additional information relevant to identified threats to agriculture and natural resources associated with implementation of the 2006 Regional Water Plan is reported in Section 7.

1.9 Summary of Existing Plans

1.9.1 2002 State Water Plan[18]

In Section 26.051 of the Texas Water Code, the Executive Administrator of the TWDB is charged with producing a State Water Plan that addresses the broad public interest of the State. As currently specified in Sections 16.055 and 16.056, the Plan is to be periodically reviewed and updated and serve as a flexible guide to state policy for the development of its water resources. The TCEQ shall consider the State Water Plan in its water regulatory actions, although its actions are not bound by the Plan.

The 2002 Texas Water Plan provides a statewide perspective that places local and regional needs within the state context. Available individual and county-level studies were built into the overall findings, and in formulating water supply solutions, the Plan focused on economic viability while taking environmental sensitivity into consideration. New legislation, passed in the 75th Legislature, specifies a 5-year update period for the Plan that is based on regional planning studies, and provides that related financial assistance applications must be consistent with the regional and State plans for regulatory approval by State agencies.

The ultimate goal of the State Water Plan is to identify those policies and actions that may be needed to meet Texas' near- and long-term water needs, based on a reasonable projected use of water, affordable water supply availability, and the goal of conservation of the State's natural resources.

The 2002 State Water Plan includes water management strategies for the South Central Texas Region that could produce new supplies of as much as 744,053 acft in 2050. These strategies include (1) municipal and irrigation water conservation; (2) water reuse; (3) purchase/lease and transfer of irrigation rights for municipal use; (4) aquifer storage and recovery; (5) increased use of Canyon Reservoir; (6) Lower Guadalupe River diversions (including 50,000 acft of off-channel storage); (7) Colorado River diversion; (8) groundwater imports from the Simsboro Aquifer in Bastrop, Lee, and Milam Counties; (9) desalination of seawater; (10) recharge of the Edwards aquifer; (11) enhanced use of the Carrizo Aquifer from Wilson, Gonzales, and Bastrop Counties; and (12) expansion of existing well fields. The plan also includes brush management, weather modification, rainwater harvesting, and additional municipal water reuse. The Planning Group evaluated and then excluded large-scale

[18] TWDB, *State Water Plan: Water for Texas – 2002*, Austin, Texas, 2002.

development of new reservoirs and focused on smaller, off-channel balancing reservoirs for efficient operations and meeting peak seasonal water needs.

1.9.2 2001 Regional Water Plan

The existing South Central Texas Regional Water Plan was submitted to the TWDB in January 2001. The SCT Regional Water Plan was then subsequently approved by the TWDB and incorporated into the 2002 State Water Plan. The SCT Regional Water Plan, outlines those water management strategies recommended by the planning group to meet the identified needs in the region. Those water management strategies are listed in Section 1.10.1 in the summary of the 2002 State Water Plan.

1.9.3 Local Water Plans

During this planning process the South Central Texas Planning Group worked with each local entity to develop a water management plan to meet any identified needs. These plans are contained in Section 4 of this document.

1.9.4 Current Preparations for Drought

Under requirements of Senate Bill 1, 1997 Texas Legislature, drought contingency plans are required by the TCEQ for wholesale water suppliers, irrigation districts, and retail water suppliers. Senate Bill 1 also requires that TCEQ require surface water right holders that supply 1,000 acft or more of water for non-irrigation use and 10,000 acft/yr for irrigation use prepare a water conservation plan. In addition, conservation plans are commonly included in the management plans of underground water conservation districts.

All drought contingency plans are required to set triggering criteria for initiation and termination of drought response stages and contain supply and demand management measures to be implemented during each stage. The retail and wholesale water suppliers' plans contain measures to limit or restrict the use of water for purposes such as the irrigation of landscaped areas, to wash any motor vehicle, to fill or add water to any indoor or outdoor swimming pool, operation of any ornamental fountain, and the irrigation of golf course greens, tees, and fairways.

The underground water conservation district management plans also contain conservation plans that set goals and objectives for conserving groundwater within the district. The districts use methods such as requiring wells in areas that are in danger of over producing groundwater and damaging the aquifers to restrict production by means of production permits, metering the amount of water produced, and by working with water utilities, agricultural, and industrial users within the district to promote the efficient use of water.

SAWS' Water Conservation and Reuse Plan aims to reduce the impacts of drought in the San Antonio area of the South Central Texas Region by water conservation programs for its customers. One of the goals of this plan is to increase the public's awareness of water-saving methods, in order to encourage customers to voluntarily conserve water, thus reducing Edwards Aquifer use. Reuse of treated municipal wastewater for landscape irrigation is also a part of the SAWS Conservation and Reuse Plan designed to reduce the use of potable groundwater for non-potable applications. A major goal of this part of the plan is to virtually eliminate the use of groundwater for irrigation and stream augmentation while preserving the integrity of the Edwards Aquifer.

In response to the passage of Senate Bill 1477 by the 73rd Texas Legislature, the Edwards Aquifer Authority has developed Drought Management and Critical Period rules to address aquifer usage during times of drought. These rules apply to all holders of regular permits, the customers of all permittees who are retail water utilities, and owners of exempt wells. Under the rules, during times of drought, water use restrictions are placed into effect, as appropriate and necessary.

The South Central Texas Regional Water Plan relies upon local water management agencies and water utilities drought contingency plans to identify factors specific to each source of water supply to be considered in determining whether to initiate a drought response, and actions to be taken as part of the response. Section 6.2 includes additional information and recommendations of the SCTRWPG regarding drought management.

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Section 2
Population and Water Demand Projections
[31 TAC §357.7(a)(2)]

In order to develop water plans to meet future water needs, it is necessary to make projections of future population and water demands for the region. For purposes of the South Central Texas Region, the TWDB has made both population and water demand projections for cities, rural areas, and water using purposes for each of the counties of the region (20 counties and part of Hays County). These counties are located in six major river basins (Nueces, San Antonio, Guadalupe, Lower Colorado, Lavaca, and Rio Grande) and three coastal basins (Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces) (Table 2-1). In accordance with TWDB Rules, Section 357.5(d), which states, "In developing regional water plans, regional water planning groups shall use: (1) state population and water demand projections contained in the state water plan or adopted by the board after consultation with the Texas Commission on Environmental Quality, the Texas Parks and Wildlife Department, and the Texas Department of Agriculture in preparation for revision of the state water plan; or (2) in lieu of paragraph (1) of this subsection, population or water demand projection revisions that have been adopted by the board, after coordination with Texas Commission on Environmental Quality, the Texas Parks and Wildlife Department, and the Texas Department of Agriculture based on changed conditions and availability of new information. Within 45 days of receipt of a request from a regional water planning group for revision of population or water demand projections, the executive administrator shall consult with the requesting regional water planning group and respond to their request," the TWDB-approved projections are presented below.

2.1 Population Projections

The year 2000 Census of Population and Housing by the U.S. Bureau of the Census indicates that Texas has the second highest population among the states of the nation, with a population of more than 20.85 million. The population of the South Central Texas Region was 2.04 million in 2000 and is projected to be 4.3 million in 2060 (Table 2-2 and Figure 2-1). Approximately 68 percent of the population of the region is projected to reside in the San Antonio River Basin in the year 2060, with 24 percent in the Guadalupe River Basin (Table 2-2). The TWDB's population projections for 165 municipal water user groups (individual cities and water supply districts and/or authorities) and 48 rural areas of each county and part of county of each river basin area of the South Central Texas Region are shown in Table 2-3.

Table 2-1.
South Central Texas Region – List of Counties
Location by River and Coastal Basin and Edwards Aquifer Area

County	Edwards Aquifer Area	River and Coastal Basin								
		Nueces Basin	San Antonio Basin	Guadalupe Basin	Lower Colorado Basin	Colorado/ Lavaca Coastal Basin	Lavaca Basin	Lavaca/ Guadalupe Coastal Basin	San Antonio/ Nueces Coastal Basin	Rio Grande
Atascosa	X	X	X							
Bexar	X	X	X							
Caldwell	X			X	X					
Calhoun				X		X		X	X	
Comal	X		X	X						
DeWitt			X	X			X	X		
Dimmit		X								X
Frio		X								
Goliad			X	X					X	
Gonzales				X			X			
Guadalupe	X		X	X						
Hays (Part)	X			X						
Karnes		X	X	X					X	
Kendall			X	X	X					
LaSalle		X								
Medina	X	X	X							
Refugio			X						X	
Uvalde	X	X								
Victoria			X	X			X	X		
Wilson		X	X	X						
Zavala		X								

* An X in the column indicates that all or part of the county is located in the River or Coastal Basin named in the column heading.

Table 2-2.
Population Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Census		*Projections*					
	1990	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Counties								
Atascosa	30,533	38,628	45,504	52,945	59,598	64,844	69,320	72,578
Bexar	1,185,394	1,392,931	1,631,935	1,857,745	2,059,112	2,222,887	2,369,950	2,500,731
Caldwell	26,392	32,194	45,958	59,722	71,459	83,250	95,103	106,575
Calhoun	19,053	20,647	23,556	26,610	29,964	33,046	34,642	36,049
Comal	51,832	78,021	108,219	146,868	190,873	233,964	278,626	326,655
DeWitt	18,840	20,013	20,460	20,964	21,251	21,341	21,021	20,648
Dimmit	10,433	10,248	10,996	11,733	12,187	12,234	11,966	11,378
Frio	13,472	16,252	18,160	20,034	21,628	22,952	23,913	24,412
Goliad	5,980	6,928	8,087	9,508	10,648	11,395	11,964	12,324
Gonzales	17,205	18,628	19,872	21,227	22,260	23,003	23,219	23,151
Guadalupe	64,873	89,023	114,878	146,511	180,725	214,912	252,857	293,736
Hays (Part)	51,478	72,499	120,199	172,674	213,908	255,183	304,337	342,746
Karnes	12,455	15,446	17,001	18,830	20,759	22,305	23,256	23,774
Kendall	14,589	23,743	35,720	50,283	65,752	78,690	89,312	99,698
LaSalle	5,254	5,866	6,599	7,278	7,930	8,578	9,048	9,407
Medina	27,312	39,304	46,675	54,815	62,416	68,987	75,370	81,104
Refugio	7,976	7,828	8,217	8,505	8,609	8,799	8,915	8,877
Uvalde	23,340	25,926	28,616	31,443	33,802	35,650	36,876	37,810
Victoria	74,361	84,088	93,073	102,487	110,221	116,368	121,416	125,865
Wilson	22,650	32,408	44,078	58,621	74,641	90,187	106,373	123,135
Zavala	12,162	11,600	12,796	14,130	15,227	16,086	16,774	17,133
Total	1,695,584	2,042,221	2,460,599	2,892,933	3,292,970	3,644,661	3,984,258	4,297,786
River and Coastal Basins Summaries								
Rio Grande	48	21	23	24	25	25	25	23
Nueces	120,265	143,260	163,549	185,226	204,433	219,978	232,969	242,742
San Antonio	1,261,182	1,503,219	1,782,785	2,058,443	2,313,981	2,529,107	2,728,302	2,913,176
Guadalupe	261,039	330,349	440,583	566,936	684,311	798,272	920,695	1,035,228
Lower Colorado	856	2,960	4,439	6,040	7,482	8,903	10,307	11,666
Lavaca	3,523	3,511	3,582	3,665	3,712	3,724	3,673	3,615
Colorado-Lavaca	1,596	1,515	1,722	2,141	3,124	4,182	4,142	4,118
Lavaca-Guadalupe	38,465	48,968	55,015	61,145	66,386	70,690	74,198	77,277
San Antonio-Nueces	8,610	8,418	8,901	9,313	9,516	9,780	9,947	9,941
Total	1,695,584	2,042,221	2,460,599	2,892,933	3,292,970	3,644,661	3,984,258	4,297,786

Source: Texas Water Development Board (TWDB), Consensus Projections adopted by the TWDB, September 17, 2003.

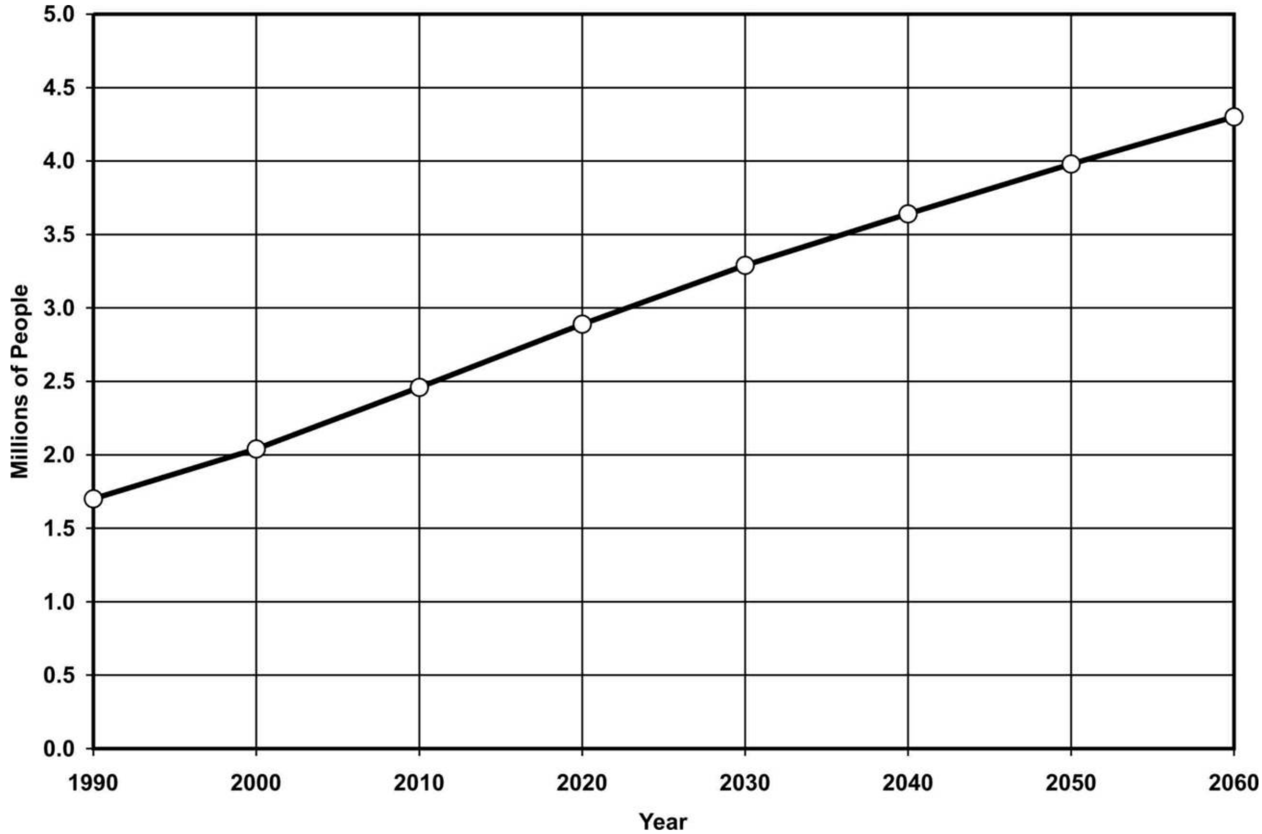

Figure 2-1. Summary of South Central Texas Region's Projected Population

Table 2-3. Population Projections South Central Texas Region River Basins, Counties, and Cities

	Census		Projections					
Basin/County/City/Rural	***1990****	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Rio Grande Basin (part)								
Dimmit (part) – Rio Grande								
County-Other (Rural)	48	21	23	24	25	25	25	23
Total	48	21	23	24	25	25	25	23
Rio Grande Basin Total	**48**	**21**	**23**	**24**	**25**	**25**	**25**	**23**
Nueces Basin (part)								
Atascosa (part) - Nueces								
Charlotte	1,475	1,637	1,764	1,895	2,010	2,101	2,178	2,234
Jourdanton	3,220	3,732	4,134	4,549	4,914	5,201	5,443	5,620
Lytle	1,911	2,046	2,152	2,261	2,357	2,433	2,497	2,544
Pleasanton	7,678	8,266	8,728	9,205	9,624	9,953	10,231	10,434
Poteet	3,206	3,305	3,383	3,463	3,534	3,589	3,636	3,670
Benton City WSC		4,407	7,046	9,770	12,163	14,042	15,629	16,788
McCoy WSC		6,719	9,798	12,976	15,768	17,961	19,812	21,164
Bexar Met Water District (BMWD)		2,944	3,954	4,996	5,912	6,631	7,238	7,682
County-Other (Rural)	12,367	4,983	3,782	2,871	2,179	1,654	1,256	953
Total	29,857	38,039	44,741	51,986	58,461	63,565	67,920	71,089
Bexar (part) - Nueces								
Lytle	4	14	25	36	46	54	61	67
Atascosa Rural WSC		268	350	427	496	552	602	647
Bexar Met Water District (BMWD)		1,203	1,260	1,314	1,362	1,401	1,436	1,467
County-Other (Rural)	2,747	1,951	2,037	2,118	2,191	2,249	2,302	2,349
Total	2,751	3,436	3,672	3,895	4,095	4,256	4,401	4,530
Dimmit (part) - Nueces								
Asherton	1,608	1,342	1,440	1,536	1,596	1,602	1,567	1,490
Big Wells	834	704	755	806	837	840	822	782
Carrizo Springs	5,745	5,655	6,068	6,474	6,725	6,751	6,603	6,279
County-Other (Rural)	2,198	2,526	2,710	2,893	3,004	3,016	2,949	2,804
Total	10,385	10,227	10,973	11,709	12,162	12,209	11,941	11,355
Frio (part) - Nueces								
Dilley	2,632	3,674	4,389	5,091	5,688	6,184	6,544	6,731
Pearsall	6,924	7,157	7,317	7,474	7,608	7,719	7,800	7,842
Benton City WSC		17	29	40	50	58	64	67
County-Other (Rural)	3,916	5,404	6,425	7,429	8,282	8,991	9,505	9,772
Total	13,472	16,252	18,160	20,034	21,628	22,952	23,913	24,412
Karnes (part) - Nueces								
El Oso WSC		63	68	74	80	85	88	90
County-Other (Rural)	314	107	134	166	200	227	244	253
Total	314	170	202	240	280	312	332	343

Continued on next page

Table 2-3 Continued

Basin/County/City/Rural	Census		Projections					
	1990*	2000	2010	2020	2030	2040	2050	2060
LaSalle (part) - Nueces								
Cotulla	3,694	3,614	4,052	4,408	4,598	4,790	4,989	5,188
Encinal	608	629	639	648	656	664	670	675
County-Other (Rural)	952	1,623	1,908	2,222	2,676	3,124	3,389	3,544
Total	5,254	5,866	6,599	7,278	7,930	8,578	9,048	9,407
Medina (part) - Nueces								
Devine	3,928	4,140	4,270	4,414	4,548	4,664	4,777	4,878
Hondo	6,018	7,897	9,050	10,324	11,513	12,541	13,540	14,437
Lytle	340	323	323	323	323	323	323	323
Natalia	1,216	1,663	1,937	2,240	2,523	2,768	3,006	3,219
East Medina SUD		5,703	6,700	7,801	8,829	9,718	10,582	11,358
Benton City WSC		3,193	4,103	5,108	6,047	6,858	7,646	8,354
County-Other (Rural)	10,379	8,264	10,549	13,072	15,428	17,465	19,444	21,221
Total	21,881	31,183	36,932	43,282	49,211	54,337	59,318	63,790
Uvalde (part) - Nueces								
Sabinal	1,584	1,586	1,588	1,590	1,592	1,593	1,594	1,595
Uvalde	14,729	14,929	15,137	15,356	15,538	15,681	15,776	15,848
County-Other (Rural)	7,027	9,411	11,891	14,497	16,672	18,376	19,506	20,367
Total	23,340	25,926	28,616	31,443	33,802	35,650	36,876	37,810
Wilson (part) - Nueces								
McCoy WSC		222	377	571	784	991	1,207	1,430
County-Other (Rural)	849	339	481	658	853	1,042	1,239	1,443
Total	849	561	858	1,229	1,637	2,033	2,446	2,873
Zavala (part) - Nueces								
Crystal City	8,263	7,190	7,514	7,713	8,046	8,118	8,192	8,266
County-Other (Rural)	3,899	4,410	5,282	6,417	7,181	7,968	8,582	8,867
Total	12,162	11,600	12,796	14,130	15,227	16,086	16,774	17,133
Nueces Basin Total	**120,265**	**143,260**	**163,549**	**185,226**	**204,433**	**219,978**	**232,969**	**242,742**
San Antonio Basin (part)								
Atascosa (part) - San Antonio								
Benton City WSC		383	612	849	1,057	1,220	1,358	1,459
County-Other (Rural)	676	206	151	110	80	59	42	30
Total	676	589	763	959	1,137	1,279	1,400	1,489
Bexar (part) - San Antonio								
Alamo Heights	6,502	7,319	7,671	8,039	8,148	8,239	8,331	8,423
Balcones Heights (SAWS)	3,022	3,016	3,327	3,670	3,909	4,154	4,414	4,674
China Grove (SAWS)	1,031	1,247	1,671	2,072	2,430	2,721	2,982	3,214
Converse	8,887	11,508	15,339	19,445	23,204	26,132	28,697	30,892
Elmendorf (SAWS)	645	664	773	876	968	1,042	1,109	1,168
Fairoaks Ranch	1,640	3,799	4,699	4,739	4,779	4,819	4,833	4,857
Helotes (SAWS)	1,535	4,285	7,980	11,812	14,808	17,244	19,432	21,378

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Table 2-3 Continued

Basin/County/City/Rural	Census		Projections					
	*1990**	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Bexar (part) Continued								
Kirby	8,326	8,673	9,066	9,437	9,768	10,037	10,279	10,494
Leon Valley	9,581	5,876	5,905	5,933	6,014	6,095	6,176	6,256
Leon Valley (SAWS)		3,363	3,379	3,396	3,442	3,488	3,534	3,581
Live Oak	10,023	9,156	9,641	10,126	10,611	11,096	11,581	12,066
Olmos Park (SAWS)	2,161	2,343	2,549	2,744	2,918	3,059	3,186	3,299
San Antonio (SAWS)	935,933	1,013,066	1,198,691	1,374,070	1,530,464	1,657,662	1,771,880	1,873,452
San Antonio (BMWD)		130,080	153,915	176,434	196,515	212,848	227,513	240,556
San Antonio (OTHERS)		1,500	1,775	2,035	2,266	2,454	2,624	2,774
Schertz	3,579	1,045	1,759	2,434	3,036	3,525	3,964	4,355
Selma		722	4,453	5,658	6,826	6,703	6,560	6,413
Shavano Park	1,708	1,754	1,806	1,855	1,899	1,935	1,967	1,995
Somerset (SAWS)	1,144	1,550	2,009	2,443	2,830	3,145	3,428	3,679
St. Hedwig	1,443	1,875	2,364	2,826	3,238	3,573	3,874	4,141
Terrell Hills	4,592	5,019	5,502	5,959	6,366	6,697	6,994	7,258
Universal City	13,057	14,849	17,248	19,722	21,970	21,970	21,970	21,970
Castle Hills (BMWD)	4,198	4,202	4,207	4,211	4,215	4,218	4,221	4,223
Bexar Met Water District	108,988	65,327	68,415	71,332	73,932	76,049	77,948	79,639
Atascosa Rural WSC		6,430	8,393	10,248	11,902	13,247	14,455	15,529
Hill Country Village (BMWD)		1,028	1,028	1,028	1,028	1,028	1,028	1,028
Hollywood Park (BMWD)	3,879	2,983	3,111	3,232	3,340	3,428	3,507	3,577
Green Valley SUD		2,598	5,113	7,490	9,609	11,333	12,881	14,257
Windcrest	5,331	5,105	5,143	5,181	5,218	5,256	5,294	5,331
Water Service Inc. (Apex)		3,009	4,107	5,144	6,069	6,821	7,496	8,097
East Central SUD		7,132	10,199	12,420	14,400	16,017	17,466	18,747
Lackland AFB (CDP)	9,352	7,123	7,123	7,123	7,123	7,123	7,123	7,123
County-Other (SAWS)		42,331	44,332	46,222	47,907	49,279	50,510	51,605
County-Other (Rural)	36,086	9,518	5,570	4,495	3,865	6,194	8,292	10,150
Total	1,182,643	1,389,495	1,628,263	1,853,850	2,055,017	2,218,631	2,365,549	2,496,201
Comal (part) - San Antonio								
Fairoaks Ranch	51	246	248	250	252	254	256	258
Schertz	129	42	71	108	150	191	233	279
Bulverde City		3,730	8,031	13,536	19,803	25,940	32,301	39,142
Bexar Met Water District (BMWD)		1,620	3,363	5,593	8,132	10,619	13,196	15,968
Garden ridge		760	961	1,218	1,511	1,798	2,096	2,416
Selma		16	225	380	571	658	737	814
Water Service Inc. (Apex)		1,632	2,217	2,965	3,817	4,651	5,516	6,446
County-Other (Rural)	6,134	838	940	1,185	1,450	1,808	2,191	2,611
Total	6,314	8,884	16,056	25,235	35,686	45,919	56,526	67,934
DeWitt (part) - San Antonio								
County-Other (Rural)	890	571	584	598	606	609	600	589
Total	890	571	584	598	606	609	600	589
Goliad (part) - San Antonio								
Goliad	1,946	1,975	2,306	2,710	3,035	3,248	3,411	3,514
County-Other (Rural)	2,119	2,054	2,054	2,054	2,054	2,054	2,054	2,054
Total	4,065	4,029	4,360	4,764	5,089	5,302	5,465	5,568

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Table 2-3 Continued

	Census		Projections					
Basin/County/City/Rural	***1990***	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Guadalupe (part) - San Antonio								
Cibolo	1,757	3,035	4,497	6,284	8,216	10,146	12,287	14,593
Marion	1,027	1,099	1,213	1,353	1,504	1,655	1,822	2,002
Schertz	14,891	17,333	24,565	33,403	42,957	52,502	63,092	74,497
Selma		50	173	253	334	389	453	523
Green Valley SUD		5,739	7,712	10,123	12,729	15,332	18,220	21,331
Springs Hill WSC		1,676	1,942	2,268	2,620	2,972	3,362	3,782
East Central SUD		747	983	1,280	1,605	1,920	2,248	2,589
Water Service Inc. (Apex)		170	217	274	336	398	466	540
Santa Clara		722	1,439	2,316	3,264	4,211	5,261	6,392
County-Other (Rural)	1,385	462	403	322	231	149	80	18
Total	19,060	31,033	43,144	57,876	73,796	89,674	107,291	126,267
Karnes (part) - San Antonio								
Karnes city	2,916	3,457	3,710	4,008	4,322	4,573	4,728	4,812
Kenedy	3,763	3,487	3,585	3,965	4,266	4,522	4,793	4,950
Runge	1,139	1,080	1,099	1,209	1,294	1,367	1,445	1,503
Falls City		591	644	706	772	825	857	875
El Oso WSC		2,419	2,609	2,833	3,069	3,258	3,374	3,437
Sunko WSC		287	316	350	385	413	430	440
County-Other (Rural)	3,977	3,806	4,656	5,303	6,117	6,749	6,991	7,098
Total	11,795	15,127	16,619	18,374	20,225	21,707	22,618	23,115
Kendall (part) - San Antonio								
Boerne	4,274	6,178	8,600	12,208	16,065	19,286	21,925	24,506
Fairoaks Ranch	169	650	1,234	1,282	1,308	1,335	1,362	1,389
Water Service Inc. (Apex)		255	313	383	457	519	570	620
County-Other (Rural)	4,260	6,543	10,043	14,299	18,820	22,601	25,705	28,740
Total	8,703	13,626	20,190	28,172	36,650	43,741	49,562	55,255
Medina (part) - San Antonio								
Castroville	2,159	2,664	2,974	3,316	3,636	3,912	4,180	4,421
La Coste	1,021	1,255	1,399	1,558	1,706	1,834	1,958	2,070
Yancey WSC		3,550	4,531	5,615	6,627	7,502	8,352	9,115
East Medina SUD		327	384	447	506	557	607	651
Bexar Met Water District (BMWD)		115	186	264	337	400	461	516
County-Other (Rural)	2,251	210	269	333	393	445	494	541
Total	5,431	8,121	9,743	11,533	13,205	14,650	16,052	17,314
Refugio (part) - San Antonio								
County-Other (Rural)	86	72	65	60	59	55	53	54
Total	86	72	65	60	59	55	53	54
Victoria (part) - San Antonio								
County-Other (Rural)	273	48	56	64	71	76	80	84
Total	273	48	56	64	71	76	80	84

Continued on next page

Table 2-3 Continued

Basin/County/City/Rural	Census		Projections					
	1990	2000	2010	2020	2030	2040	2050	2060
Wilson (part) - San Antonio								
Floresville	5,247	5,868	9,000	10,261	11,653	12,999	14,402	15,846
LaVernia	757	931	1,280	1,715	2,194	2,659	3,143	3,645
Poth	1,642	1,850	2,099	2,409	2,750	3,081	3,426	3,783
Stockdale	1,268	1,398	1,553	1,747	1,960	2,167	2,383	2,606
SS WSC		8,701	13,417	19,294	25,767	32,049	38,589	45,362
Oak Hills WSC		3,100	4,655	6,592	8,726	10,797	12,953	15,186
Sunko WSC		2,905	3,646	4,570	5,588	6,576	7,604	8,669
East Central SUD		654	801	982	1,177	1,371	1,588	1,822
El Oso WSC		240	284	339	400	459	520	584
County-Other (Rural)	12,332	5,977	6,167	9,049	12,225	15,306	18,498	21,803
Total	21,246	31,624	42,902	56,958	72,440	87,464	103,106	119,306
San Antonio Basin Total	**1,261,182**	**1,503,219**	**1,782,785**	**2,058,443**	**2,313,981**	**2,529,107**	**2,728,302**	**2,913,176**
Guadalupe Basin (part)								
Caldwell (part) – Guadalupe Basin								
Lockhart	9,205	11,615	16,328	21,083	25,111	29,154	33,216	37,148
Luling	4,661	5,080	6,309	7,301	7,998	8,700	9,407	10,092
Polonia WSC		3,304	5,074	6,988	8,684	10,386	12,094	13,747
Maxwell WSC		2,757	4,356	6,113	7,685	9,260	10,843	12,374
Martindale	1,028	953	1,150	1,291	1,378	1,465	1,553	1,638
Martindale WSC		826	1,307	1,468	1,566	1,666	1,765	1,861
AQUA WSC		1,260	1,782	2,313	2,764	3,217	3,672	4,112
Goforth WSC		1,013	1,770	2,636	3,429	4,226	5,024	5,797
County Line WSC		681	1,262	1,939	2,565	3,193	3,824	4,434
Creedmoor-Maha WSC		616	929	1,264	1,558	1,854	2,150	2,437
Gonzales County WSC		154	215	277	329	381	433	484
Niederwald		83	203	349	489	629	769	904
Mustang Ridge		37	54	74	90	107	124	139
County-Other (Rural)	10,804	1,069	1,109	1,054	947	849	764	683
Total	25,698	29,448	41,848	54,150	64,593	75,087	85,638	95,850
Calhoun (part) – Guadalupe Basin								
County-Other (Rural)	23	0	0	0	0	0	0	0
Total	23	0	0	0	0	0	0	0
Comal (part) – Guadalupe Basin								
Garden Ridge	1,450	1,122	1,419	1,799	2,232	2,656	3,095	3,567
New Braunfels	27,091	35,328	44,826	56,982	70,823	84,376	98,423	113,529
Canyon Lake WSC		9,741	19,509	32,010	46,244	60,182	74,628	90,163
Green Valley SUD		1,818	2,617	3,640	4,804	5,944	7,126	8,397
Crystal Clear WSC		1,557	2,258	3,155	4,177	5,177	6,214	7,329
Schertz		274	461	700	972	1,239	1,516	1,813
Bexar Met Water District (BMWD)		123	255	424	617	806	1,002	1,212
Bulverde City		31	67	113	165	216	269	326
County-Other (Rural)	16,977	19,143	20,751	22,810	25,153	27,449	29,827	32,385
Total	45,518	69,137	92,163	121,633	155,187	188,045	222,100	258,721

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Table 2-3 Continued

Basin/County/City/Rural	Census 1990	Census 2000	Projections 2010	2020	2030	2040	2050	2060
DeWitt (part) – Guadalupe Basin								
Cuero	6,700	6,571	6,718	6,883	6,977	7,007	6,902	6,779
Yorktown	2,207	2,271	2,322	2,379	2,411	2,422	2,385	2,343
Gonzales County WSC		359	367	376	381	383	377	370
County-Other (Rural)	5,736	6,859	7,012	7,185	7,283	7,314	7,204	7,077
Total	14,643	16,060	16,419	16,823	17,052	17,126	16,868	16,569
Goliad (part) – Guadalupe Basin								
County-Other (Rural)	1,465	2,331	3,064	3,964	4,687	5,158	5,519	5,745
Total	1,465	2,331	3,064	3,964	4,687	5,158	5,519	5,745
Gonzales (part) – Guadalupe Basin								
Gonzales	6,527	7,202	7,792	8,435	8,925	9,277	9,379	9,347
Nixon	1,995	2,186	2,353	2,535	2,674	2,774	2,803	2,794
Waelder	744	947	1,124	1,316	1,463	1,568	1,599	1,589
Gonzales County WSC		4,612	5,418	6,296	6,965	7,446	7,586	7,542
County-Other (Rural)	7,873	3,598	3,113	2,585	2,183	1,894	1,810	1,836
Total	17,139	18,545	19,800	21,167	22,210	22,959	23,177	23,108
Guadalupe (part) – Guadalupe Basin								
New Braunfels	243	1,166	2,083	3,204	4,416	5,626	6,969	8,415
Seguin	18,853	22,011	25,309	29,339	33,696	38,048	42,877	48,077
Green Valley SUD		14,042	18,868	24,766	31,142	37,512	44,579	52,190
Springs Hill WSC		9,097	10,543	12,311	14,222	16,131	18,249	20,530
Crystal Clear WSC		9,083	12,367	16,380	20,718	25,052	29,860	35,038
Martindale WSC		232	428	610	831	1,136	1,328	1,554
Santa Clara		177	353	568	800	1,032	1,290	1,567
County-Other (Rural)	26,717	2,182	1,783	1,457	1,104	701	414	98
Total	45,813	57,990	71,734	88,635	106,929	125,238	145,566	167,469
Hays (part) – Guadalupe Basin								
Kyle	2,225	5,314	21,457	31,126	33,613	35,203	39,197	41,850
San Marcos	28,743	34,733	48,814	69,906	90,990	114,477	139,466	158,099
Wimberley WSC	2,520	5,058	7,069	9,370	11,753	14,148	17,026	19,289
Woodcreek	978	1,274	1,730	2,252	2,792	3,335	3,987	4,500
Wood Creek Utilities Inc.		1,950	3,733	5,774	7,888	10,012	12,564	14,571
Goforth WSC		6,006	9,334	13,144	17,090	21,055	25,819	29,565
Crystal Clear WSC		3,114	4,554	6,202	7,909	9,624	11,685	13,306
Plum Creek Water Co.		3,504	5,319	7,397	9,549	11,711	14,309	16,352
County Line WSC		1,512	5,870	12,570	14,684	15,258	16,655	19,014
Maxwell WSC		969	1,360	1,807	2,270	2,735	3,294	3,734
Niederwald		501	818	1,181	1,557	1,935	2,389	2,746
Mountain City		135	282	450	624	799	1,009	1,174
Creedmoor-Maha WSC		70	94	121	149	177	211	238
County-Other (Rural)	17,012	8,359	9,765	11,374	13,040	14,714	16,726	18,308
Total	51,478	72,499	120,199	172,674	213,908	255,183	304,337	342,746
Karnes (part) – Guadalupe Basin								
El Oso WSC		25	27	29	31	33	34	35
County-Other (Rural)	116	74	93	115	138	158	170	176
Total	116	99	120	144	169	191	204	211

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Table 2-3 Continued

Basin/County/City/Rural	***Census***		***Projections***					
	1990	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Kendall (part) – Guadalupe Basin								
County-Other (Rural)	5,724	9,903	15,201	21,643	28,486	34,209	38,908	43,502
Total	5,724	9,903	15,201	21,643	28,486	34,209	38,908	43,502
Victoria (part) – Guadalupe Basin								
Victoria	43,747	40,726	44,157	47,752	50,705	53,052	54,980	56,679
County-Other (Rural)	9,120	13,388	15,600	17,917	19,821	21,334	22,577	23,672
Total	52,867	54,114	59,757	65,669	70,526	74,386	77,557	80,351
Wilson (part) – Guadalupe Basin								
County-Other (Rural)	555	223	318	434	564	690	821	956
Total	555	223	318	434	564	690	821	956
Guadalupe Basin Total	**261,039**	**330,349**	**440,583**	**566,936**	**684,311**	**798,272**	**920,695**	**1,035,228**
Lower Colorado Basin (part)								
Caldwell (part) – Lower Colorado								
Polonia WSC		1,433	2,201	3,031	3,767	4,505	5,246	5,963
Creedmoor-Maha WSC		854	1,288	1,751	2,159	2,569	2,980	3,378
Mustang Ridge		339	501	672	821	970	1,121	1,266
County-Other (Rural)	694	120	120	118	119	119	118	118
Total	694	2,746	4,110	5,572	6,866	8,163	9,465	10,725
Kendall (part) – Lower Colorado								
County-Other (Rural)	162	214	329	468	616	740	842	941
Total	162	214	329	468	616	740	842	941
Lower Colorado Basin Total	**856**	**2,960**	**4,439**	**6,040**	**7,482**	**8,903**	**10,307**	**11,666**
Lavaca Basin (part)								
DeWitt (part) – Lavaca Basin								
Yoakum	2,154	2,137	2,185	2,239	2,269	2,279	2,245	2,205
County-Other (Rural)	1,129	1,245	1,272	1,304	1,324	1,327	1,308	1,285
Total	3,283	3,382	3,457	3,543	3,593	3,606	3,553	3,490
Gonzales (part) – Lavaca Basin								
County-Other (Rural)	66	83	72	60	50	44	42	43
Total	66	83	72	60	50	44	42	43
Victoria (part) – Lavaca Basin								
County-Other (Rural)	174	46	53	62	69	74	78	82
Total	174	46	53	62	69	74	78	82
Lavaca Basin Total	3,523	3,511	3,582	3,665	3,712	3,724	3,673	3,615
Colorado-Lavaca Coastal Basin (part)								
Calhoun (part) – Colorado-Lavaca CB								
Point Comfort	956	781	1,276	1,870	2,959	4,081	4,081	4,081
County-Other (Rural)	640	734	446	271	165	101	61	37
Total	1,596	1,515	1,722	2,141	3,124	4,182	4,142	4,118
Colorado Lavaca Coastal Basin Total	**1,596**	**1,515**	**1,722**	**2,141**	**3,124**	**4,182**	**4,142**	**4,118**

Continued on next page

Table 2-3 Continued

Basin/County/City/Rural	*Census*		*Projections*					
	1990	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Lavaca-Guadalupe CB (part)								
Calhoun (part) –Lavaca Guadalupe CB								
Port Lavaca	10,886	12,035	13,163	14,325	15,513	16,717	17,925	19,030
Seadrift	1,277	1,352	1,408	1,459	1,499	1,525	1,537	1,545
Calhoun County WSC		4,470	5,891	7,204	8,232	8,906	9,202	9,408
County-Other (Rural)	5,231	1,231	1,346	1,465	1,587	1,710	1,833	1,946
Total	17,394	19,088	21,808	24,453	26,831	28,858	30,497	31,929
DeWitt (part) –Lavaca Guadalupe CB								
County-Other (Rural)	24	0	0	0	0	0	0	0
Total	24	0	0	0	0	0	0	0
Victoria (part) –Lavaca Guadalupe CB								
Victoria	11,329	19,877	21,552	23,306	24,747	25,893	26,834	27,663
County-Other (Rural)	9,718	10,003	11,655	13,386	14,808	15,939	16,867	17,685
Total	21,047	29,880	33,207	36,692	39,555	41,832	43,701	45,348
Lavaca-Guadalupe CB Total	**38,465**	**48,968**	**55,015**	**61,145**	**66,386**	**70,690**	**74,198**	**77,277**
San Antonio-Nueces CB (part)								
Calhoun (part) – San Antonio-Nueces CB								
County-Other (Rural)	40	44	26	16	9	6	3	2
Total	40	44	26	16	9	6	3	2
Goliad (part) – San Antonio-Nueces CB								
County-Other (Rural)	450	568	663	780	872	935	980	1,011
Total	450	568	663	780	872	935	980	1,011
Karnes (part) – San Antonio-Nueces CB								
El Oso WSC		13	14	15	16	17	18	18
County-Other (Rural)	230	37	46	57	69	78	84	87
Total	230	50	60	72	85	95	102	105
Refugio (part) – San Antonio-Nueces CB								
Refugio	3,158	2,941	3,511	3,933	4,085	4,364	4,534	4,478
Woodsboro	1,731	1,685	1,806	1,896	1,928	1,987	2,023	2,011
County-Other (Rural)	3,001	3,130	2,835	2,616	2,537	2,393	2,305	2,334
Total	7,890	7,756	8,152	8,445	8,550	8,744	8,862	8,823
San Antonio-Nueces CB Total	**8,610**	**8,418**	**8,901**	**9,313**	**9,516**	**9,780**	**9,947**	**9,941**
South Central Texas Region	**1,695,584**	**2,042,221**	**2,460,599**	**2,892,933**	**3,292,970**	**3,644,661**	**3,984,258**	**4,297,786**
River and Coastal Basin Summary								
Rio Grande Basin (part)	48	21	23	24	25	25	25	23
Nueces Basin (part)	120,265	143,260	163,549	185,226	204,433	219,978	232,969	242,742
San Antonio Basin (part)	1,261,182	1,503,219	1,782,785	2,058,443	2,313,981	2,529,107	2,728,302	2,913,176
Guadalupe Basin (part)	261,039	330,349	440,583	566,936	684,311	798,272	920,695	1,035,228
Lower Colorado Basin (part)	856	2,960	4,439	6,040	7,482	8,903	10,307	11,666
Lavaca Basin (part)	3,523	3,511	3,582	3,665	3,712	3,724	3,673	3,615
Colorado-Lavaca CB (part)	1,596	1,515	1,722	2,141	3,124	4,182	4,142	4,118
Lavaca-Guadalupe CB (part)	38,465	48,968	55,015	61,145	66,386	70,690	74,198	77,277
San Antonio-Nueces CB (part)	8,610	8,418	8,901	9,313	9,516	9,780	9,947	9,941
South Central Texas Region	**1,695,584**	**2,042,221**	**2,460,599**	**2,892,933**	**3,292,970**	**3,644,661**	**3,984,258**	**4,297,786**

* Data for Water Supply Corporations and Districts were included in County Other in the 2001 Plan.

2.2 Municipal Water Demand Projections

Municipal water is water used primarily for drinking, bathing, dish and clothes washing, cleaning, sanitation, air conditioning, and landscape watering for residential and commercial establishments and public offices and institutions. Residential and commercial uses are categorized together because they are similar types of uses and they are usually served treated water, of drinking quality, from a common system (e.g., a public water system). The projected quantity of water needed for municipal purposes depends upon the size of the population of the service area, climatic conditions, and water conservation measures. In addition to these factors, per capita water use (gallons per person per day of water use) is a key municipal water planning parameter. Population and per capita water use are used to make projections of municipal water demand for each of the 213 municipal water user groups of the South Central Texas Water Planning Region (Table 2-12).

Per capita water use is projected to decline over the planning period from 148 gallons per person per day (gpcd) in year 2000 to 132 gpcd in 2060 (Figure 2-2). However, due to projected population growth between 2000 and 2060, municipal water demand in the South Central Texas Region is projected to increase from 340,030 acft/yr in 2000 to 637,236 acft/yr in 2060 (Table 2-4 and Figure 2-2).[1] The projected municipal water demand for individual counties in the region is shown in Table 2-4. Since Bexar County has the highest population, it also has the largest projected water demand, with almost 60 percent of the projected total water demand for the region by the year 2060 (Table 2-4 and Figure 2-2).

[1] One acre-foot (acft) is 325,851 gallons.

Table 2-4.
Municipal Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Counties								
Atascosa	5,670	6,229	6,941	7,696	8,335	8,809	9,288	9,666
Bexar	225,626	229,693	262,105	290,071	316,423	336,033	355,246	374,536
Caldwell	4,931	4,643	6,306	7,898	9,222	10,555	11,926	13,328
Calhoun	3,916	2,705	2,948	3,222	3,556	3,870	4,007	4,171
Comal	10,415	14,055	18,771	24,753	31,598	38,304	45,318	53,018
DeWitt	3,556	3,065	3,064	3,071	3,039	2,982	2,889	2,839
Dimmit	2,208	2,432	2,561	2,692	2,756	2,725	2,652	2,523
Frio	3,045	3,114	3,402	3,668	3,890	4,061	4,202	4,287
Goliad	916	908	1,024	1,181	1,286	1,347	1,401	1,442
Gonzales	3,832	3,828	4,108	4,404	4,624	4,765	4,794	4,774
Guadalupe	9,627	13,850	17,113	21,167	25,595	29,907	34,980	40,533
Hays (Part)	9,805	10,926	17,278	24,409	29,964	35,414	42,121	47,474
Karnes	2,187	2,726	2,927	3,190	3,465	3,679	3,822	3,909
Kendall	2,130	3,262	4,649	6,370	8,142	9,610	10,888	12,139
LaSalle	1,233	1,625	1,799	1,946	2,058	2,162	2,262	2,350
Medina	5,254	6,616	7,576	8,660	9,656	10,509	11,395	12,234
Refugio	1,227	1,191	1,249	1,287	1,282	1,299	1,312	1,302
Uvalde	5,278	7,768	8,066	8,394	8,652	8,846	8,964	9,099
Victoria	11,545	13,664	14,590	15,614	16,378	16,884	17,435	18,034
Wilson	3,745	4,813	6,407	8,118	9,977	11,797	13,766	15,836
Zavala	2,349	2,916	3,111	3,300	3,477	3,578	3,676	3,741
Total	318,495	340,030	395,996	451,111	503,375	547,136	592,344	637,236
River and Coastal Basins Summaries								
Rio Grande	6	2	2	2	2	2	2	2
Nueces	24,157	29,599	32,130	34,782	37,029	38,702	40,264	41,555
San Antonio	239,648	247,068	285,003	319,510	352,859	379,040	405,175	431,723
Guadalupe	45,608	53,808	68,514	85,622	101,545	116,800	133,839	150,388
Lower Colorado	236	365	518	676	817	959	1,097	1,239
Lavaca	590	513	511	512	505	495	479	471
Colorado-Lavaca	217	251	289	362	523	691	675	672
Lavaca-Guadalupe	6,696	7,163	7,702	8,269	8,716	9,044	9,394	9,774
San Antonio-Nueces	1,337	1,261	1,327	1,376	1,379	1,403	1,419	1,412
Total	318,495	340,030	395,996	451,111	503,375	547,136	592,344	637,236

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

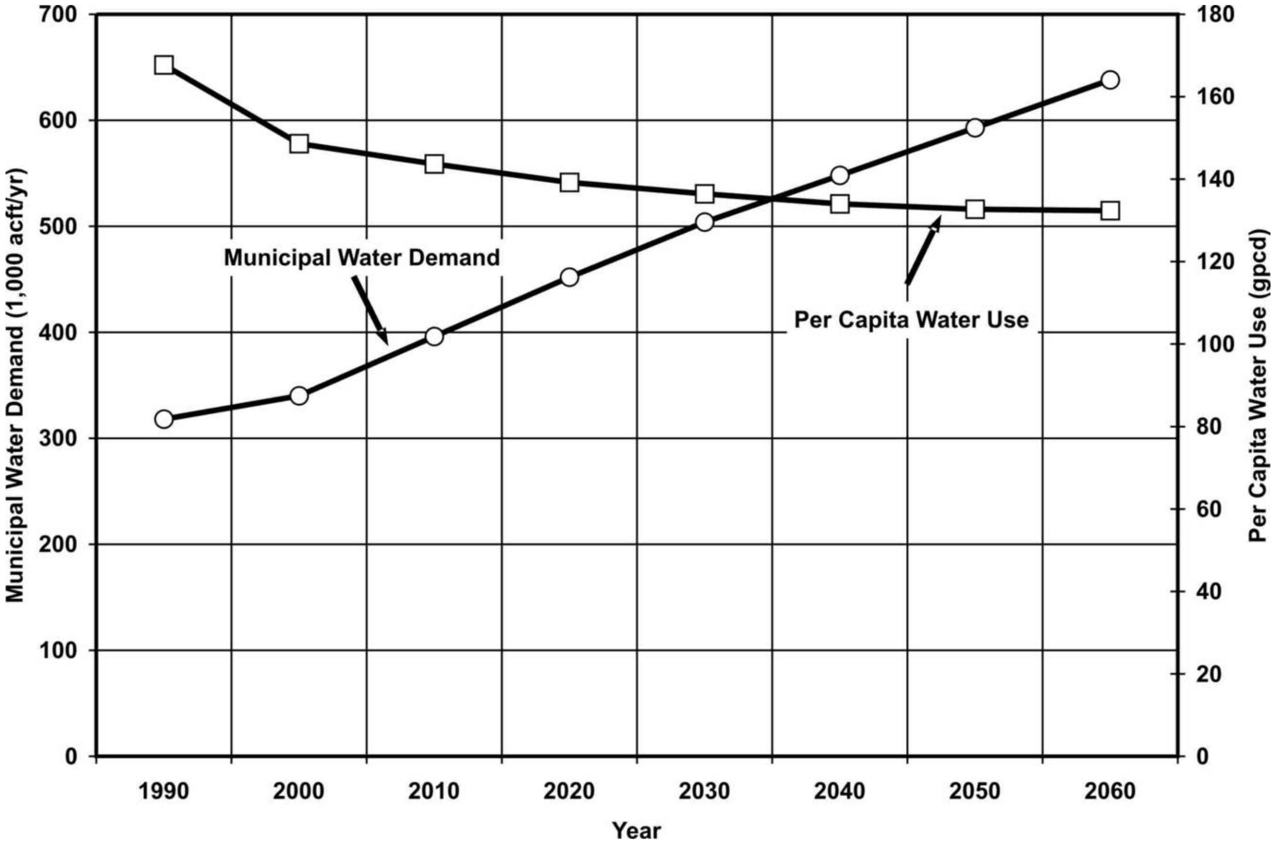

Figure 2-2. Projected Per Capita Water Use and Municipal Water Demand South Central Texas Region – 1990 to 2060

2.3 Industrial Water Demand Projections

The use of water for the production of goods for domestic and foreign markets varies widely among manufacturing industries in Texas. Manufactured products in Texas range from food and clothing to refined chemical and petroleum products to computers and automobiles. Some processes require direct consumption of water as part of the products being manufactured, while others require very little water consumption, but large volumes of water for cooling or cleaning purposes. Five manufacturing industries account for approximately 90 percent of water used by all manufacturing industries in Texas. These five water-intensive industries are chemical products, petroleum refining, pulp and paper, food and kindred products, and primary metals. The chemical and petroleum refining industries account for nearly 60 percent of the State's annual industrial water use.

The South Central Texas Region's major water using manufacturing sectors are fabricated metal products, industrial machinery, and food processing. All industries in the region used 100,195 acft of water in 2000 and are projected to have a demand of 179,715 acft/yr in 2060 (Table 2-5 and Figure 2-3). As can be seen in Figure 2-3, manufacturing water demand is projected to increase throughout the planning period.

2.4 Steam-Electric Power Water Demand Projections

Steam-Electric Power production in Texas is concentrated in ten privately owned utilities, which account for 85 percent of production. Nine percent of power production is from facilities that are both publicly and privately held, and 6 percent is from publicly owned utilities. The industry has faced and will continue to face significant changes in the structure of power generation. These changes range from new generation technology to government regulations on the marketing of electricity. These changes may have an impact on how and where power will be generated and the quantities of water needed.

In the generation of electricity, cooling water is circulated through the power generation plants, with approximately 2 percent being evaporated or consumed, and the remainder being either recirculated or returned to streams. Eight counties (Atascosa, Bexar, Calhoun, Frio, Goliad, Guadalupe, Hays, and Victoria) of the South Central Texas Region have electric power generation plants that use water in steam-electric power production. In 2000, 35,379 acft of water was consumed for electric power generation, and by the year 2060, it is estimated that 109,776 acft/yr of water will be consumed in the production of steam-electric power (Table 2-6 and Figure 2-3).

2.5 Mining Water Demand Projections

Although the Texas mineral industry is foremost in the production of crude petroleum and natural gas in the United States, it also produces a wide variety of important non-fuel minerals. Texas is the only state to produce native asphalt and is the leading producer nationally of Frasch-mined sulfur. It is also one of the leading states in the production of clay, gypsum, lime, salt, stone, and aggregate. In the South Central Texas Region, the principal uses of water for mining are for the extraction of stone, clay, and petroleum and for sand and gravel washing.

In the region, total mining water demand was 11,757 acft in 2000 and is expected to increase to 18,644 acft/yr in 2060, an increase of over 58 percent (Table 2-7 and Figure 2-3).

Table 2-5.
Industrial Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Counties								
Atascosa	0	6	6	6	6	6	6	6
Bexar	14,049	21,252	25,951	29,497	32,775	36,068	38,965	42,112
Caldwell	0	11	15	18	21	24	27	29
Calhoun	24,539	42,397	49,784	54,857	59,235	63,575	67,406	72,238
Comal	3,248	6,283	7,729	8,563	9,314	10,045	10,672	11,553
DeWitt	91	154	184	199	212	225	236	254
Dimmit	3	0	0	0	0	0	0	0
Frio	0	0	0	0	0	0	0	0
Goliad	0	0	4	8	12	16	20	24
Gonzales	865	2,051	2,400	2,628	2,822	3,011	3,177	3,402
Guadalupe	1,661	2,097	2,638	2,957	3,249	3,530	3,771	4,097
Hays (Part)	57	157	212	249	285	322	355	386
Karnes	270	107	118	122	125	128	130	137
Kendall	2	0	0	0	0	0	0	0
LASalle	0	0	0	0	0	0	0	0
Medina	286	56	67	75	82	89	95	103
Refugio	0	0	0	0	0	0	0	0
Uvalde	557	378	432	455	473	490	505	538
Victoria	20,032	24,323	28,726	32,095	35,035	37,962	40,578	43,520
Wilson	50	1	1	1	1	1	1	1
Zavala	1,306	922	1,043	1,106	1,154	1,200	1,238	1,315
Total	67,016	100,195	119,310	132,836	144,801	156,692	167,182	179,715
River and Coastal Basins Summaries								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	2,152	1,362	1,548	1,642	1,715	1,785	1,844	1,962
San Antonio	14,323	21,364	26,079	29,633	32,919	36,220	39,123	42,282
Guadalupe	26,235	35,201	42,051	46,871	51,112	55,306	59,014	63,453
Lower Colorado	0	0	0	0	0	0	0	0
Lavaca	0	7	8	9	10	10	11	12
Colorado-Lavaca	6,343	19,175	22,516	24,810	26,790	28,753	30,486	32,671
Lavaca-Guadalupe	17,963	23,086	27,108	29,871	32,255	34,618	36,704	39,335
San Antonio-Nueces	0	0	0	0	0	0	0	0
Total	67,016	100,195	119,310	132,836	144,801	156,692	167,182	179,715

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

Table 2-6.
Steam-Electric Power Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	Total in 2000 (acft)	Projections					
			2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Counties								
Atascosa	6,036	5,814	5,884	5,954	6,962	8,189	9,685	11,510
Bexar	24,263	17,399	17,309	17,275	20,196	23,757	28,098	33,390
Caldwell	0	0	0	0	0	0	0	0
Calhoun	62	684	569	454	530	624	738	877
Comal	0	0	0	0	0	0	0	0
DeWitt	0	0	0	0	0	0	0	0
Dimmit	0	0	0	0	0	0	0	0
Frio	38	129	107	85	100	117	139	165
Goliad	12,165	9,027	9,136	9,245	10,808	12,714	15,038	17,870
Gonzales	0	0	0	0	0	0	0	0
Guadalupe	0	129	10,065	14,407	16,844	19,814	23,435	27,848
Hays (Part)	0	0	5,331	7,631	8,922	10,495	12,413	14,751
Karnes	0	0	0	0	0	0	0	0
Kendall	0	0	0	0	0	0	0	0
LaSalle	0	0	0	0	0	0	0	0
Medina	0	0	0	0	0	0	0	0
Refugio	0	0	0	0	0	0	0	0
Uvalde	0	0	0	0	0	0	0	0
Victoria	887	2,197	2,026	1,741	2,035	2,394	2,832	3,365
Wilson	0	0	0	0	0	0	0	0
Zavala	0	0	0	0	0	0	0	0
Total	43,451	35,379	50,427	56,792	66,397	78,104	92,378	109,776
River and Coastal Basins Summaries								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	6,074	5,943	5,991	6,039	7,062	8,306	9,824	11,675
San Antonio	24,263	17,399	17,309	17,275	20,196	23,757	28,098	33,390
Guadalupe	13,052	11,353	26,558	33,024	38,609	45,417	53,718	63,834
Lower Colorado	0	0	0	0	0	0	0	0
Lavaca	0	0	0	0	0	0	0	0
Colorado-Lavaca	62	684	569	454	530	624	738	877
Lavaca-Guadalupe	0	0	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0	0	0
Total	43,451	35,379	50,427	56,792	66,397	78,104	92,378	109,776

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

Table 2-7.
Mining Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Counties								
Atascosa	664	1,125	1,298	1,370	1,405	1,439	1,472	1,509
Bexar	1,591	2,902	3,582	3,934	4,150	4,363	4,576	4,766
Caldwell	27	12	14	15	16	17	18	18
Calhoun	5	28	32	35	36	37	38	38
Comal	946	2,224	2,678	2,897	3,029	3,159	3,287	3,401
DeWitt	129	58	64	67	68	68	70	71
Dimmit	506	919	1,003	1,034	1,051	1,067	1,082	1,095
Frio	313	139	109	104	102	100	98	96
Goliad	0	13	398	282	205	140	76	46
Gonzales	21	33	28	27	26	25	24	24
Guadalupe	8	270	306	321	330	338	346	353
Hays (Part)	0	129	142	151	157	161	162	163
Karnes	187	119	106	103	102	101	101	100
Kendall	0	6	6	6	6	6	6	6
LaSalle	0	0	0	0	0	0	0	0
Medina	120	118	130	135	137	139	141	143
Refugio	77	6	7	8	8	8	8	8
Uvalde	399	250	313	345	364	383	401	418
Victoria	2,409	3,015	3,944	4,511	4,906	5,308	5,721	6,041
Wilson	281	277	242	234	229	225	221	218
Zavala	116	114	122	125	127	128	129	130
Total	7,799	11,757	14,524	15,704	16,454	17,212	17,977	18,644
River and Coastal Basins Summaries								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	2,212	2,715	3,044	3,193	3,273	3,350	3,424	3,498
San Antonio	1,973	3,232	3,980	4,273	4,450	4,630	4,811	4,982
Guadalupe	3,413	4,966	6,288	6,918	7,336	7,758	8,185	8,537
Lower Colorado	0	13	15	15	16	17	17	17
Lavaca	108	37	40	42	43	42	43	43
Colorado-Lavaca	0	1	1	1	1	1	1	1
Lavaca-Guadalupe	12	769	1,003	1,146	1,244	1,344	1,447	1,527
San Antonio-Nueces	81	24	153	116	91	70	49	39
Total	7,799	11,757	14,524	15,704	16,454	17,212	17,977	18,644

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

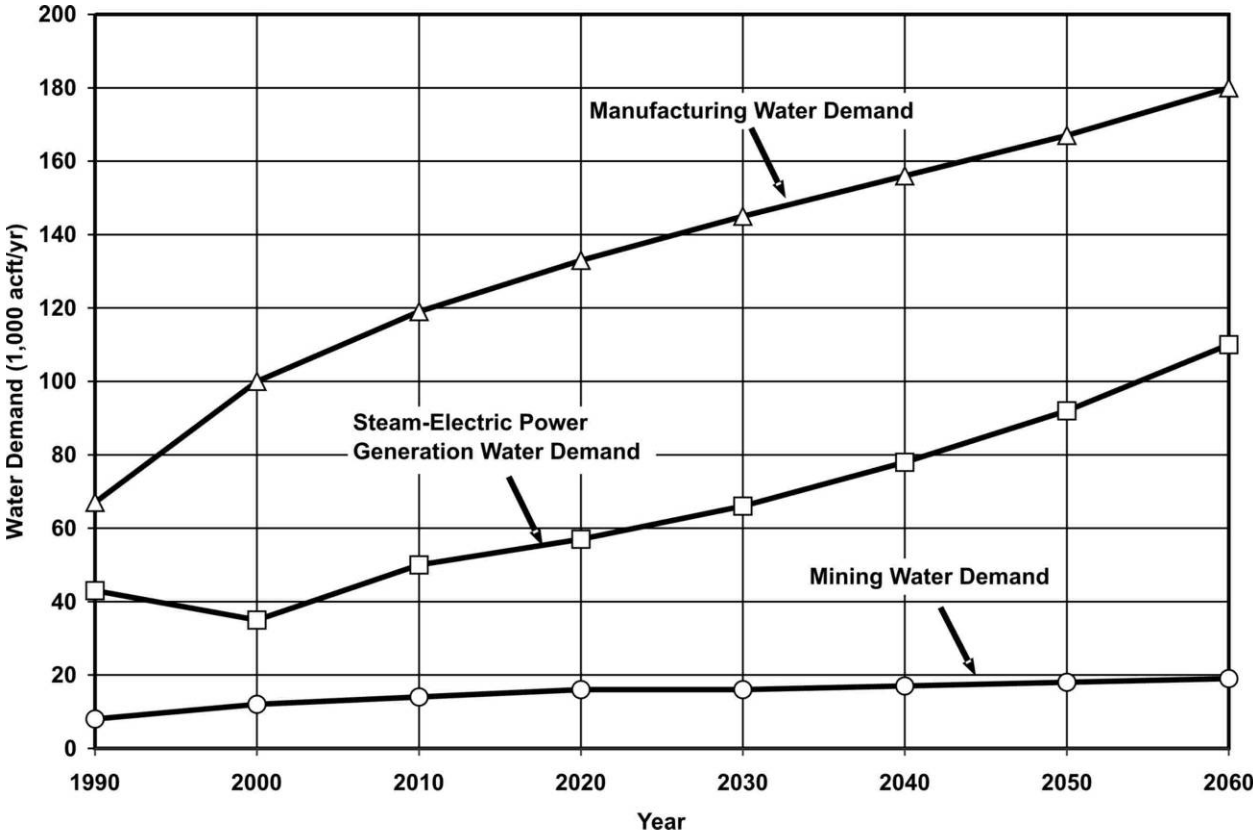

Figure 2-3. Projections of Industrial, Steam-Electric, and Mining Water Demands South Central Texas Region – 1990 to 2060

2.6 Irrigation Water Demand Projections

Irrigated agriculture accounted for almost 60 percent of the total water used in the state in the year 2000. Currently, in Texas, approximately 10 million acft of water is used to grow a variety of crops ranging from food and feed grains to fruits, vegetables, and cotton. Of this 10 million acft of water used for irrigation in Texas, groundwater is approximately 70 percent, and surface is 30 percent. The TWDB irrigation water use data show annual use for irrigation in the South Central Texas Region in 2000 of 383,332 acft/yr, or 3.8 percent of the total irrigation water used in Texas in 2000 (Table 2-8 and Figure 2-4). Projected irrigation water demands in the region in 2060 are 301,679 acft/yr, or 21.3 percent less than in 2000 (Table 2-8 and Figure 2-4). The projected decline is based upon increased irrigation efficiency and reduced profitability of irrigated agriculture.

Table 2-8.
Irrigation Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	Total in 2000 (acft)	Projections					
			2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Counties								
Atascosa	47,208	35,053	40,885	39,509	38,185	36,911	35,686	34,502
Bexar	37,012	15,865	15,273	14,628	14,010	13,417	12,850	12,306
Caldwell	1,375	989	1,044	928	824	733	651	578
Calhoun	35,421	8,077	15,568	13,654	12,096	11,041	10,285	9,581
Comal	479	50	204	186	169	152	135	119
DeWitt	285	102	159	132	108	87	69	54
Dimmit	11,185	6,750	10,611	10,333	10,225	9,813	9,391	8,987
Frio	83,233	117,098	82,017	79,098	76,302	73,627	71,065	68,592
Goliad	685	359	309	268	232	200	173	149
Gonzales	3,540	2,438	1,304	1,124	969	835	720	621
Guadalupe	2,646	875	1,070	955	846	742	710	705
Hays (Part)	298	162	353	350	347	344	341	338
Karnes	2,034	1,916	1,382	1,250	1,131	1,023	925	836
Kendall	380	396	714	699	685	671	658	646
LaSalle	7,292	4,003	4,791	4,643	4,500	4,361	4,227	4,097
Medina	157,380	56,422	54,450	52,179	50,005	47,922	45,927	44,015
Refugio	0	850	69	69	69	69	69	69
Uvalde	140,669	58,061	55,791	53,609	51,513	49,498	47,563	45,703
Victoria	13,699	6,708	9,936	8,576	7,402	6,388	5,514	4,759
Wilson	13,697	20,883	11,296	10,034	8,921	7,940	7,077	6,330
Zavala	110,922	46,275	71,800	68,963	66,238	63,621	61,107	58,692
Total	669,440	383,332	379,026	361,187	344,777	329,395	315,143	301,679
River and Coastal Basins Summaries								
Rio Grande	0	0	0	0	0	0	0	0
Nueces	539,759	319,890	314,279	302,311	291,011	279,881	269,196	258,935
San Antonio	72,216	42,823	34,568	32,437	30,474	28,668	27,010	25,493
Guadalupe	10,320	5,937	6,032	5,371	4,787	4,263	3,859	3,525
Lower Colorado	20	15	15	14	12	11	10	8
Lavaca	0	0	0	0	0	0	0	0
Colorado-Lavaca	0	0	0	0	0	0	0	0
Lavaca-Guadalupe	47,125	13,806	24,054	20,977	18,417	16,497	14,994	13,645
San Antonio-Nueces	0	861	78	77	76	75	74	73
Total	669,440	383,332	379,026	361,187	344,777	329,395	315,143	301,679

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

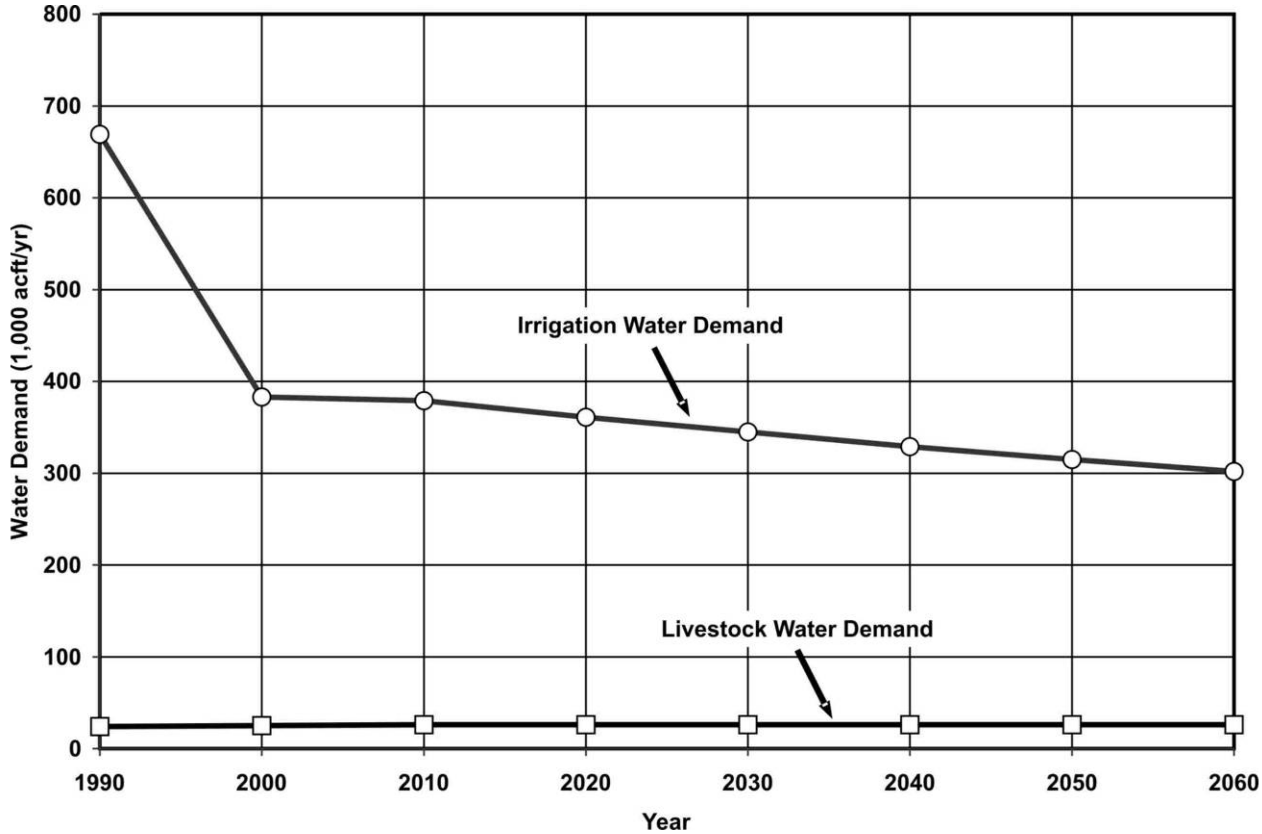

Figure 2-4. Projections of Irrigation and Livestock Water Demands South Central Texas Region – 1990 to 2060

2.7 Livestock Water Demand Projections

In the South Central Texas Region in 2002, livestock production was valued at approximately \$707 million, which was 2.6 times the value of crops produced in the region in 2002. In 2002, there were approximately 1.26 million head of cattle and calves, 64 million chickens, 54,000 head of sheep and lambs, and about 14,575 hogs and pigs. Although livestock production is an important component of the regional economy, the industry consumes a relatively small amount of water. In 2000, water use in the South Central Texas Region for livestock purposes was estimated at 25,660 acft/yr (Table 2-9 and Figure 2-5). The TWDB projections for livestock use in the region estimate that in the year 2010 livestock demand will be 25,954 acft/yr. After the year 2010, it is projected that livestock demand will remain level at 25,954 acft/yr throughout the planning period (Table 2-9 and Figure 2-5).

Table 2-9.
Livestock Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	Total in 2000 (acft)	Projections					
			2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Counties								
Atascosa	1,613	1,745	1,745	1,745	1,745	1,745	1,745	1,745
Bexar	1,376	1,319	1,319	1,319	1,319	1,319	1,319	1,319
Caldwell	816	918	918	918	918	918	918	918
Calhoun	291	342	342	342	342	342	342	342
Comal	316	298	298	298	298	298	298	298
DeWitt	1,840	1,689	1,689	1,689	1,689	1,689	1,689	1,689
Dimmit	987	552	552	552	552	552	552	552
Frio	1,097	1,209	1,209	1,209	1,209	1,209	1,209	1,209
Goliad	884	920	920	920	920	920	920	920
Gonzales	4,108	5,159	5,453	5,453	5,453	5,453	5,453	5,453
Guadalupe	1,031	1,057	1,057	1,057	1,057	1,057	1,057	1,057
Hays (Part)	378	280	280	280	280	280	280	280
Karnes	1,371	1,185	1,185	1,185	1,185	1,185	1,185	1,185
Kendall	389	446	446	446	446	446	446	446
LaSalle	988	1,687	1,687	1,687	1,687	1,687	1,687	1,687
Medina	1,560	1,298	1,298	1,298	1,298	1,298	1,298	1,298
Refugio	563	623	623	623	623	623	623	623
Uvalde	994	1,284	1,284	1,284	1,284	1,284	1,284	1,284
Victoria	1,271	1,085	1,085	1,085	1,085	1,085	1,085	1,085
Wilson	1,813	1,808	1,808	1,808	1,808	1,808	1,808	1,808
Zavala	714	756	756	756	756	756	756	756
Total	24,400	25,660	25,954	25,954	25,954	25,954	25,954	25,954
River and Coastal Basins Summaries								
Rio Grande	192	105	105	105	105	105	105	105
Nueces	7,767	8,450	8,450	8,450	8,450	8,450	8,450	8,450
San Antonio	5,285	5,058	5,058	5,058	5,058	5,058	5,058	5,058
Guadalupe	8,836	9,667	9,914	9,914	9,914	9,914	9,914	9,914
Lower Colorado	147	169	169	169	169	169	169	169
Lavaca	305	310	357	357	357	357	357	357
Colorado-Lavaca	13	17	17	17	17	17	17	17
Lavaca-Guadalupe	898	868	868	868	868	868	868	868
San Antonio-Nueces	957	1,016	1,016	1,016	1,016	1,016	1,016	1,016
Total	24,400	25,660	25,954	25,954	25,954	25,954	25,954	25,954

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

2.8 Total Water Demand Projections

Total water demand projections for the South Central Texas Region are the sum of water demand projections for municipal, manufacturing, steam-electric power generation, mining, irrigation, and livestock water demand projections (Tables 2-4 through 2-9) and are shown in Table 2-10 and Figure 2-5. Total water use in 2000 was 896,353 acft/yr (Table 2-10). Projected total water demand for the region is 1,101,758 acft/yr in 2030 and 1,273,003 acft/yr in 2060 (Table 2-10 and Figure 2-5). Projections of future water demands for municipal, manufacturing, steam-electric power, mining, and livestock increase while projections for irrigation decrease. The reasons for the decline in the projections of demand in future years for irrigation are predictions of increased efficiency in irrigation and economic factors adversely affecting the profitability of irrigation in future years.

Projections of future water demands for the South Central Texas Region show irrigation demand at 31.29 percent of total demand in 2030 and 23.70 percent in 2060 (Table 2-11). Municipal demand, as a percent of total demand, is projected to increase from 37.93 percent in 2000 to 45.69 percent in 2030, and to 50.06 percent in 2060 (Table 2-11), with livestock demand as a percent of total demand decreasing from 2.86 percent in 2000 to 2.36 percent in 2030, and to 2.04 percent in 2060 (Table 2-11). Manufacturing water demand was 11.18 percent of total demand in 2000, and is projected to be 13.14 percent in 2030, and 14.12 percent in 2060 (Table 2-11). Steam-electric power demand increases from 3.95 percent of total demand in 2000 to 6.03 percent in 2030, and 8.62 percent in 2060 (Table 2-11).

Table 2-10.
Total Water Demand Projections
South Central Texas Region
Individual Counties with River Basin Summaries

	Total in 1990 (acft)	***Total in 2000 (acft)***	***Projections***					
			2010 (acft)	***2020 (acft)***	***2030 (acft)***	***2040 (acft)***	***2050 (acft)***	***2060 (acft)***
Counties								
Atascosa	61,191	49,972	56,759	56,280	56,638	57,099	57,882	58,938
Bexar	303,917	288,430	325,540	356,724	388,873	414,957	441,053	468,429
Caldwell	7,149	6,573	8,297	9,777	11,001	12,247	13,540	14,871
Calhoun	64,234	54,233	69,243	72,564	75,795	79,489	82,816	87,247
Comal	15,404	22,910	29,680	36,697	44,408	51,958	59,710	68,389
DeWitt	5,901	5,068	5,160	5,158	5,116	5,051	4,953	4,907
Dimmit	14,889	10,653	14,727	14,611	14,584	14,157	13,677	13,157
Frio	87,726	121,689	86,844	84,164	81,603	79,114	76,713	74,349
Goliad	14,650	11,227	11,791	11,904	13,463	15,337	17,628	20,451
Gonzales	12,366	13,509	13,293	13,636	13,894	14,089	14,168	14,274
Guadalupe	14,973	18,278	32,249	40,864	47,921	55,388	64,299	74,593
Hays (Part)	10,538	11,654	23,596	33,070	39,955	47,016	55,672	63,392
Karnes	6,049	6,053	5,718	5,850	6,008	6,116	6,163	6,167
Kendall	2,901	4,110	5,815	7,521	9,279	10,733	11,998	13,237
LaSalle	9,513	7,315	8,277	8,276	8,245	8,210	8,176	8,134
Medina	164,600	64,510	63,521	62,347	61,178	59,957	58,856	57,793
Refugio	1,867	2,670	1,948	1,987	1,982	1,999	2,012	2,002
Uvalde	147,897	67,741	65,886	64,087	62,286	60,501	58,717	57,042
Victoria	49,843	50,992	60,307	63,622	66,841	70,021	73,165	76,804
Wilson	19,586	27,782	19,754	20,195	20,936	21,771	22,873	24,193
Zavala	115,407	50,983	76,832	74,250	71,752	69,283	66,906	64,634
Total	1,130,601	896,353	985,237	1,043,584	1,101,758	1,154,493	1,210,977	1,273,003
River and Coastal Basins Summaries								
Rio Grande	198	107	107	107	107	107	107	107
Nueces	582,121	367,959	365,442	356,417	348,540	340,474	333,002	326,075
San Antonio	357,708	337,024	371,996	408,186	445,956	477,374	509,275	542,928
Guadalupe	107,464	120,932	159,357	187,720	213,303	239,458	268,529	299,651
Lower Colorado	403	562	717	874	1,014	1,156	1,293	1,433
Lavaca	1,003	867	916	920	915	904	890	883
Colorado-Lavaca	6,635	20,128	23,392	25,644	27,861	30,086	31,917	34,238
Lavaca-Guadalupe	72,694	45,692	60,735	61,131	61,500	62,371	63,407	65,149
San Antonio-Nueces	2,375	3,162	2,574	2,585	2,562	2,564	2,558	2,540
Total	1,130,601	896,353	985,237	1,043,584	1,101,758	1,154,493	1,210,977	1,273,003

Source: Texas Water Development Board (TWDB); Consensus Projections adopted by the TWDB, September 17, 2003.

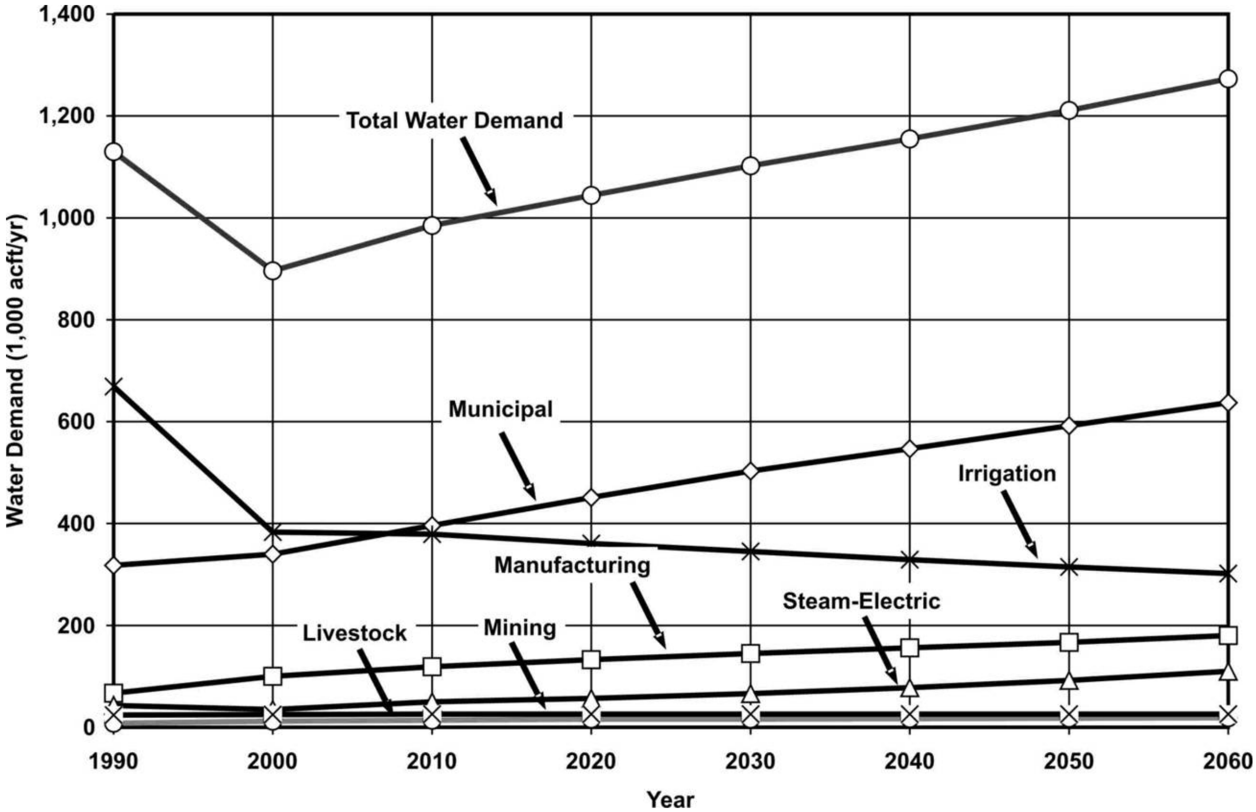

Figure 2-5. Total Water Demand Projections
South Central Texas Region – 1990 to 2060

Table 2-11.
Composition of Total Water Use
South Central Texas Region
1990, 2000, 2030, and 2060

	1990		*2000*		*2030*		*2060*	
Water Use	***acft***	***% Total***	***acft***	***% Total***	***acft***	***% Total***	***acft***	***% Total***
Municipal	318,495	28.17%	340,030	37.93%	503,375	45.69%	637,236	50.06%
Manufacturing	67,016	5.93%	100,195	11.18%	144,801	13.14%	179,715	14.12%
Steam-Electric Power	43,451	3.84%	35,379	3.95%	66,397	6.03%	109,776	8.62%
Mining	7,799	0.69%	11,757	1.31%	16,454	1.49%	18,644	1.46%
Irrigation	669,440	59.21%	383,332	42.77%	344,777	31.29%	301,679	23.70%
Livestock	24,400	2.16%	25,660	2.86%	25,954	2.36%	25,954	2.04%
Total	1,130,601	100.00%	896,353	100.00%	1,101,758	100.00%	1,273,003	100.00%

2.9 Water Demand Projections for Counties and River Basins

For purposes of this regional planning project, and in accordance with TWDB Rules, Section 357.7(a)(2), water demand projections are tabulated by river and coastal basin, county or part of county located within the river or coastal basin, and city and rural areas of each county or part of county for the South Central Texas Region (Table 2-12).[2] An illustration of how to read Table 2-12 is given below; however, the entire table will not be verbalized here. For example, a part of the rural area of Dimmit County is located in the Rio Grande Basin. The projected 2 acft/yr of water demand for the people who live in this rural area is shown as municipal water demand (Table 2-12). There is no industry, steam-electric power, irrigation, or mining demand projected for that part of Dimmit County located in the Rio Grande Basin. However, there is a livestock demand of 105 acft/yr (Table 2-12).

A part of Atascosa County is located in the Nueces River Basin, and a part is located in the San Antonio River Basin. That part located in the Nueces River Basin contains the cities of Charlotte, Jourdanton, Lytle, Pleasanton, and Poteet, with each city having a municipal water system. In addition, the Benton Water Supply Corporation, McCoy Water Supply Corporation, and Bexar Metropolitan Water District have water service areas in the Nueces Basin part of the county. Rural areas of Atascosa County located in the Nueces River Basin have population which supplies their own water via individual household systems. The municipal water use by Charlotte in 1990 was 247 acft/yr, and in 2000 was 282 acft/yr, with projected municipal water demand in 2060 of 350 acft/yr (Table 2-12).

Water use in 1990 by Jourdanton was 670 acft/yr and 740 acft/yr in 2000, with projected 2060 demands of 1,026 acft/yr (Table 2-12). Benton Water Supply Corporation supplied 464 acft/yr in 2000, and has a projected demand in 2060 of 1,617 acft/yr. In 1990, rural areas of Atascosa County located in the Nueces River Basin used 1,633 acft/yr for household purposes (municipal type of water use), used 569 acft/yr in 2000, and are projected to have a 2060 demand of 94 acft/yr (Table 2-12). It is important to note that areas served by Benton Water Supply Corporation, McCoy Water Supply Corporation, and Bexar Metropolitan Water District were included as rural areas in 1990, but have been separated out for 2000 through 2060, thus partly explaining the reduced quantities for 2000 through 2060 for rural areas.

[2] 31 Texas Administrative Code, Chapter 357, Regional Water Planning Guideline Rules, Texas Water Development Board, Austin, Texas, March 11, 1998.

There is no industrial demand in Atascosa County in the Nueces River Basin. However, there was an estimated 6,036 acft/yr of water used for steam-electric power in 1990, and 5,814 acft/yr in 2000, with projected steam-electric power water demand in 2060 of 11,510 acft/yr (Table 2-12). Irrigation water demand in Atascosa County in the Nueces River Basin decreased from 45,792 acft/yr in 1990 to 34,107 acft/yr in 2000, with projected demand in 2060 of 33,570 acft/yr (Table 2-12).

Total water use in Atascosa County in the Nueces River Basin in 1990 was 59,619 acft/yr, in 2000 was 48,892 acft/yr, with projected total water demand for this same area at 57,792 acft/yr in 2060 (Table 2-12).

The reader can see the projections for each county or part of county of each respective river or coastal basin of the region in Table 2-12. Total projections for counties and parts of counties of each river and coastal basin area located in the South Central Texas Region are shown at the end of the listing of individual counties and parts of counties of each river or coastal basin. In addition, the basin totals are listed at the end of Table 2-12. For example, total water use in 1990 in the Nueces River Basin part of the South Central Texas Planning Region was 582,121 acft/yr, of which 24,157 acft/yr was for municipal purposes, 2,152 acft/yr was for industrial purposes, 6,074 acft/yr was for steam-electric power purposes, 539,759 acft/yr was for irrigation, 2,212 acft/yr was for mining, and 7,767 acft/yr was for livestock (Page 2-33). In 2000 in the Nueces River Basin part of the South Central Texas Planning Region, total water use was 367,959 acft/yr, of which 29,599 acft/yr was for municipal purposes, 1,362 acft/yr was for manufacturing (industrial) purposes, 5,943 acft/yr was for steam-electric power purposes, 319,890 acft/yr was for irrigation, 2,715 acft/yr was for mining, and 8,450 acft/yr was for livestock (Page 2-33). Projected water demand for the Nueces River Basin part of the planning region in 2060 is 326,075 acft/yr, with 41,555 acft/yr being for municipal demand, 1,962 acft/yr being for manufacturing, 11,675 acft/yr being for steam-electric power, 258,935 acft/yr being for irrigation, 3,498 acft/yr being for mining, and 8,450 acft/yr being for livestock (Page 2-33).

The reader can see the projections, by type of demand, for the Rio Grande, Nueces, San Antonio, Guadalupe, Lower Colorado, and Lavaca River Basins as well as for the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basin areas of the South Central Planning Region in Table 2-12, Pages 2-44 through 2-46. Total water use in the South Central Texas Region in 1990 was 1,130,601 acft/yr, and in 2000 was 896,353 acft/yr, with projected 2060 water demands of 1,273,003 acft/yr (Page 2-46). The quantity of projected water demands in 2060 are 107 acft/yr for the Rio Grande River Basin, 326,075 acft/yr for the Nueces River Basin, 542,928 acft/yr for the San Antonio River Basin, 299,651 acft/yr for the Guadalupe River Basin, 1,433 acft/yr for the Lower Colorado River Basin, 883 acft/yr for the Lavaca River Basin, 34,238 acft/yr for the Colorado-Lavaca Coastal Basin, 65,149 acft/yr for the Lavaca-Guadalupe Coastal Basin, and 2,540 acft/yr for the San Antonio-Nueces Coastal Basin (Page 2-46).

Table 2-12.
Water Demand Projections
South Central Texas Region
River Basins, Counties, Cities, and Water Supply Districts and Authorities

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Rio Grande Basin (part)								
Dimmit (part) - Rio Grande								
County-Other (Rural)	6	2	2	2	2	2	2	2
Municipal Demand	6	2	2	2	2	2	2	2
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	192	105	105	105	105	105	105	105
Total Demand	198	107	107	107	107	107	107	107
Rio Grande Basin								
Municipal Demand	6	2	2	2	2	2	2	2
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	192	105	105	105	105	105	105	105
Rio Grande Basin Total	**198**	**107**	**107**	**107**	**107**	**107**	**107**	**107**
Nueces Basin (part)								
Atascosa (part) - Nueces								
Charlotte	247	282	296	312	324	332	342	350
Jourdanton	670	740	801	861	914	955	994	1,026
Lytle	410	399	412	423	433	439	448	456
Pleasanton	1,556	1,833	1,906	1,969	2,027	2,063	2,109	2,151
Poteet	1,055	729	735	741	740	740	745	752
Benton City Water Supply Corp.		464	710	963	1,185	1,353	1,506	1,617
McCoy Water Supply Corp.		760	1,065	1,381	1,643	1,851	2,042	2,181
Bexar Met Water District		389	505	621	715	780	843	895
County-Other (Rural)	1,633	569	432	328	242	172	124	94
Municipal Demand	5,571	6,165	6,862	7,599	8,223	8,685	9,153	9,522
Manufacturing Demand	0	6	6	6	6	6	6	6
Steam-Electric Power Demand	6,036	5,814	5,884	5,954	6,962	8,189	9,685	11,510
Irrigation Demand	45,792	34,107	39,782	38,442	37,154	35,914	34,723	33,570
Mining Demand	664	1,125	1,298	1,370	1,405	1,439	1,472	1,509
Livestock Demand	1,556	1,675	1,675	1,675	1,675	1,675	1,675	1,675
Total Demand	59,619	48,892	55,507	55,046	55,425	55,908	56,714	57,792

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Bexar (part) - Nueces								
Lytle	1	3	5	7	8	10	11	12
Atascosa Rural Water Supply Corp.		31	38	44	51	56	60	65
Bexar Met Water District		159	161	163	165	165	167	171
County-Other (Rural)	330	251	258	263	268	270	273	279
Municipal Demand	331	444	462	477	492	501	511	527
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	3,374	1,333	1,283	1,229	1,177	1,127	1,080	1,034
Mining Demand	147	106	131	144	152	160	168	175
Livestock Demand	23	24	24	24	24	24	24	24
Total Demand	3,875	1,907	1,900	1,874	1,845	1,812	1,783	1,760
Dimmit (part) - Nueces								
Asherton	215	274	286	299	306	301	293	279
Big Wells	178	142	149	156	159	157	153	145
Carrizo Springs	1,592	1,742	1,842	1,943	1,996	1,981	1,930	1,836
County-Other (Rural)	217	272	282	292	293	284	274	261
Municipal Demand	2,202	2,430	2,559	2,690	2,754	2,723	2,650	2,521
Manufacturing Demand	3	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	11,185	6,750	10,611	10,333	10,225	9,813	9,391	8,987
Mining Demand	506	919	1,003	1,034	1,051	1,067	1,082	1,095
Livestock Demand	795	447	447	447	447	447	447	447
Total Demand	14,691	10,546	14,620	14,504	14,477	14,050	13,570	13,050
Frio (part) - Nueces								
Dilley	771	1,041	1,229	1,409	1,555	1,683	1,774	1,825
Pearsall	1,602	1,435	1,443	1,448	1,449	1,435	1,442	1,449
Benton City Water Supply Corp.		2	3	4	5	6	6	6
County-Other (Rural)	672	636	727	807	881	937	980	1,007
Municipal Demand	3,045	3,114	3,402	3,668	3,890	4,061	4,202	4,287
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	38	129	107	85	100	117	139	165
Irrigation Demand	83,233	117,098	82,017	79,098	76,302	73,627	71,065	68,592
Mining Demand	313	139	109	104	102	100	98	96
Livestock Demand	1,097	1,209	1,209	1,209	1,209	1,209	1,209	1,209
Total Demand	87,726	121,689	86,844	84,164	81,603	79,114	76,713	74,349
Karnes (part) - Nueces								
El Oso Water Supply Corp.		12	13	13	14	15	15	16
County-Other (Rural)	39	19	24	29	35	39	42	44
Municipal Demand	39	31	37	42	49	54	57	60
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	118	107	107	107	107	107	107	107
Total Demand	157	138	144	149	156	161	164	167

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
LaSalle (part) - Nueces								
Cotulla	795	1,271	1,407	1,516	1,566	1,615	1,677	1,743
Encinal	98	110	110	109	108	106	107	107
County-Other (Rural)	340	244	282	321	384	441	478	500
Municipal Demand	1,233	1,625	1,799	1,946	2,058	2,162	2,262	2,350
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	7,292	4,003	4,791	4,643	4,500	4,361	4,227	4,097
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	988	1,687	1,687	1,687	1,687	1,687	1,687	1,687
Total Demand	9,513	7,315	8,277	8,276	8,245	8,210	8,176	8,134
Medina (part) - Nueces								
Devine	630	830	837	850	856	862	878	896
Hondo	1,456	1,601	1,784	2,001	2,205	2,374	2,548	2,717
Lytle	73	63	62	60	59	58	58	58
Natalia	294	291	330	374	415	450	485	519
East Medina Special Utility Dist.		735	833	944	1,048	1,132	1,221	1,310
Benton City Water Supply Corp.		336	414	504	589	661	737	805
County-Other (Rural)	1,535	1,194	1,489	1,816	2,108	2,367	2,635	2,876
Municipal Demand	3,988	5,050	5,749	6,549	7,280	7,904	8,562	9,181
Manufacturing Demand	286	56	67	75	82	89	95	103
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	133,196	47,000	45,357	43,465	41,654	39,919	38,257	36,665
Mining Demand	67	62	68	71	72	73	74	75
Livestock Demand	1,336	1,116	1,116	1,116	1,116	1,116	1,116	1,116
Total Demand	138,873	53,284	52,357	51,276	50,204	49,101	48,104	47,140
Uvalde (part) - Nueces								
Sabinal	381	412	407	403	398	393	389	389
Uvalde	3,915	6,070	6,087	6,124	6,144	6,148	6,150	6,178
County-Other (Rural)	982	1,286	1,572	1,867	2,110	2,305	2,425	2,532
Municipal Demand	5,278	7,768	8,066	8,394	8,652	8,846	8,964	9,099
Manufacturing Demand	557	378	432	455	473	490	505	538
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	140,669	58,061	55,791	53,609	51,513	49,498	47,563	45,703
Mining Demand	399	250	313	345	364	383	401	418
Livestock Demand	994	1,284	1,284	1,284	1,284	1,284	1,284	1,284
Total Demand	147,897	67,741	65,886	64,087	62,286	60,501	58,717	57,042
Wilson (part) - Nueces								
McCoy Water Supply Corp.		25	41	61	82	102	124	147
County-Other (Rural)	121	31	42	56	72	86	103	120
Municipal Demand	121	56	83	117	154	188	227	267
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	4,096	5,263	2,847	2,529	2,248	2,001	1,783	1,595
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	146	145	145	145	145	145	145	145
Total Demand	4,363	5,464	3,075	2,791	2,547	2,334	2,155	2,007

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	*Use in 1990 (acft)*	*Use in 2000 (acft)*	*Projections 2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
Zavala (part) - Nueces								
Crystal City	1,692	2,175	2,247	2,272	2,343	2,337	2,349	2,370
County-Other (Rural)	657	741	864	1,028	1,134	1,241	1,327	1,371
Municipal Demand	2,349	2,916	3,111	3,300	3,477	3,578	3,676	3,741
Manufacturing Demand	1,306	922	1043	1106	1154	1200	1238	1315
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	110,922	46,275	71,800	68,963	66,238	63,621	61,107	58,692
Mining Demand	116	114	122	125	127	128	129	130
Livestock Demand	714	756	756	756	756	756	756	756
Total Demand	115,407	50,983	76,832	74,250	71,752	69,283	66,906	64,634
Nueces Basin								
Municipal Demand	24,157	29,599	32,130	34,782	37,029	38,702	40,264	41,555
Manufacturing Demand	2,152	1,362	1,548	1,642	1,715	1,785	1,844	1,962
Steam-Electric Power Demand	6,074	5,943	5,991	6,039	7,062	8,306	9,824	11,675
Irrigation Demand	539,759	319,890	314,279	302,311	291,011	279,881	269,196	258,935
Mining Demand	2,212	2,715	3,045	3,193	3,273	3,350	3,424	3,498
Livestock Demand	7,767	8,450	8,450	8,450	8,450	8,450	8,450	8,450
Nueces Basin Total Demand	**582,121**	**367,959**	**365,443**	**356,417**	**348,540**	**340,474**	**333,002**	**326,075**
San Antonio Basin (part)								
Atascosa (part) - San Antonio								
Benton City Water Supply Corp.		40	62	84	103	118	131	141
County-Other (Rural)	99	24	17	13	9	6	4	3
Municipal Demand	99	64	79	97	112	124	135	144
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	1,416	946	1,103	1,067	1,031	997	963	932
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	57	70	70	70	70	70	70	70
Total Demand	1,572	1,080	1,252	1,234	1,213	1,191	1,168	1,146
Bexar (part) - San Antonio								
Alamo Heights	2,210	2,000	2,071	2,134	2,136	2,132	2,146	2,170
Balcones Heights (SAWS)	538	480	514	555	578	600	633	670
China Grove (SAWS)	217	288	376	457	531	591	645	695
Converse	1,213	1,495	1,907	2,331	2,729	3,044	3,311	3,564
Elmendorf (SAWS)	52	99	112	123	132	140	148	156
Fairoaks Ranch	617	889	1,090	1,094	1,097	1,101	1,099	1,104
Helotes (SAWS)	310	845	1,537	2,249	2,820	3,264	3,679	4,047
Kirby	1,080	1,001	1,005	1,004	1,007	1,001	1,013	1,034
Leon Valley	1,715	711	694	678	667	655	650	659
Leon Valley (SAWS)		407	397	388	382	375	372	377
Live Oak	1,221	1,128	1,145	1,157	1,177	1,193	1,232	1,284
Olmos Park (SAWS)	385	381	403	424	441	452	468	484
San Antonio (SAWS)	166,616	166,813	192,007	213,943	234,865	250,671	265,958	281,204
San Antonio (Served by BMWD)		21,419	24,654	27,471	30,157	32,187	34,150	36,107
San Antonio (Served by OTHERS)		247	284	317	348	371	394	416
Schertz	667	167	272	371	456	525	591	649
Selma		252	1,531	1,927	2,309	2,260	2,204	2,155

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Shavano Park	840	802	819	835	847	856	868	880
Somerset (SAWS)		321	405	484	552	609	660	709
St. Hedwig	187	256	310	358	403	436	469	501
Terrell Hills	817	815	863	914	956	983	1,018	1,057
Universal City	2,323	2,329	2,608	2,916	3,175	3,125	3,101	3,101
Castle Hills (Bexar Met WD)	1,311	838	820	807	793	780	771	771
Bexar Met Water District	20,741	8,635	8,736	8,869	8,944	8,945	9,081	9,278
Atascosa Rural Water Supply Corp.		735	903	1,068	1,213	1,335	1,441	1,548
Hill Country Village (BMWD)		842	838	835	831	828	826	826
Hollywood Park (BMWD)	2,174	2,229	2,314	2,389	2,458	2,511	2,565	2,616
Green Valley Special Utility Dist.		247	458	646	818	939	1,068	1,182
Windcrest	1,329	1,212	1,204	1,196	1,187	1,177	1,174	1,182
Water Service Inc (Apex)		435	570	697	809	902	982	1,061
East Central SUD		975	1,325	1,572	1,790	1,974	2,133	2,289
Lackland AFB (CDP)	4,212	3,136	3,104	3,080	3,056	3,032	3,016	3,016
County-Other (SAWS)		5,595	5,661	5,747	5,796	5,796	5,884	6,012
County-Other (Rural)	14,520	1,226	705	559	472	742	985	1,205
Municipal Demand	225,295	229,249	261,643	289,594	315,931	335,532	354,735	374,009
Manufacturing Demand	14,049	21,252	25,951	29,497	32,775	36,068	38,965	42,112
Steam-Electric Power Demand	24,263	17,399	17,309	17,275	20,196	23,757	28,098	33,390
Irrigation Demand	33,638	14,532	13,990	13,399	12,833	12,290	11,770	11,272
Mining Demand	1,444	2,796	3,451	3,790	3,998	4,203	4,408	4,591
Livestock Demand	1,353	1,295	1,295	1,295	1,295	1,295	1,295	1,295
Total Demand	300,042	286,523	323,639	354,850	387,028	413,145	439,271	466,669
Comal (part) - San Antonio								
Fairoaks Ranch	19	58	58	58	58	58	58	59
Schertz	19	7	11	16	23	28	35	42
Bulverde City		501	1,044	1,728	2,507	3,283	4,089	4,954
Bexar Met Water District		214	429	695	984	1,249	1,537	1,860
Garden ridge		185	228	284	347	411	477	549
Selma		6	77	129	193	222	248	274
Water Service Inc (Apex)		236	308	402	509	615	723	845
County-Other (Rural)	1,718	109	118	145	172	209	250	298
Municipal Demand	1,756	1,316	2,273	3,457	4,793	6,075	7,417	8,881
Manufacturing Demand	0	1	1	1	1	2	2	2
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	409	7	30	28	23	22	20	18
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	45	42	42	42	42	42	42	42
Total Demand	2,210	1,366	2,346	3,528	4,859	6,141	7,481	8,943
DeWitt (part) - San Antonio								
County-Other (Rural)	109	67	67	66	65	63	61	60
Municipal Demand	109	67	67	66	65	63	61	60
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	22	8	12	10	8	7	5	5
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	148	135	135	135	135	135	135	135
Total Demand	279	210	214	211	208	205	201	200

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Goliad (part) - San Antonio								
Goliad	412	365	416	480	527	553	577	594
County-Other (Rural)	261	225	225	225	225	225	225	225
Municipal Demand	673	590	641	705	752	778	802	819
Manufacturing Demand	0	0	4	8	12	16	20	24
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	685	298	257	222	193	166	144	124
Mining Demand	0	0	129	91	64	43	21	11
Livestock Demand	345	359	359	359	359	359	359	359
Total Demand	1,703	1,247	1,390	1,385	1,380	1,362	1,346	1,337
Guadalupe (part) - San Antonio								
Cibolo	178	598	866	1,190	1,546	1,898	2,298	2,730
Marion	111	154	164	179	194	209	229	251
Schertz	1,454	2,776	3,797	5,089	6,448	7,822	9,399	11,098
Selma		17	59	86	113	131	152	176
Green Valley Special Utility Dist.		546	691	873	1,084	1,271	1,510	1,768
Springs Hill Water Supply Corp.		323	365	417	475	533	599	674
East Central SUD		102	128	162	200	237	274	316
Water Service Inc (Apex)		25	30	37	45	53	61	71
Santa Clara		92	177	280	395	505	631	766
County-Other (Rural)	1,666	58	50	39	27	17	9	2
Municipal Demand	3,409	4,691	6,327	8,352	10,527	12,676	15,162	17,852
Manufacturing Demand	0	3	4	4	5	5	5	6
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	343	113	137	123	109	96	91	91
Mining Demand	8	14	16	16	17	17	18	18
Livestock Demand	258	264	264	264	264	264	264	264
Total Demand	4,018	5,085	6,748	8,759	10,922	13,058	15,540	18,231
Karnes (part) - San Antonio								
Karnes city	410	418	432	453	474	492	503	512
Kenedy	682	758	763	826	874	912	961	993
Runge	164	195	195	209	219	227	238	247
Falls City		107	113	122	131	138	142	145
El Oso Water Supply Corp.		458	482	514	547	573	590	601
Sunko Water Supply Corp.		46	49	53	57	61	63	64
County-Other (Rural)	820	686	824	933	1,069	1,172	1,214	1,232
Municipal Demand	2,076	2,668	2,858	3,110	3,371	3,575	3,711	3,794
Manufacturing Demand	270	107	118	122	125	128	130	137
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	2,034	1,916	1,382	1,250	1,131	1,023	925	836
Mining Demand	187	105	94	91	90	89	89	88
Livestock Demand	1,088	936	936	936	936	936	936	936
Total Demand	5,655	5,732	5,388	5,509	5,653	5,751	5,791	5,791

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Kendall (part) - San Antonio								
Boerne	785	1,170	1,570	2,188	2,843	3,370	3,831	4,282
Fairoaks Ranch	64	152	286	296	300	305	310	316
Water Service Inc (Apex)		37	43	52	61	69	75	81
County-Other (Rural)	515	748	1,080	1,506	1,939	2,304	2,620	2,930
Municipal Demand	1,364	2,107	2,979	4,042	5,143	6,048	6,836	7,609
Manufacturing Demand	2	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	107	194	189	185	181	177	174
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	70	80	80	80	80	80	80	80
Total Demand	1,436	2,294	3,253	4,311	5,408	6,309	7,093	7,863
Medina (part) - San Antonio								
Castroville	779	621	680	743	802	854	908	961
La Coste	229	190	205	222	239	251	265	281
Yancey Water Supply Corp.		668	832	1,013	1,180	1,328	1,469	1,603
East Medina Special Utility Dist.		42	48	54	60	65	70	75
Bexar Met Water District		15	24	33	41	47	54	60
County-Other (Rural)	258	30	38	46	54	60	67	73
Municipal Demand	1,266	1,566	1,827	2,111	2,376	2,605	2,833	3,053
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	24,184	9,422	9,093	8,714	8,351	8,003	7,670	7,350
Mining Demand	53	56	62	64	65	66	67	68
Livestock Demand	224	182	182	182	182	182	182	182
Total Demand	25,727	11,226	11,164	11,071	10,974	10,856	10,752	10,653
Refugio (part) - San Antonio								
County-Other (Rural)	11	8	7	6	6	5	5	5
Municipal Demand	11	8	7	6	6	5	5	5
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	21	25	25	25	25	25	25	25
Total Demand	32	33	32	31	31	30	30	30
Victoria (part) - San Antonio								
County-Other (Rural)	34	5	5	6	7	7	7	7
Municipal Demand	34	5	5	6	7	7	7	7
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	70	61	61	61	61	61	61	61
Total Demand	104	66	66	67	68	68	68	68

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Wilson (part) - San Antonio								
Floresville	1,044	1,203	1,805	2,011	2,245	2,475	2,726	3,000
LaVernia	218	206	278	367	464	557	658	764
Poth	361	315	348	389	434	480	530	585
Stockdale	273	321	350	386	426	466	510	558
SS Water Supply Corp.		1,072	1,563	2,204	2,886	3,554	4,279	5,030
Oak Hills Water Supply Corp.		479	693	960	1,251	1,536	1,843	2,160
Sunko Water Supply Corp.		465	564	691	826	965	1,107	1,262
East Central SUD		89	104	124	146	169	194	222
El Oso Water Supply Corp.		45	52	62	71	81	91	102
County-Other (Rural)	1,660	542	539	770	1,027	1,269	1,533	1,807
Municipal Demand	3,556	4,737	6,296	7,964	9,776	11,552	13,471	15,490
Manufacturing Demand	2	1	1	1	1	1	1	1
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	9,485	15,474	8,370	7,435	6,610	5,883	5,245	4,691
Mining Demand	281	261	228	221	216	212	208	206
Livestock Demand	1,606	1,609	1,609	1,609	1,609	1,609	1,609	1,609
Total Demand	14,930	22,082	16,504	17,230	18,212	19,257	20,534	21,997
San Antonio Basin								
Municipal Demand	239,648	247,068	285,003	319,510	352,859	379,040	405,175	431,723
Manufacturing Demand	14,323	21,364	26,079	29,633	32,919	36,220	39,123	42,282
Steam-Electric Power Demand	24,263	17,399	17,309	17,275	20,196	23,757	28,098	33,390
Irrigation Demand	72,216	42,823	34,568	32,437	30,474	28,668	27,010	25,493
Mining Demand	1,973	3,232	3,979	4,273	4,450	4,631	4,811	4,981
Livestock Demand	5,285	5,058	5,058	5,058	5,058	5,058	5,058	5,058
San Antonio Basin Total	**357,708**	**337,024**	**371,996**	**408,186**	**445,956**	**477,374**	**509,275**	**542,928**
Guadalupe Basin (part)								
Caldwell (part) - Guadalupe								
Lockhart	1,816	1,795	2,451	3,094	3,629	4,180	4,725	5,285
Luling	1,207	888	1,067	1,210	1,299	1,384	1,486	1,594
Polonia Water supply Corp.		322	466	618	749	884	1,016	1,155
Maxwell Water Supply Corp.		334	503	678	844	996	1,166	1,331
Martindale	101	107	125	134	139	143	150	158
Martindale Water Supply Corp.		93	142	153	158	162	170	179
AQUA Water Supply Corp.		196	267	339	396	458	518	580
Goforth Water Supply corp.		112	184	269	342	417	495	571
County Line Water Supply Corp.		114	204	308	405	501	600	695
Creedmoor-Maha Water Supply Corp.		68	98	127	154	181	207	235
Gonzales County Water Supply Corp.		46	63	79	94	108	122	136
Niederwald		11	26	43	61	78	95	111
Mustang Ridge		9	13	18	21	25	29	33
County-Other (Rural)	1,591	207	214	201	177	154	136	122
Municipal Demand	4,715	4,302	5,823	7,271	8,468	9,671	10,915	12,185
Manufacturing Demand	0	11	15	18	21	24	27	29
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	1,355	974	1,029	914	812	722	641	570
Mining Demand	27	5	5	6	6	6	7	7
Livestock Demand	681	762	762	762	762	762	762	762
Total Demand	6,778	6,054	7,634	8,971	10,069	11,185	12,352	13,553

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Calhoun (part) - Guadalupe								
County-Other (Rural)	3	0	0	0	0	0	0	0
Municipal Demand	3	0	0	0	0	0	0	0
Manufacturing Demand	233	136	160	176	190	204	216	232
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	13	15	16	17	17	18	18
Livestock Demand	0	3	3	3	3	3	3	3
Total Demand	236	152	178	195	210	224	237	253
Comal (part) - Guadalupe								
Garden Ridge	361	273	337	419	513	607	704	811
New Braunfels	6,199	8,073	10,042	12,510	15,390	18,241	21,168	24,416
Canyon Lake Water supply Corp.		1,495	2,928	4,769	6,838	8,898	11,034	13,331
Green Valley Special Utility Dist.		173	235	314	409	493	591	696
Crystal Clear Water Supply Corp.		174	240	325	426	516	619	731
Schertz		44	71	107	146	185	226	270
Bexar Met Water District		16	33	53	75	95	117	141
Bulverde City		4	9	14	21	27	34	41
County-Other (Rural)	2,099	2,487	2,603	2,785	2,987	3,167	3,408	3,700
Municipal Demand	8,659	12,739	16,498	21,296	26,805	32,229	37,901	44,137
Manufacturing Demand	3,248	6,282	7,728	8,562	9,313	10,043	10,670	11,551
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	70	43	174	158	146	130	115	101
Mining Demand	946	2,224	2,678	2,897	3,029	3,159	3,287	3,401
Livestock Demand	271	256	256	256	256	256	256	256
Total Demand	13,194	21,544	27,334	33,169	39,549	45,817	52,229	59,446
DeWitt (part) - Guadalupe								
Cuero	1,716	1,244	1,249	1,257	1,250	1,232	1,198	1,177
Yorktown	405	343	343	344	340	334	323	318
Gonzales County Water Supply Corp.		106	107	108	108	108	106	104
County-Other (Rural)	762	807	801	797	783	762	734	721
Municipal Demand	2,883	2,500	2,500	2,506	2,481	2,436	2,361	2,320
Manufacturing Demand	91	147	176	190	202	215	225	242
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	263	94	147	122	100	80	64	49
Mining Demand	21	9	10	10	10	10	10	11
Livestock Demand	1,378	1,267	1,267	1,267	1,267	1,267	1,267	1,267
Total Demand	4,636	4,017	4,100	4,095	4,060	4,008	3,927	3,889
Goliad (part) - Guadalupe								
County-Other (Rural)	184	256	313	396	447	478	505	526
Municipal Demand	184	256	313	396	447	478	505	526
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	12,165	9,027	9,136	9,245	10,808	12,714	15,038	17,870
Irrigation Demand	0	50	43	38	32	28	24	21
Mining Demand	0	9	137	98	73	51	30	20
Livestock Demand	195	202	202	202	202	202	202	202
Total Demand	12,544	9,544	9,831	9,979	11,562	13,473	15,799	18,639

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Gonzales (part) - Guadalupe								
Gonzales	1,646	1,460	1,545	1,644	1,710	1,756	1,765	1,759
Nixon	373	414	438	460	479	488	490	488
Waelder	169	133	154	175	190	202	204	203
Gonzales County Water Supply Corp.		1,364	1,578	1,805	1,982	2,102	2,133	2,120
County-Other (Rural)	1,636	447	384	313	257	212	197	199
Municipal Demand	3,824	3,818	4,099	4,397	4,618	4,760	4,789	4,769
Manufacturing Demand	865	2,051	2,400	2,628	2,822	3,011	3,177	3,402
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	3,540	2,438	1,304	1,124	969	835	720	621
Mining Demand	21	30	25	24	23	23	22	22
Livestock Demand	4,072	5,107	5,354	5,354	5,354	5,354	5,354	5,354
Total Demand	12,322	13,444	13,182	13,527	13,786	13,983	14,062	14,168
Guadalupe (part) - Guadalupe								
New Braunfels	55	266	467	703	960	1,216	1,499	1,810
Seguin	3,604	4,463	5,018	5,718	6,454	7,203	8,069	9,047
Green Valley Special Utility Dist.		1,337	1,691	2,136	2,651	3,109	3,695	4,326
Springs Hill Water Supply Corp.		1,753	1,984	2,262	2,581	2,891	3,250	3,656
Crystal Clear Water Supply Corp.		1,017	1,316	1,688	2,112	2,498	2,977	3,493
Martindale Water Supply Corp.		26	47	64	84	111	128	150
Santa Clara		23	43	69	97	124	155	188
County-Other (Rural)	2,559	274	220	175	129	79	45	11
Municipal Demand	6,218	9,159	10,786	12,815	15,068	17,231	19,818	22,681
Manufacturing Demand	1,661	2,094	2,634	2,953	3,244	3,525	3,766	4,091
Steam-Electric Power Demand	0	129	10,065	14,407	16,844	19,814	23,435	27,848
Irrigation Demand	2,303	762	933	832	737	646	619	614
Mining Demand	0	256	290	305	313	321	328	335
Livestock Demand	773	793	793	793	793	793	793	793
Total Demand	10,955	13,193	25,501	32,105	36,999	42,330	48,759	56,362
Hays (part) - Guadalupe								
Kyle	326	702	2,740	3,940	4,217	4,377	4,874	5,203
San Marcos	6,321	5,914	8,038	11,198	14,371	17,824	21,559	24,439
Wimberley WS Corp.	732	578	776	997	1,224	1,442	1,736	1,966
Woodcreek	182	188	246	315	385	452	540	610
Wood Creek Utilities Inc.		400	748	1,145	1,564	1,974	2,477	2,873
Goforth WS Corp.		666	972	1,340	1,704	2,075	2,545	2,914
Crystal Clear WS Corp.		349	485	639	806	959	1,165	1,327
Plum Creek Water Co		392	566	762	963	1,168	1,427	1,630
County Line WS Corp.		252	947	1,999	2,319	2,393	2,612	2,982
Maxwell WS Corp.		117	157	200	249	294	354	402
Niederwald		65	104	147	194	238	294	338
Mountain City		22	45	71	98	124	157	183
Creedmoor-Maha WSC		8	10	12	15	17	20	23
County-Other (Rural)	2,244	1,273	1,444	1,644	1,855	2,077	2,361	2,584
Municipal Demand	9,805	10,926	17,278	24,409	29,964	35,414	42,121	47,474
Manufacturing Demand	57	157	212	249	285	322	355	386
Steam-Electric Power Demand	0	0	5,331	7,631	8,922	10,495	12,413	14,751
Irrigation Demand	298	162	353	350	347	344	341	338
Mining Demand	0	129	142	151	157	161	162	163
Livestock Demand	378	280	280	280	280	280	280	280
Total Demand	10,538	11,654	23,596	33,070	39,955	47,016	55,672	63,392

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Karnes (part) - Guadalupe								
El Oso Water Supply Corp.		5	5	5	6	6	6	6
County-Other (Rural)	14	13	16	20	24	27	30	31
Municipal Demand	14	18	21	25	30	33	36	37
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	8	7	7	7	7	7	7
Livestock Demand	94	83	83	83	83	83	83	83
Total Demand	108	109	111	115	120	123	126	127
Kendall (part) - Guadalupe								
County-Other (Rural)	746	1,131	1,635	2,279	2,936	3,487	3,966	4,434
Municipal Demand	746	1,131	1,635	2,279	2,936	3,487	3,966	4,434
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	380	289	520	510	500	490	481	472
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	307	353	353	353	353	353	353	353
Total Demand	1,433	1,773	2,508	3,142	3,789	4,330	4,800	5,259
Victoria (part) - Guadalupe								
Victoria	7,269	7,573	8,013	8,505	8,860	9,092	9,361	9,650
County-Other (Rural)	1,220	1,365	1,520	1,686	1,821	1,912	1,998	2,095
Municipal Demand	8,489	8,938	9,533	10,191	10,681	11,004	11,359	11,745
Manufacturing Demand	20,032	24,323	28,726	32,095	35,035	37,962	40,578	43,520
Steam-Electric Power Demand	887	2,197	2,026	1,741	2,035	2,394	2,832	3,365
Irrigation Demand	1,995	979	1,450	1,253	1,081	932	805	695
Mining Demand	2,398	2,267	2,965	3,391	3,688	3,990	4,301	4,541
Livestock Demand	626	507	507	507	507	507	507	507
Total Demand	34,427	39,211	45,207	49,178	53,027	56,789	60,382	64,373
Wilson (part) - Guadalupe								
County-Other (Rural)	68	20	28	37	47	57	68	79
Municipal Demand	68	20	28	37	47	57	68	79
Manufacturing Demand	48	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	116	146	79	70	63	56	49	44
Mining Demand	0	16	14	13	13	13	13	12
Livestock Demand	61	54	54	54	54	54	54	54
Total Demand	293	236	175	174	177	180	184	189
Guadalupe Basin								
Municipal Demand	45,608	53,808	68,514	85,622	101,545	116,800	133,839	150,388
Manufacturing Demand	26,235	35,201	42,051	46,871	51,112	55,306	59,014	63,453
Steam-Electric Power Demand	13,052	11,353	26,558	33,024	38,609	45,417	53,718	63,834
Irrigation Demand	10,320	5,937	6,032	5,371	4,787	4,263	3,859	3,525
Mining Demand	3,413	4,964	6,289	6,918	7,336	7,758	8,184	8,536
Livestock Demand	8,836	9,667	9,914	9,914	9,914	9,914	9,914	9,914
Guadalupe Basin Total	**107,464**	**120,930**	**159,357**	**187,720**	**213,303**	**239,458**	**268,529**	**299,651**

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lower Colorado Basin (part)								
Caldwell (part) - Lower Colorado								
Polonia Water supply Corp.		140	202	268	325	384	441	501
Creedmoor-Maha Water Supply Corp.		94	136	177	213	250	287	325
Mustang Ridge		84	122	160	194	228	262	296
County-Other (Rural)	216	23	23	22	22	22	21	21
Municipal Demand	216	341	483	627	754	884	1,011	1,143
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	20	15	15	14	12	11	10	8
Mining Demand	0	7	9	9	10	11	11	11
Livestock Demand	135	156	156	156	156	156	156	156
Total Demand	371	519	663	806	932	1,062	1,188	1,318
Kendall (part) - Lower Colorado								
County-Other (Rural)	20	24	35	49	63	75	86	96
Municipal Demand	20	24	35	49	63	75	86	96
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	6	6	6	6	6	6	6
Livestock Demand	12	13	13	13	13	13	13	13
Total Demand	32	43	54	68	82	94	105	115
Lower Colorado Basin								
Municipal Demand	236	365	518	676	817	959	1,097	1,239
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	20	15	15	14	12	11	10	8
Mining Demand	0	13	15	15	16	17	17	17
Livestock Demand	147	169	169	169	169	169	169	169
Lower Colorado Basin Total	**403**	**562**	**717**	**874**	**1,014**	**1,156**	**1,293**	**1,433**
Lavaca Basin (part)								
DeWitt (part) - Lavaca								
Yoakum	425	352	352	354	351	345	334	328
County-Other (Rural)	136	146	145	145	142	138	133	131
Municipal Demand	561	498	497	499	493	483	467	459
Manufacturing Demand	0	7	8	9	10	10	11	12
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	108	34	37	39	40	40	41	41
Livestock Demand	263	253	253	253	253	253	253	253
Total Demand	932	792	795	800	796	786	772	765
Gonzales (part) - Lavaca								
County-Other (Rural)	8	10	9	7	6	5	5	5
Municipal Demand	8	10	9	7	6	5	5	5
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	3	3	3	3	2	2	2
Livestock Demand	36	52	99	99	99	99	99	99
Total Demand	44	65	111	109	108	106	106	106

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Victoria (part) - Lavaca								
County-Other (Rural)	21	5	5	6	6	7	7	7
Municipal Demand	21	5	5	6	6	7	7	7
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	6	5	5	5	5	5	5	5
Total Demand	27	10	10	11	11	12	12	12
Lavaca Basin								
Municipal Demand	590	513	511	512	505	495	479	471
Manufacturing Demand	0	7	8	9	10	10	11	12
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	108	37	40	41	42	43	43	44
Livestock Demand	305	310	357	357	357	357	357	357
Lavaca Basin Total	**1,003**	**867**	**916**	**919**	**914**	**905**	**890**	**884**
Colorado-Lavaca Coastal Basin (part)								
Calhoun (part)-Colorado-Lavaca CB[2]								
Point Comfort	137	140	224	323	500	677	667	667
County-Other (Rural)	80	111	65	39	23	14	8	5
Municipal Demand	217	251	289	362	523	691	675	672
Manufacturing Demand	6,343	19,175	22,516	24,810	26,790	28,753	30,486	32,671
Steam-Electric Power Demand	62	684	569	454	530	624	738	877
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	1	1	1	1	1	1	1
Livestock Demand	13	17	17	17	17	17	17	17
Total Demand	6,635	20,128	23,392	25,644	27,861	30,086	31,917	34,238
Colorado Lavaca Coastal Basin								
Municipal Demand	217	251	289	362	523	691	675	672
Manufacturing Demand	6,343	19,175	22,516	24,810	26,790	28,753	30,486	32,671
Steam-Electric Power Demand	62	684	569	454	530	624	738	877
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	1	1	1	1	1	1	1
Livestock Demand	13	17	17	17	17	17	17	17
Colorado Lavaca CB Total	**6,635**	**20,128**	**23,392**	**25,644**	**27,861**	**30,086**	**31,917**	**34,238**
Lavaca-Guadalupe Coastal Basin (part)								
Calhoun (part)-Lavaca-Guadalupe CB								
Port Lavaca	1,507	1,658	1,769	1,877	1,981	2,079	2,209	2,345
Seadrift	169	247	252	255	257	256	257	258
Calhoun county WSC		356	436	516	572	609	618	632
County-Other (Rural)	2,016	186	198	210	222	234	248	264
Municipal Demand	3,692	2,447	2,655	2,858	3,032	3,178	3,332	3,499
Manufacturing Demand	17,963	23,086	27,108	29,871	32,255	34,618	36,704	39,335
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	35,421	8,077	15,568	13,654	12,096	11,041	10,285	9,581
Mining Demand	1	6	7	8	8	8	8	8
Livestock Demand	278	322	322	322	322	322	322	322
Total Demand	57,355	33,938	45,660	46,713	47,713	49,167	50,651	52,745

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Table 2-12 Continued

Basin/County/City/Rural	*Use in 1990 (acft)*	*Use in 2000 (acft)*	*Projections 2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
DeWitt (part)-Lavaca-Guadalupe CB								
County-Other (Rural)	3	0	0	0	0	0	0	0
Municipal Demand	3	0	0	0	0	0	0	0
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	15	17	18	18	18	19	19
Livestock Demand	51	34	34	34	34	34	34	34
Total Demand	54	49	51	52	52	52	53	53
Victoria (part)-Lavaca-Guadalupe CB								
Victoria	1,883	3,696	3,911	4,151	4,324	4,438	4,569	4,710
County-Other (Rural)	1,118	1,020	1,136	1,260	1,360	1,428	1,493	1,565
Municipal Demand	3,001	4,716	5,047	5,411	5,684	5,866	6,062	6,275
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	11,704	5,729	8,486	7,323	6,321	5,456	4,709	4,064
Mining Demand	11	748	979	1,120	1,218	1,318	1,420	1,500
Livestock Demand	569	512	512	512	512	512	512	512
Total Demand	15,285	11,705	15,024	14,366	13,735	13,152	12,703	12,351
Lavaca-Guadalupe Coastal Basin								
Municipal Demand	6,696	7,163	7,702	8,269	8,716	9,044	9,394	9,774
Manufacturing Demand	17,963	23,086	27,108	29,871	32,255	34,618	36,704	39,335
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	47,125	13,806	24,054	20,977	18,417	16,497	14,994	13,645
Mining Demand	12	770	1,003	1,145	1,244	1,344	1,447	1,527
Livestock Demand	898	868	868	868	868	868	868	868
Lavaca-Guadalupe CB Total	**72,694**	**45,693**	**60,735**	**61,130**	**61,500**	**62,371**	**63,407**	**65,149**
San Antonio-Nueces Coastal Basin (part)								
Calhoun (part)-San Antonio-Nueces CB								
County-Other (Rural)	4	7	4	2	1	1	0	0
Municipal Demand	4	7	4	2	1	1	0	0
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	4	8	9	10	10	11	11	11
Livestock Demand	0	0	0	0	0	0	0	0
Total Demand	8	15	13	12	11	12	11	11
Goliad (part)-San Antonio-Nueces CB								
County-Other (Rural)	59	62	70	80	87	91	94	97
Municipal Demand	59	62	70	80	87	91	94	97
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	11	9	8	7	6	5	4
Mining Demand	0	4	132	93	68	46	25	15
Livestock Demand	344	359	359	359	359	359	359	359
Total Demand	403	436	570	540	521	502	483	475

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	*Use in 1990 (acft)*	*Use in 2000 (acft)*	*2010 (acft)*	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
Karnes (part)-San Antonio-Nueces CB								
El Oso Water Supply Corp.		2	3	3	3	3	3	3
County-Other (Rural)	58	7	8	10	12	14	15	15
Municipal Demand	58	9	11	13	15	17	18	18
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	6	5	5	5	5	5	5
Livestock Demand	71	59	59	59	59	59	59	59
Total Demand	129	74	75	77	79	81	82	82
Refugio (part)-San Antonio-Nueces CB								
Refugio	569	557	645	709	723	763	787	777
Woodsboro	309	272	283	291	289	292	295	293
County-Other (Rural)	338	354	314	281	264	239	225	227
Municipal Demand	1,216	1,183	1,242	1,281	1,276	1,294	1,307	1,297
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	850	69	69	69	69	69	69
Mining Demand	77	6	7	8	8	8	8	8
Livestock Demand	542	598	598	598	598	598	598	598
Total Demand	1,835	2,637	1,916	1,956	1,951	1,969	1,982	1,972
San Antonio-Nueces Coastal Basin								
Municipal Demand	1,337	1,261	1,327	1,376	1,379	1,403	1,419	1,412
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	861	78	77	76	75	74	73
Mining Demand	81	24	154	116	91	69	49	39
Livestock Demand	957	1,016	1,016	1,016	1,016	1,016	1,016	1,016
San Antonio-Nueces CB Total	**2,375**	**3,162**	**2,575**	**2,585**	**2,562**	**2,563**	**2,558**	**2,540**
South Central Texas Region River and Coastal Basins Summary								
Rio Grande Basin								
Municipal Demand	6	2	2	2	2	2	2	2
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	0	0	0	0	0	0	0
Livestock Demand	192	105	105	105	105	105	105	105
Rio Grande Basin Total	**198**	**107**	**107**	**107**	**107**	**107**	**107**	**107**
Nueces Basin								
Municipal Demand	24,157	29,599	32,130	34,782	37,029	38,702	40,264	41,555
Manufacturing Demand	2,152	1,362	1,548	1,642	1,715	1,785	1,844	1,962
Steam-Electric Power Demand	6,074	5,943	5,991	6,039	7,062	8,306	9,824	11,675
Irrigation Demand	539,759	319,890	314,279	302,311	291,011	279,881	269,196	258,935
Mining Demand	2,212	2,715	3,045	3,193	3,273	3,350	3,424	3,498
Livestock Demand	7,767	8,450	8,450	8,450	8,450	8,450	8,450	8,450
Nueces Basin Total Demand	**582,121**	**367,959**	**365,443**	**356,417**	**348,540**	**340,474**	**333,002**	**326,075**

Continued on next page

Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio Basin								
Municipal Demand	239,648	247,068	285,003	319,510	352,859	379,040	405,175	431,723
Manufacturing Demand	14,323	21,364	26,079	29,633	32,919	36,220	39,123	42,282
Steam-Electric Power Demand	24,263	17,399	17,309	17,275	20,196	23,757	28,098	33,390
Irrigation Demand	72,216	42,823	34,568	32,437	30,474	28,668	27,010	25,493
Mining Demand	1,973	3,232	3,979	4,273	4,450	4,631	4,811	4,981
Livestock Demand	5,285	5,058	5,058	5,058	5,058	5,058	5,058	5,058
San Antonio Basin Total	**357,708**	**337,024**	**371,996**	**408,186**	**445,956**	**477,374**	**509,275**	**542,928**
Guadalupe Basin								
Municipal Demand	45,608	53,808	68,514	85,622	101,545	116,800	133,839	150,388
Manufacturing Demand	26,235	35,201	42,051	46,871	51,112	55,306	59,014	63,453
Steam-Electric Power Demand	13,052	11,353	26,558	33,024	38,609	45,417	53,718	63,834
Irrigation Demand	10,320	5,937	6,032	5,371	4,787	4,263	3,859	3,525
Mining Demand	3,413	4,964	6,289	6,918	7,336	7,758	8,184	8,536
Livestock Demand	8,836	9,667	9,914	9,914	9,914	9,914	9,914	9,914
Guadalupe Basin Total	**107,464**	**120,930**	**159,357**	**187,720**	**213,303**	**239,458**	**268,529**	**299,651**
Lower Colorado Basin								
Municipal Demand	236	365	518	676	817	959	1,097	1,239
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	20	15	15	14	12	11	10	8
Mining Demand	0	13	15	15	16	17	17	17
Livestock Demand	147	169	169	169	169	169	169	169
Lower Colorado Basin Total	**403**	**562**	**717**	**874**	**1,014**	**1,156**	**1,293**	**1,433**
Lavaca Basin								
Municipal Demand	590	513	511	512	505	495	479	471
Manufacturing Demand	0	7	8	9	10	10	11	12
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	108	37	40	41	42	43	43	44
Livestock Demand	305	310	357	357	357	357	357	357
Lavaca Basin Total	**1,003**	**867**	**916**	**919**	**914**	**905**	**890**	**884**
Colorado Lavaca Coastal Basin								
Municipal Demand	217	251	289	362	523	691	675	672
Manufacturing Demand	6,343	19,175	22,516	24,810	26,790	28,753	30,486	32,671
Steam-Electric Power Demand	62	684	569	454	530	624	738	877
Irrigation Demand	0	0	0	0	0	0	0	0
Mining Demand	0	1	1	1	1	1	1	1
Livestock Demand	13	17	17	17	17	17	17	17
Colorado Lavaca CB Total	**6,635**	**20,128**	**23,392**	**25,644**	**27,861**	**30,086**	**31,917**	**34,238**

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Table 2-12 Continued

Basin/County/City/Rural	Use in 1990 (acft)	Use in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lavaca-Guadalupe Coastal Basin								
Municipal Demand	6,696	7,163	7,702	8,269	8,716	9,044	9,394	9,774
Manufacturing Demand	17,963	23,086	27,108	29,871	32,255	34,618	36,704	39,335
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	47,125	13,806	24,054	20,977	18,417	16,497	14,994	13,645
Mining Demand	12	770	1,003	1,145	1,244	1,344	1,447	1,527
Livestock Demand	898	868	868	868	868	868	868	868
Lavaca-Guadalupe CB Total	**72,694**	**45,693**	**60,735**	**61,130**	**61,500**	**62,371**	**63,407**	**65,149**
San Antonio-Nueces Coastal Basin								
Municipal Demand	1,337	1,261	1,327	1,376	1,379	1,403	1,419	1,412
Manufacturing Demand	0	0	0	0	0	0	0	0
Steam-Electric Power Demand	0	0	0	0	0	0	0	0
Irrigation Demand	0	861	78	77	76	75	74	73
Mining Demand	81	24	154	116	91	69	49	39
Livestock Demand	957	1,016	1,016	1,016	1,016	1,016	1,016	1,016
San Antonio-Nueces CB Total	**2,375**	**3,162**	**2,575**	**2,585**	**2,562**	**2,563**	**2,558**	**2,540**
South Central Texas Region								
Municipal Demand	318,495	340,030	395,995	451,111	503,375	547,136	592,344	637,236
Manufacturing Demand	67,016	100,195	119,310	132,836	144,801	156,692	167,182	179,715
Steam-Electric Power Demand	43,451	35,379	50,427	56,792	66,397	78,104	92,378	109,776
Irrigation Demand	669,440	383,332	379,026	361,187	344,777	329,395	315,143	301,679
Mining Demand	7,799	11,757	14,525	15,703	16,454	17,213	17,976	18,644
Livestock Demand	24,400	25,660	25,954	25,954	25,954	25,954	25,954	25,954
Region Total	**1,130,601**	**896,353**	**985,237**	**1,043,584**	**1,101,758**	**1,154,493**	**1,210,977**	**1,273,003**
River and Coastal Basin Totals								
Rio Grande Basin (part)	198	107	107	107	107	107	107	107
Nueces basin (part)	582,121	367,959	365,443	356,417	348,540	340,474	333,002	326,075
San Antonio Basin (part)	357,708	337,024	371,996	408,186	445,956	477,374	509,275	542,928
Guadalupe Basin (part)	107,464	120,930	159,357	187,720	213,303	239,458	268,529	299,651
Lower Colorado Basin (part)	403	562	717	874	1,014	1,156	1,293	1,433
Lavaca Basin (part)	1,003	867	916	919	914	905	890	884
Colorado-Lavaca Coastal Basin (part)	6,635	20,128	23,392	25,644	27,861	30,086	31,917	34,238
Lavaca-Guadalupe Coastal Basin (part)	72,694	45,693	60,735	61,130	61,500	62,371	63,407	65,149
San Antonio-Nueces Coastal Basin(part)	2,375	3,162	2,575	2,585	2,562	2,563	2,558	2,540
Region Total	**1,130,601**	**896,353**	**985,237**	**1,043,584**	**1,101,758**	**1,154,493**	**1,210,977**	**1,273,003**

* Data for Water Supply Corporations and Districts were included in County Other in the 2001 Plan.
[2] CB means Coastal Basin.

2.10 Water Demand Projections for Wholesale Water Providers

The TWDB defines a Wholesale Water Provider (WWP) as any person or entity, including river authorities and irrigation districts, that has contracts to sell more than 1,000 acft of water wholesale in any one year during the five years immediately preceding the adoption of the last Regional Water Plan. Under this definition, the list of WWPs for the South Central Texas Region is as follows:

- Regional Water Provider for Bexar County (RWPBC);
- San Antonio Water System (SAWS);
- Bexar Metropolitan Water District (BMWD);
- Guadalupe-Blanco River Authority (GBRA);
- Canyon Region Water Authority (CRWA);
- Schertz-Sequin Local Government Corporation (SSLGC); and
- Springs Hill WSC (SHWSC)

2.10.1 Regional Water Provider for Bexar County

In view of the large number of municipal WUGs located in Bexar County that are projected to need additional water supply in future years, and in view of the possibility that the most economical way to meet these needs is on a regional, rather than provider-by-provider, basis, the concept of a WWP identified as the Regional Water Provider for Bexar County (RWPBC) is used. Designation of a regional RWPBC recognizes that water management strategies may be developed by individual sponsors and/or coalitions of cooperating sponsors (Section 1.6.1).

There are four WUGs listed as potential customers of the RWPBC at this time. Projected demands in 2020 are 5,000 acft/yr, in 2040 are 6,500 acft/yr, and in 2060 are 6,500 acft/yr (Table 2-13).

Table 2-13.
Regional Water Provider for Bexar County Water Demand Projections

	Year						
Water Purchaser	***2000 (acft)***	***2010 (acft)***	***2020 (acft)***	***2030 (acft)***	***2040 (acft)***	***2050 (acft)***	***2060 (acft)***
Bexar Metropolitan Water District (BMWD)			4,000	4,000	4,000	4,000	4,000
Selma			1,000	1,000	1,000	1,000	1,000
County-Other (Bexar)				200	200	200	200
Mining (Bexar)	–	–		1,300	1,300	1,300	1,300
Total Demand	**0**	**0**	**5,000**	**6,500**	**6,500**	**6,500**	**6,500**

2.10.2 San Antonio Water System

The San Antonio Water System (SAWS) provides wholesale water supplies to three utility systems, retail water supplies to six suburban municipalities, retail water supplies for most, but not all, of the City of San Antonio, a portion of County-Other in Bexar County, and a portion of the industrial supplies in Bexar County. SAWS is the sole water provider for the Cities of Elmendorf, Balcones Heights, China Grove, Helotes, Olmos Park, Terrell Hills, and Palm Park Water Co., and provides part of the water supply for East Central SUD, Leon Valley, and San Antonio.

As noted in the preceding paragraph, several of SAWS' customers also obtain water from other WWPs or supply a portion of their own water. East Central SUD is a customer of BMWD and CRWA, although historically East Central SUD has not obtained water from BMWD. Leon Valley obtains water from SAWS and also supplies a portion of their own water (Table 2-14). The total amount of water needed by SAWS to meet its customers' projected demands in 2030 is 264,501 acft/yr and in 2060 is 324,702 acft/yr (Table 2-14).

Table 2-14.
San Antonio Water System Water Demand Projections

	Year						
Water Purchaser	***2000 (acft)***	***2010 (acft)***	***2020 (acft)***	***2030 (acft)***	***2040 (acft)***	***2050 (acft)***	***2060 (acft)***
Balcones Heights	480	514	555	578	600	633	670
China Grove	288	376	457	531	591	645	695
Elmendorf	99	112	123	132	140	148	156
Helotes	845	1,537	2,249	2,820	3,264	3,679	4,047
Leon Valley	407	397	388	382	375	372	377
Olmos Park	381	403	424	441	452	468	484
San Antonio	166,813	192,007	213,943	234,865	250,671	265,958	281,204
Terrell Hills	815	863	914	956	983	1,018	1,057
East Central SUD[1]	2,240	0	0	0	0	0	0
East Central SUD (Palm Park)[2]	1,120	1,120	1,120	0	0	0	0
Rural	5,595	5,661	5,747	5,796	5,796	5,884	6,012
Industrial (Bexar County)	7,723	12,000	16,000	18,000	22,000	30,000	30,000
Total Demand	**186,806**	**214,991**	**241,920**	**264,501**	**284,872**	**308,805**	**324,702**

[1] Contract expires in 2008.
[2] Contract expires in 2028.

2.10.3 Bexar Metropolitan Water District

The Bexar Metropolitan Water District (BMWD) supplies retail water within the District's service area, as well has providing water to, or having connections with Castle Hills, Hill Country Village, Hollywood Park, San Antonio, Somerset, East Central SUD, Converse, and Live Oak. The total amount of water needed by BMWD to meet its customers' projected demands in 2030 is 49,615 acft/yr and in 2060 is 57,334 acft/yr (Table 2-15).

Table 2-15.
Bexar Metropolitan Water District Water Demand Projections

Water Purchaser	Year						
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Bexar Met Water District (Atascosa County)	389	505	621	715	780	843	895
Bexar Met Water District (Bexar County)	8,794	8,897	9,032	9,109	9,110	9,248	9,449
Bexar Met Water District (Comal County)	230	462	748	1,059	1,344	1,654	2,001
Bexar Met Water District (Medina County)	15	24	33	41	47	54	60
Castle Hills	838	820	807	793	780	771	771
Hill Country Village	842	838	835	831	828	826	826
Hollywood Park	2,229	2,314	2,389	2,458	2,511	2,565	2,616
San Antonio	21,419	24,654	27,471	30,157	32,187	34,150	36,107
Somerset	321	405	484	552	609	660	709
East Central SUD	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Converse	0	1,500	1,500	1,500	1,500	1,500	1,500
Live Oak	0	1,000	1,000	1,000	1,000	1,000	1,000
Total Demand	**36,477**	**42,819**	**46,320**	**49,615**	**52,096**	**54,671**	**57,334**

2.10.4 Guadalupe-Blanco River Authority

The Guadalupe-Blanco River Authority (GBRA) supplies potable water and raw water for municipal, industrial, irrigation, and steam-electric purposes through management of substantial quantities of run-of-river rights and storage rights in Canyon Reservoir. As of January 2005, the Authority had contracts to provide water to over 40 public and private entities. The total amount of water needed by GBRA to meet its customers' current contract amounts and projected future contract amounts in 2030 is 165,904 acft/yr, with 24,392 acft/yr being for use in the upper basin (at or above Canyon Dam), 66,151 acft/yr being for use in the mid-basin (below Canyon Dam and above Victoria), and 84,740 acft/yr being for use in the lower basin (at or below Victoria) (Table 2-16). The total amount of water needed by GBRA to meet its customers' current contract amounts and projected future contract amounts in 2060 is 213,548 acft/yr, with 36,261 acft/yr being for use in the upper basin, 81,139 acft/yr being for use in the mid-basin, and 96,148 acft/yr being for use in the lower basin (Table 2-16).

2.10.5 Canyon Regional Water Authority

Canyon Regional Water Authority (CRWA) is a water planning and development agency for water purveyors that serve large areas of Guadalupe County, and portions of Bexar, Caldwell, Hays, Wilson, and Comal Counties. CRWA also serves as a planning and development agency for its 12 member entities. CRWA provides all or part of the water supply for Bexar Metropolitan Water District, City of Cibolo, County Line WSC, East Central SUD, Green Valley SUD, City of Marion, Martindale WSC, Springs Hills WSC, Maxwell WSC, and Crystal Clear WSC. In addition to these existing customers, CRWA is projected to meet a portion of the projected demands for the City of La Vernia, SS WSC, City of Santa Clara, and the rural needs of Guadalupe County. The total amount of water needed by CRWA to meet its customers' projected demands in 2030 is 22,776 acft/yr and 27,803 acft/yr in 2060 (Table 2-17).

2.10.6 Schertz-Seguin Local Government Corporation

The Schertz-Seguin Local Government Corporation (SSLGC) supplies water to the cities of Schertz and Seguin as well as Springs Hill WSC, City of Selma, and the City of Universal City. In addition to these current customers, the SSLGC is projected to meet a portion of the projected demands for Green Valley SUD, Crystal Clear WSC, and the City of Garden Ridge. The total amount of water needed by SSLGC to meet its customers' projected demands in 2030 is 16,815 acft/yr and in 2060 is 24,992 acft/yr (Table 2-18).

2.10.7 Springs Hill Water Supply Corporation

Springs Hill WSC provides retail water service within the WSC's service area as well as wholesale water to Crystal Clear WSC. In addition, Springs Hill WSC also supplies water on a wholesale basis to the City of La Vernia and East Central SUD via CRWA. The total amount of water needed by Springs Hill WSC to meet its customers' projected demands in 2030 is 4,091 acft/yr and in 2060 is 5,365 acft/yr (Table 2-19).

Table 2-16.
Guadalupe-Blanco River Authority Water Demand Projections

Water Purchaser	Year						
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal (Canyon Reservoir)							
Upper Basin - At or above Canyon Reservoir							
Canyon Lake WSC	4,000	4,000	4,769	6,838	8,898	11,034	13,331
City of Blanco	600	600	600	600	600	600	600
Domestic Contracts	25	25	25	25	25	25	25
Rebecca Creek MUD	130	130	130	130	130	130	130
Wimberley WSC	0	177	400	628	847	1,248	1,479
Woodcreek & Woodcreek Utilities	0	593	1,059	1,549	2,027	2,691	3,157
WW Sports	1	1	1	1	1	1	1
Yacht Club	4	4	4	4	4	4	4
Bulverde (Western Canyon)	0	1,053	1,742	2,528	3,310	4,123	4,995
City of Boerne (Western Canyon)	0	650	1,300	1,884	2,410	2,953	3,403
City of Fair Oaks Ranch (Western Canyon)	0	1,200	1,300	1,400	1,400	1,400	1,400
Comal County-Other (Western Canyon)	0	876	955	1,064	1,161	1,343	1,494
Cordillera Ranch (Western Canyon)	0	366	660	1,000	1,000	1,000	1,000
DH Invest.-Johnson Ranch (Western Canyon)	0	45	400	400	400	400	400
Kendall & Tapatio (Western Canyon)	0	366	500	500	500	500	500
Kendall County-Other (Western Canyon)	0	221	865	1,612	2,527	3,385	4,163
SARA (Western Canyon)	0	0	50	50	0	0	0
SAWS (Western Canyon)	0	7,500	5,500	4,000	0	0	0
Western Canyon Sub-Total	*0*	*12,277*	*13,272*	*14,438*	*12,708*	*15,104*	*17,355*
Total Upper Basin Municipal (Canyon Reservoir)	**4,760**	**17,807**	**20,260**	**24,213**	**25,240**	**30,837**	**36,082**
Mid Basin							
Canyon Regional Water Authority (In district after 2018)	10,025	10,025	10,025	10,025	10,025	10,025	10,025
NBU + 50% of Comal County-Other	6,720	7,687	9,136	12,382	15,586	18,979	22,688
City of Seguin	3,000	2,000	2,000	2,000	2,000	2,000	2,000
Dittmar, Gary	5	5	5	5	5	5	5
Dittmar, Ray	5	5	5	5	5	5	5
Gonzales County WSC	700	700	700	700	700	700	700
Green Valley SUD	200	200	300	300	700	700	700
Springs Hill WSC	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Canyon Regional Water Authority (San Marcos WTP)	2,038	2,038	2,038	2,038	2,038	2,038	2,038
City of Buda (San Marcos WTP)	1,120	1,120	1,120	1,120	1,120	1,120	1,120
City of Kyle (San Marcos WTP)	589	2,957	3,177	3,454	3,614	4,111	4,111
City of Mustang Ridge (San Marcos WTP)	0	19	62	99	137	175	213
City of Niederwald (San Marcos WTP)	0	35	95	160	221	294	354
Plum Creek WC (San Marcos WTP)	0	0	73	274	479	738	941
City of San Marcos (San Marcos WTP)	5,000	5,000	10,000	10,000	10,000	10,000	10,000
County Line WSC (San Marcos WTP)	0	0	500	1,000	1,000	1,000	1,000
Crystal Clear WSC (San Marcos WTP)	800	800	800	1,300	1,800	1,800	1,800
Maxwell WSC (San Marcos WTP)	0	0	0	100	400	500	700
Martindale WSC (San Marcos WTP)	0	0	0	0	50	50	50
Goforth WSC (San Marcos WTP)	250	1,000	1,000	1,500	2,000	2,500	3,000
Hays County-Other (San Marcos WTP)	0	4,480	4,480	4,480	4,480	4,480	4,480
San Marcos WTP Sub-Total	*9,797*	*17,449*	*23,345*	*25,525*	*27,339*	*28,806*	*29,807*
Total Mid Basin Municipal (Canyon Reservoir)	**32,952**	**40,571**	**48,016**	**53,442**	**58,860**	**63,720**	**68,430**

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Table 2-16 continued

Water Purchaser	Year 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lower Basin							
Calhoun County Rural WSC	500	500	500	500	500	500	500
City of Port Lavaca	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Port O'Conner MUD	60	60	60	60	60	60	60
Total Lower Basin Municipal (Canyon Reservoir)	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**
Industrial/Steam-Electric (Canyon Reservoir)							
Upper Basin							
Harris Road Company	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Mid Basin (Includes no new commitments for Steam-Electric supply)							
Acme	25	25	25	25	25	25	25
Boehm (Pecan Dr.)	1	1	1	1	1	1	1
Comal Fair	1	1	1	1	1	1	1
Comal Road Department	3	3	3	3	3	3	3
GPP (Panda Energy)	6,840	6,840	5,720	5,720	5,720	5,720	5,720
Guadalupe County	1	1	1	1	1	1	1
Hays Energy LP	2,464	2,464	2,464	2,464	2,464	2,464	2,464
SMI	700	700	700	700	700	700	700
Std. Gypsum	258	258	258	258	258	258	258
Total Mid Basin Industrial/SE (Canyon Reservoir)	**10,293**	**10,293**	**9,173**	**9,173**	**9,173**	**9,173**	**9,173**
Lower Basin							
Coleto Creek	4,000	4,000	6,000	6,000	6,000	6,000	6,000
BP Chemical	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Seadrift Coke	334	334	334	334	334	334	334
UCC	100	100	100	100	100	100	100
Total Lower Basin Industrial/SE (Canyon Reservoir)	**5,534**	**5,534**	**7,534**	**7,534**	**7,534**	**7,534**	**7,534**
Irrigation (Canyon Reservoir)							
Irrigation Contracts	**173**	**173**	**173**	**173**	**173**	**173**	**173**
Irrigation Contracts	**736**	**736**	**736**	**736**	**736**	**736**	**736**
Canyon Reservoir Total	**56,514**	**77,180**	**87,958**	**97,337**	**103,782**	**114,239**	**124,194**
Mid-Basin Municipal (Run-of-River)							
Lockhart	1,120	1,120	1,120	1,120	1,120	1,120	1,120
Luling	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Mid-Basin Municipal (Run-of-River) Total	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**
Lower Basin Municipal (Run-of-River)							
Calhoun County Rural WSC	1,000	1,000	1,000	1,000	1,000	1,000	1,000
City of Victoria (pursuant to Canyon Amendment)	1,240	1,240	1,240	1,240	1,240	1,240	1,240
Port Lavaca	2,980	2,980	2,980	2,980	2,980	2,980	2,980
Port O'Conner MUD	1,060	1,060	1,060	1,060	1,060	1,060	1,060
Total Lower Basin Municipal (Run-of-River)	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**

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Table 2-16 concluded

Water Purchaser	Year 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lower Basin Industrial/SE (Run-of-River)							
BP Chemical	2,200	2,200	2,200	2,200	2,200	2,200	2,200
Coleto Creek	0	0	0	0	0	2,010	4,842
Seadrift Coke	666	666	666	666	666	666	666
Victoria County Industry	0	0	0	0	1,008	3,624	6,566
UCC	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Other Existing & New Industry	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Total Lower Basin Industrial/SE (Run-of-River)	**42,866**	**42,866**	**42,866**	**42,866**	**43,874**	**48,500**	**54,274**
Lower Basin Irrigation (Run-of-River)							
Irrigation Agreements (Includes Losses)	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**
Lower Basin (Run-of-River) Total	**75,146**	**75,146**	**75,146**	**75,146**	**75,154**	**80,780**	**86,554**
Total Demand	**134,460**	**155,126**	**165,904**	**175,283**	**182,736**	**197,819**	**213,548**
Total Upper Basin Demand	4,939	17,986	20,439	24,392	25,419	31,016	36,261
Total Mid Basin Demand	46,781	54,400	60,725	66,151	71,569	76,429	81,139
Total Lower Basin Demand	82,740	82,740	84,740	84,740	85,748	90,374	96,148
Total Demand	**134,460**	**155,126**	**165,904**	**175,283**	**182,736**	**197,819**	**213,548**

Table 2-17. Canyon Regional Water Authority Water Demand Projections

Water Purchaser	Year 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Bexar Met Water District[1]	4,000	5,500	6,600	7,500	7,500	7,500	7,500
City of Cibolo	800	866	2,800	2,800	2,800	2,800	2,800
County Line WSC	1,267	1,267	1,767	1,767	2,267	2,267	2,267
East Central SUD	1,400	1,400	1,400	551	795	1,016	1,242
Green Valley SUD	1,800	1,800	5,600	6,000	6,400	7,200	8,000
City of La Vernia	0	0	0	0	0	8	114
City of Marion	100	100	100	113	128	148	170
Martindale	158	158	158	158	158	158	158
Martindale WSC	288	288	288	288	288	288	288
Springs Hill WSC	1,925	1,925	1,925	1,925	1,925	1,925	1,925
SS WSC[2]	0	0	0	0	0	0	690
City of Santa Clara[3]	0	100	300	400	500	700	900
Guadalupe County-Other	56	48	37	25	15	7	0
Maxwell WSC	867	867	867	867	867	867	867
Crystal Clear WSC	382	382	382	382	382	882	882
Total Demand	**13,043**	**14,701**	**22,224**	**22,776**	**24,025**	**25,766**	**27,803**

Note: Demands are the sum of contracts, plus projected need unless noted otherwise.
1 Assumes after GBRA out-of-district water returns in 2018, CRWA will still supply water to meet a portion of BMWD's demand.
2 Demand for SS WSC is calculated as the projected need above 3,000 acft/yr.
3 Served by Green Valley SUD.

Table 2-18.
Schertz-Seguin Local Government Corporation Water Demand Projections

Water Purchaser	Year						
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Schertz	5,420	5,420	5,444	6,055	7,542	9,233	11,041
Seguin	5,420	5,420	5,718	6,454	7,203	8,069	9,047
Selma	800	1,500	1,500	1,500	1,500	1,500	1,500
Springs Hill WSC	560	560	560	560	560	560	560
Universal City	800	800	800	800	800	800	800
Green Valley SUD	0	200	500	500	500	500	500
Crystal Clear WSC	0	0	300	600	900	900	900
Garden Ridge	0	170	252	346	440	537	644
Total Demand	**13,000**	**14,070**	**15,074**	**16,815**	**19,445**	**22,099**	**24,992**

Table 2-19.
Springs Hill Water Supply Corporation Water Demand Projections

Water Purchaser	Year (acft)						
	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Springs Hill WSC	2,076	2,349	2,679	3,056	3,424	3,849	4,330
La Vernia (via CRWA)	400	400	400	400	400	400	400
Crystal Clear WSC	250	250	250	250	250	250	250
East Central SUD (via CRWA)	385	385	385	385	385	385	385
Total Demand	**3,111**	**3,384**	**3,714**	**4,091**	**4,459**	**4,884**	**5,365**

Section 3
Water Supply Analyses
[31 TAC §357.7(a)(3)]

3.1 Groundwater Supplies

There are five major and two minor aquifers supplying water to the South Central Texas Region. The five major aquifers are the Edwards-Balcones Fault Zone, Carrizo-Wilcox, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers (Figure 3-1). The two minor aquifers are the Sparta and Queen City Aquifers. Section 1.7.1 contains further descriptions of the aquifers, including water quality.

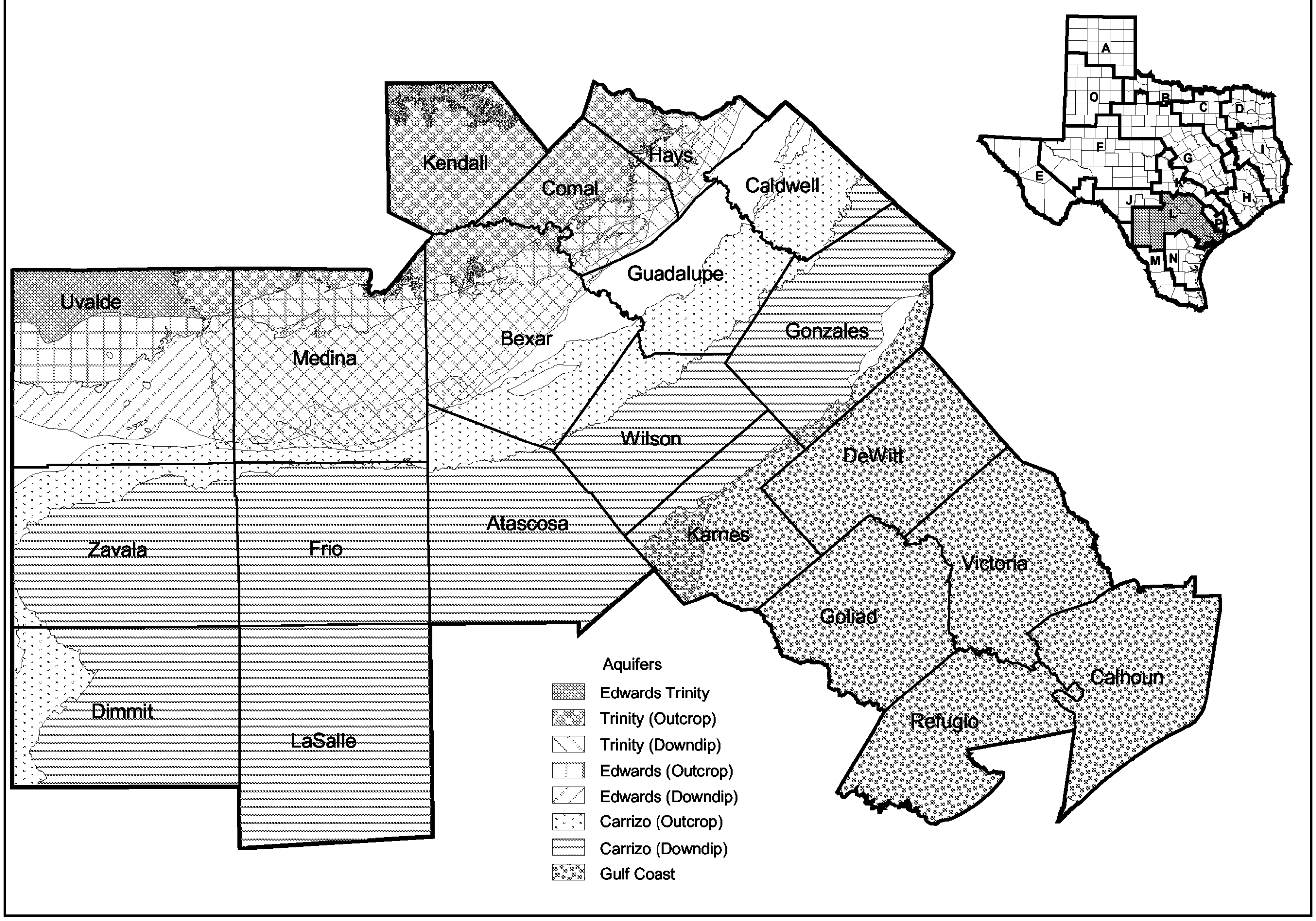

Figure 3-1. Major Aquifers — South Central Texas Region

There are 15 groundwater conservation districts (GCDs) in the South Central Texas Region (Figure 3-2). With the exceptions of Calhoun and Victoria Counties, a GCD serves all or a portion of each county in the region. The responsibilities and authorities of these GCDs vary depending upon creating legislation and governing law, and some districts are not responsible for all aquifers within the geographic boundaries of the district. For example, the statutory district of the Edwards Aquifer Authority (EAA) includes (among others) Bexar, Medina, and Uvalde Counties, but the EAA exercises permitting authority only with respect to the Edwards Aquifer. Other aquifers used within this three-county area are managed by the Trinity-Glen Rose GCD, Medina County GCD, and the Uvalde County Underground Water Conservation District. The Carrizo-Wilcox Aquifer in Bexar County, however, is not managed by a GCD.

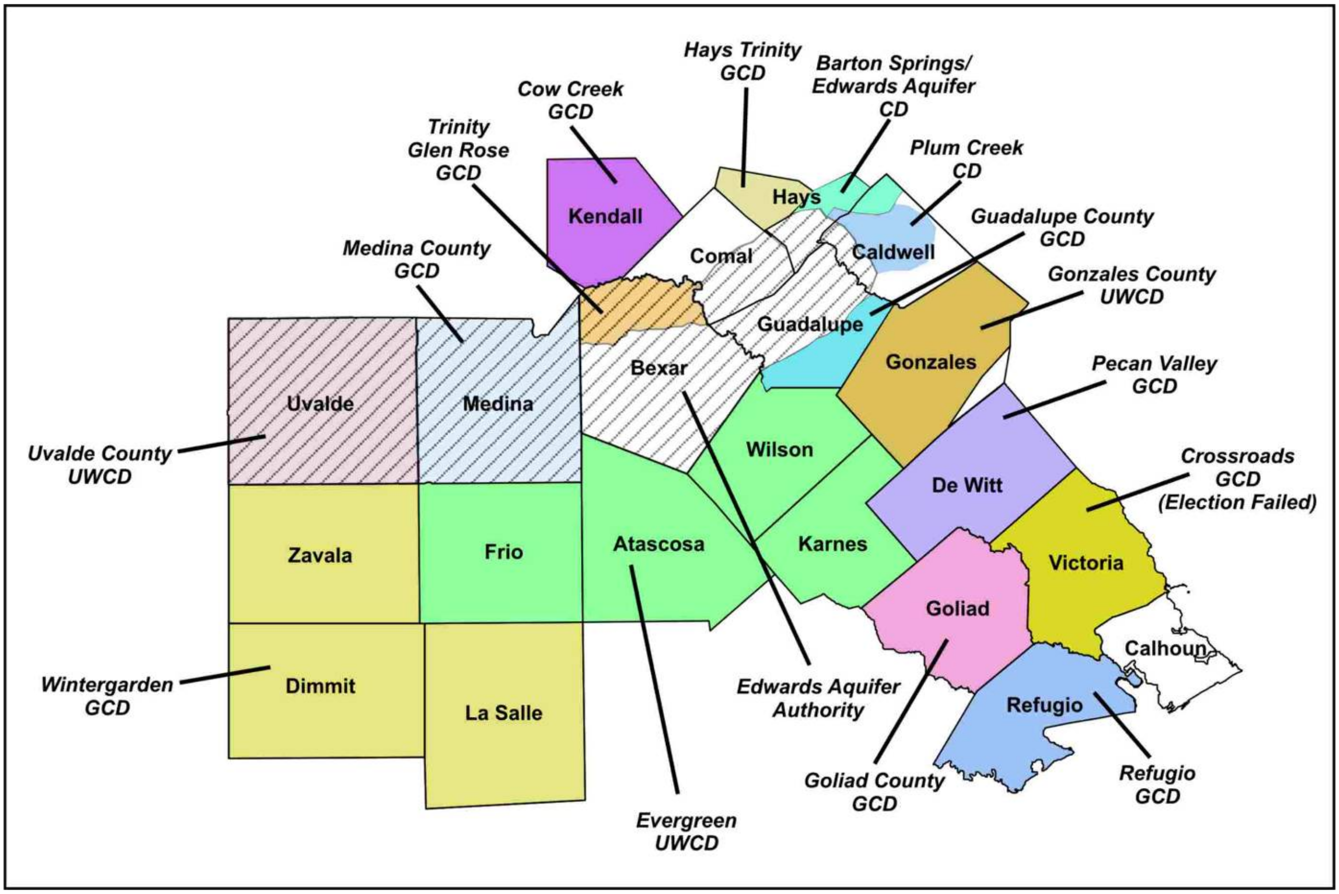

Figure 3-2. Groundwater Conservation Districts

3.1.1 Groundwater Availability

TWDB Guidelines for Regional Water Plan Development describe available groundwater supply as follows:

> "*The largest amount of water that can be pumped from a given aquifer without violating the most restrictive physical or regulatory or policy conditions limiting withdrawals under drought of record conditions. Regulatory conditions refer specifically to any limitations on pumping withdrawals imposed by groundwater conservation districts through their rules and permitting programs.*"

As a matter of policy, the SCTRWPG has chosen to accept estimates of available groundwater supply from the management plans of the GCDs for regional planning purposes. When a GCD management plan is not available or an area is not represented by a GCD, the SCTRWPG has chosen to retain the estimates of groundwater supply used in the 2001 South Central Texas Regional Water Plan. Table 3-1 provides a summary of information pertinent to groundwater supply and availability by county, GCD, and aquifer for all major aquifers with the exception of the Edwards Aquifer. In the rightmost column of Table 3-1, the existing groundwater supply "allocated" to meet local demands at year 2010 is shown for reference and comparison to estimates of overall supply. With respect to municipal utilities, it is important to note that this "allocated" supply is equal to the lesser of the tested well capacities as reported to the Texas Commission on Environmental Quality (TCEQ) or the available groundwater supply adopted by the SCTRWPG and is not necessarily representative of current or projected groundwater use.

Two GCDs, the Trinity-Glen Rose in Bexar County and the Cow Creek in Kendall County, adopted management plans including estimates of available groundwater supply after the SCTRWPG had completed its assessment of needs for additional water supply by comparison of projected demands and existing supplies. The Cow Creek GCD adopted estimates of available groundwater supply identical to those in the 2001 South Central Texas Regional Water Plan so no adjustment of the needs assessment is necessary. Upon consideration of recent technical studies,[1] the Trinity-Glen Rose GCD adopted an estimate of available groundwater supply well in excess of that in the 2001 South Central Texas Regional Water Plan. While this new estimate of available groundwater supply could reduce the needs for additional water supply

[1] U.S. Army Corps of Engineers, Natural Resources Conservation Service, and U.S. Geological Survey, "Guadalupe – San Antonio River Basins, Cibolo Creek Watershed, Phase I - Existing Conditions, Draft," November 2003.

Table 3-1.
Available Groundwater Supply for the Gulf Coast, Carrizo-Wilcox, and Trinity Aquifers

County	Groundwater Conservation District[1]	Major Aquifer(s)[2]			Management Plan Status[3]	Production Limits[4] (acft/ac/yr)	2010 Supply[5]		2010 Supply Allocated (acft/yr)
		Gulf Coast	Carrizo-Wilcox	Trinity			2001 RWP[6] (acft/yr)	GCD Mgmt. Plan (acft/yr)	
Calhoun		■			No GCD		2,940		2,161
Refugio	Refugio	■			Current			42,320	3,062
Goliad	Goliad Co.	■			Current	0.5		12,810	3,404
Victoria	Crossroads	■			GCD confirmation failed		41,129		35,489
DeWitt	Pecan Valley	■			Current		15,866	Variable	10,069
Karnes	Evergreen	■			Current	2.0		15,200	4,721
Wilson	Evergreen		■		Current	2.0		32,804	19,943
Atascosa	Evergreen		■		Current	2.0		47,806	47,806
Frio	Evergreen		■		Current	2.0		130,765	83,582
Zavala	Wintergarden		■		Current	2.5		30,475	30,475
Dimmit	Wintergarden		■		Current	2.5		30,277	12,205
LaSalle	Wintergarden		■		Current	2.5		34,810	7,892
Gonzales	Gonzales Co.		■		Current	2.0		28,942	19,484
Guadalupe	Guadalupe Co.		■		Current	2.0		12,583	5,934
Caldwell	Plum Creek		■		Current			12,500	5,348
Uvalde	Uvalde Co.		■		Current	2.5		30,858[7]	3,120[7]
	Uvalde Co.			■	Current	2.5			
Medina	Medina Co.		■		Current	2.0		6,966	6,494
	Medina Co.			■	Current	2.0		860	203
Bexar			■		No GCD		17,950		13,391
	Trinity -Glen Rose			■	Recently adopted[8]		1,175		1,167
Comal				■	No GCD		1,800		1,800
Hays	Hays Trinity			■	None adopted to-date		1,213		1,213
Kendall	Cow Creek			■	Recently adopted[9]		3,935		2,770

1 Edwards Aquifer Authority and Barton Springs/Edwards Aquifer Conservation District are not included in this table.
2 Edwards-Balcones Fault Zone Aquifer and various minor aquifers are not included in this table.
3 Management Plan status as of April 2005.
4 Production limits obtained from available GCD rules.
5 Value shown represents groundwater supply from the indicated major aquifer used in the 2006 South Central Texas Regional Water Plan. Table does not include small amounts of Carrizo -Wilcox supply in Karnes County and Gulf Coast supply in Gonzales County.
6 In the absence of a current GCD Management Plan, the estimated groundwater supply used in the 2001 South Central Texas Regional Water Plan was adopted.
7 Value shown is for all aquifers except the Edwards.
8 Trinity-Glen Rose GCD Management Plan was adopted after completion of the water needs assessment for the 2006 South Central Texas Regional Water Plan. The Trinity-Glen Rose GCD Management Plan reports estimated groundwater supply from the Trinity Aquifer in Bexar County as 32,767 acft/yr.
9 Cow Creek GCD Management Plan was adopted after completion of the water needs assessment for the 2006 South Central Texas Regional Water Plan. The Cow Creek GCD Management Plan reports estimated groundwater supply from the Trinity Aquifer in Kendall County as 3,935 acft/yr.

in Bexar County by a few thousand acft/yr, the SCTRWPG does not deem it necessary to revise the current needs assessment given that the magnitude of projected need for additional water supply for Bexar County exceeds 80,000 acft/yr at 2010 and is nearly 225,000 acft/yr at 2060.

In the case of the Edwards Aquifer, the act creating the EAA limits pumpage withdrawals to 450,000 acft/yr until December 31, 2007, and to 400,000 acft/yr beginning in 2008. In addition, the act states in Section 1.14(h):

> *"…the authority, through a program, shall implement and enforce water management practices, procedures, and methods to ensure that, not later than December 31, 2012, the continuous minimum springflows of the Comal Springs and the San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. The authority from time to time as appropriate may revise the practices, procedures, and methods. To meet this requirement, the authority shall require: (1) phased reductions in the amount of water that may be used or withdrawn by existing users or categories of other users; or (2) implementation of alternative management practices, procedures, and methods."*

Thus, supplies from the Edwards Aquifer may be less than the pumpage limits specified in the act. For purposes of water supply analyses for the 2006 South Central Texas Regional Water Plan, the supply from the Edwards Aquifer is included at 340,000 acft/yr.[2]

Projected groundwater supplies available in the South Central Texas Region during drought of record conditions are 935,593 acft/yr in 2010, 925,559 acft/yr in 2030, and 924,203 acft/yr in 2060 (Table 3-2). Supplies available from the Edwards, Sparta, Queen City, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers are projected to hold steady on an annual basis throughout the 2010 through 2060 projection period, and represent about 55 percent of the total groundwater available to the region in 2060 (Table 3-2). The supply available from the Carrizo Aquifer is projected to decline from 414,774 acft/yr for the 2010 through 2020 period to 404,740 acft/yr for the period after 2020. The supply available from the Trinity Aquifer is projected to decline from 9,563 acft/yr for the 2010 through 2040 period to 8,207 acft/yr for the period after 2040.

[2] For planning purposes, an estimate of 340,000 acft/yr of available supply during a drought of record from the Edwards Aquifer was agreed upon by the SCTRWPG and the staff of the TWDB. This quantity is adopted as a placeholder number until the EAA obtains approval from the U.S. Fish and Wildlife Service for a Habitat Conservation Plan (HCP).

3.1.2 Assumptions for Assessment of Groundwater Supply

1. Groundwater availability by county is subdivided into river basin parts of each county according to the ratios used in the 2001 Regional Water Plan. The ratios are the percent of land surface located in each river and coastal basin. Groundwater supplies for municipal utilities using water from the Carrizo, Gulf Coast, and Trinity Aquifers are based upon well capacities obtained from the TCEQ Water Utility Database.

Table 3-2.
Available Groundwater Supply by Aquifer

Aquifer Name and TWDB Aquifer No.[1]	Annual Quantity Available					
	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Edwards (11)[2]	340,000	340,000	340,000	340,000	340,000	340,000
Carrizo (10)	414,774	414,774	404,740	404,740	404,740	404,740
Sparta (27)	8,540	8,540	8,540	8,540	8,540	8,540
Queen City (24)	26,278	26,278	26,278	26,278	26,278	26,278
Trinity (28)	9,563	9,563	9,563	9,563	8,207	8,207
Gulf Coast (15)	132,348	132,348	132,348	132,348	132,348	132,348
Edwards-Trinity (Plateau) (13)	4,090	4,090	4,090	4,090	4,090	4,090
Total	935,593	935,593	925,559	925,559	924,203	924,203
Percent of Total						
Edwards (11)	36.34%	36.34%	36.73%	36.73%	36.79%	36.79%
Carrizo (10)	44.33%	44.33%	43.73%	43.73%	43.79%	43.79%
Sparta (27)	0.91%	0.91%	0.92%	0.92%	0.92%	0.92%
Queen City (24)	2.81%	2.81%	2.84%	2.84%	2.84%	2.84%
Trinity (28)	1.02%	1.02%	1.03%	1.03%	0.89%	0.89%
Gulf Coast (15)	14.15%	14.15%	14.30%	14.30%	14.32%	14.32%
Edwards-Trinity (Plateau) (13)	0.44%	0.44%	0.44%	0.44%	0.44%	0.44%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

[1] TWDB aquifer identification number is shown in parentheses in column number 1.

[2] Availability value does not include 3,158 acft/yr from the Edwards Aquifer – Barton Springs segment for use in Hays and Caldwell Counties. These values are however, shown in Tables C-3 and C-12 and are also included in the TWDB database.

2. Groundwater availability during drought of record conditions from the Edwards Aquifer is set at a total of 340,000 acft/yr. Initial regular permit amounts from the EAA are prorated down to achieve a total value of 340,000 acft/yr as the sum of all permits. Permanent acquisitions of permits or portions of permits are accounted for prior to proration. Leases and dry year options, because most expire before year 2010, are considered a water management strategy (Section 4C.2, Vol. II) rather than existing water supply.

3. Municipal supplies from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers are estimated as follows:
   a. For cities using water from the Carrizo, Gulf Coast, and Trinity Aquifers, supply is based upon well capacities. In cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the total availability, supply is prorated downwards for every entity using that particular source.
   b. For rural areas, it is assumed that the rural household (municipal type) demand would be met from aquifers underlying that river basin portion of the county. The rural supply is generally calculated as 125 percent of the year 2000 use from each particular aquifer. In cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the total availability, supply is prorated downwards for every entity using that particular source.
4. Industrial supply from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers is associated with aquifers underlying the river basin portion of the county. The industrial supply is generally calculated as 130 percent of the year 2000 use from each particular aquifer. In cases in which the total demand on that portion (i.e. county & river basin) of the aquifer exceeds the total availability, supply is prorated downwards for every entity using that particular source.
5. Steam-electric supply from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers is associated with aquifers underlying the river basin portion of the county. The steam-electric supply is generally calculated as 130 percent of the year 2000 use from each particular aquifer. In cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the total availability, supply is prorated downwards for every entity using that particular source.
6. Irrigation supply from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers is associated with aquifers underlying the river basin portion of the county. The irrigation supply is calculated as being equal to the projected demand in each decade. In cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the total availability, supply is prorated downwards for every entity using that particular source.
7. Mining supply from the Carrizo, Sparta, Queen City, Trinity, Gulf Coast, and Edwards-Trinity (Plateau) Aquifers is associated with aquifers underlying the river basin portion of the county. The mining supply is calculated as being equal to the projected demand in each decade. In cases in which the total demand on that portion (i.e., county and river basin) of the aquifer exceeds the total availability, supply is prorated downwards for every entity using that particular source.
8. For all areas within the planning region, livestock water demand is assumed to be met 50 percent from quantified groundwater sources and 50 percent from local surface water and unquantified groundwater sources such as stock tanks, streams, and windmills. Livestock water supply is set equal to projected livestock demand.

3.2 Surface Water Supplies

The South Central Texas Region includes parts of the Rio Grande, Nueces, San Antonio, Guadalupe, Colorado, and Lavaca River Basins, and parts of the Colorado-Lavaca, Lavaca-Guadalupe, and San Antonio-Nueces Coastal Basins. As indicated in Figure 3-3, however, the Nueces, San Antonio, and Guadalupe are the major river basins of interest in considering surface water supplies. Although the Guadalupe and San Antonio River Basins have been delineated in Figure 3-3 as separate river basins, the two rivers join prior to discharge into San Antonio Bay. In part because of the large concentration of senior water rights below the confluence of the two rivers, the two watersheds are considered as one (the Guadalupe-San Antonio River Basin) when evaluating surface water supplies available under existing water rights. All of the major reservoirs within the South Central Texas Region are located in the Guadalupe-San Antonio River Basin and are identified in Figure 3-3. Owners and locations of major run-of-river rights having authorized annual consumptive use in excess of 10,000 acft/yr are also shown in Figure 3-3. Major reservoirs and run-of-river water rights are discussed in the follow subsections.

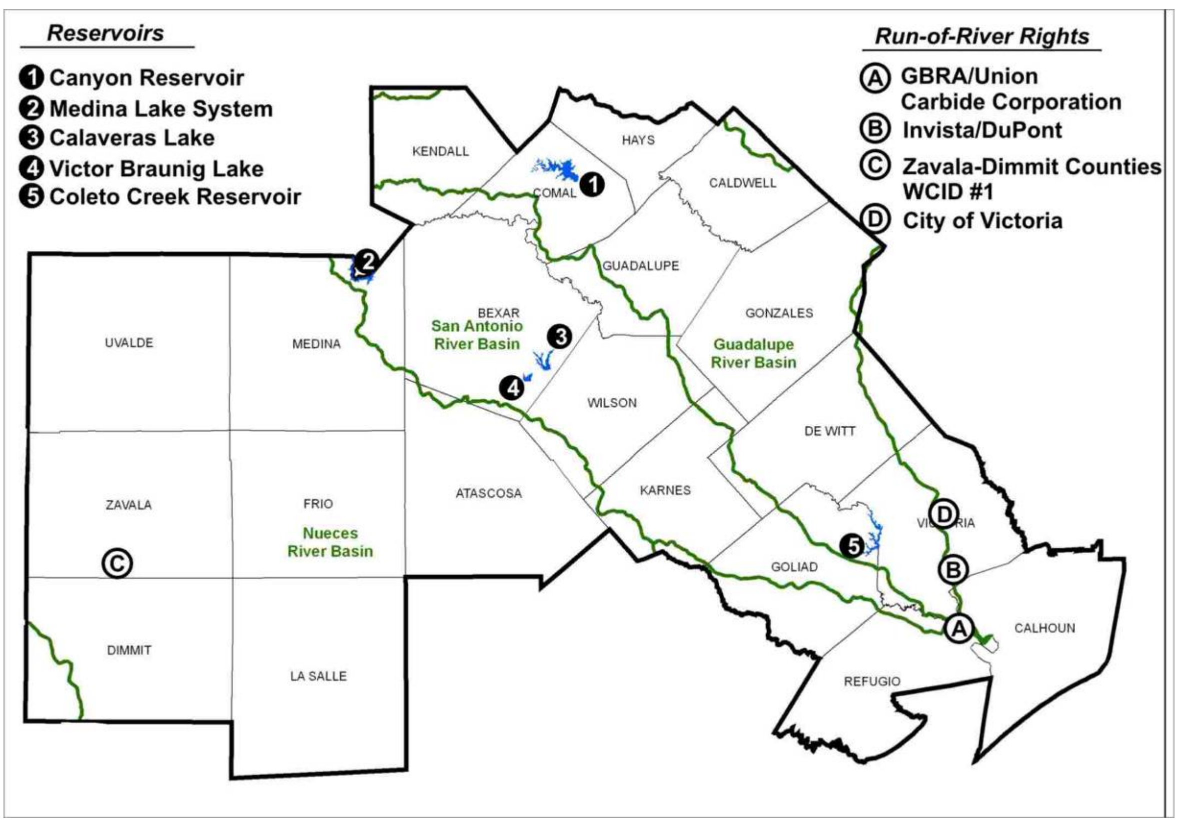

Figure 3-3. Major River Basins, Reservoirs, and Run-of-River Rights

3.2.1 Major Reservoirs and Associated Water Rights

Major reservoirs and associated water rights within the South Central Texas Region are summarized in Table 3-3. The firm yield, or dependable supply of water available during a repeat of the drought of record, for each of these reservoirs is also listed in Table 3-3. Additional information regarding each of the major reservoirs is provided in the following paragraphs.

The Medina Lake System is located on the Medina River, a tributary of the San Antonio River, in Medina and Bandera Counties. The Medina Lake System is owned by the Bexar-Medina-Atascosa Counties Water Control and Improvement District No. 1 (BMA) and has traditionally been used to supply irrigation water to farms in Bexar, Medina, and Atascosa Counties via the Medina Canal System. In recent years, Bexar Metropolitan Water District (BMWD) has entered into contracts with BMA to obtain municipal water supplies from the Medina Lake System which are delivered via the bed and banks of the Medina River to a point of diversion near Von Ormy in southwestern Bexar County. The Medina Lake System is unique among the major reservoirs in the South Central Texas Region because waters impounded therein contribute recharge, estimated to average over 42,000 acft/yr,[3] to the Edwards Aquifer. Because of surface water "losses" to recharge and special conditions within Certificate of Adjudication #19-2130, as amended, it has been determined that the firm yield of the Medina Lake System in a repeat of the drought of record is essentially zero. Hence, the Medina Lake System has not been included as an existing source of surface water supply in the South Central Texas Region. Because of its location on the boundary of Regions L and J, the TWDB has designated the Medina Lake System as a special water resource. As the South Central Texas Region is not relying upon the Medina Lake System as a source of supply during drought, it is assumed that there are no conflicts with any water supply contracts or option agreements held by entities in the Plateau Region. It is further assumed that interests upstream of Medina Lake will obtain the necessary water rights permit(s) for diversion from the Medina River and/or its tributaries and will mitigate any associated impacts upon recharge of the Edwards Aquifer within Region L.

[3] HDR Engineering, Inc. (HDR), "Edwards Aquifer Recharge Analyses," Trans-Texas Water Program, West Central Study Area, Phase II, San Antonio River Authority, et al., March 1998.

Table 3-3.
List of Major Reservoirs[1]

Reservoir	Water Right Owner	Certificate of Adjudication Number	Authorized Diversion (acft/yr)	Firm Yield (acft/yr)	Purposes
San Antonio River Basin					
Medina Lake System	Bexar-Medina-Atascosa Counties WCID #1	19-2130	66,750	0[2]	Irrigation, municipal, domestic, livestock
Victor Braunig Lake	City Public Service Board of San Antonio	19-2161	12,000[3]	>12,000[4]	Steam-electric power generation
Calaveras Lake	City Public Service Board of San Antonio	19-2162	37,000[5]	>37,000[4]	Steam-electric power generation
Guadalupe River Basin					
Canyon Reservoir	Guadalupe-Blanco River Authority	18-2074	90,000[6]	~90,000[6]	Municipal, industrial, steam-electric, hydropower, irrigation, flood protection
Coleto Creek Reservoir	Coleto Creek Power	18-5486	12,500[7]	>12,500[4]	Steam-electric power generation

[1] See Table 3-3 for a summary of run-of-river permits.
[2] Based on operation of the Medina Lake System in accordance with CA #19-2130C.
[3] Includes rights to divert up to 12,000 acft/yr from the San Antonio River to Braunig Lake and to consume up to 12,000 acft/yr at Braunig Lake.
[4] The reservoir and supplemental authorized diversions from the adjacent river could support a firm yield in excess of the authorized consumptive use, however, operations of steam-electric power generation facilities could be impaired.
[5] Includes rights to divert up to 60,000 acft/yr of reclaimed wastewater from the San Antonio River to Calaveras Lake and to consume up to 37,000 acft/yr.
[6] The firm yield of Canyon Reservoir is dependent upon a number of factors including points of diversion for contracted supplies, Edwards Aquifer springflow, term recreational flow agreements, and discharge of treated effluent throughout the Guadalupe – San Antonio River Basin. Subject to the hydrologic assumptions and operational procedures listed in Section 3.2.3.1, estimates of Canyon Reservoir firm yield range from 88,232 acft/yr to 87,484 acft/yr in years 2000 and 2060, respectively.
[7] Includes rights to divert up to 20,000 acft/yr from the Guadalupe River to Coleto Creek Reservoir and to consume up to 12,500 acft/yr.

Braunig and Calaveras Lakes, owned by the City Public Service Board of San Antonio, are located in the San Antonio River Basin in Bexar County to the southeast of San Antonio and are used for steam-electric power plant cooling water. Runoff from the watersheds above the reservoirs and diversions from the San Antonio River (including treated effluent discharged by the San Antonio Water System) are used to maintain necessary lake levels to facilitate efficient power plant operations.

Constructed by the U.S. Army Corps of Engineers, Canyon Reservoir in the Guadalupe River Basin is located in Comal County on the mainstem of the Guadalupe River. Uses of the reservoir include water supply for municipal, industrial, steam-electric power generation, irrigation, and hydroelectric power generation, as well as flood protection and recreation. Diversions from Canyon Reservoir are currently authorized up to an average of 90,000 acft/yr. Water supplies from Canyon Reservoir are managed by the Guadalupe-Blanco River Authority (GBRA) and made available to customers both within their ten-county district and in adjacent counties and/or river basins. Because a portion of its watershed is located in the Plateau Region (J), the TWDB has designated Canyon Reservoir as a special water resource. The South Central Texas Region (L) has included existing contracts between GBRA and entities in the Plateau Region in its assessments of surface water supplies using the Guadalupe-San Antonio River Basin Water Availability Model (GSA WAM). Pursuant to a Memorandum of Understanding (MOU) between GBRA and the Commissioners' Court of Kerr County, the SCTRWPG recognizes a potential commitment of approximately 2,000 acft/yr from the firm yield of Canyon Reservoir for the calendar years 2021 through 2050. GBRA's hydrology studies have indicated that a commitment of about 2,000 acft/yr would be necessary to allow permits for 6,000 acft/yr to be issued by TCEQ for diversion in Kerr County. No additional supplies from Canyon Reservoir are specifically reserved for entities within the Plateau Regional Water Planning Area (Region J) at this time. The SCTRWPG also recognizes a commitment of about 600 acft/yr from Canyon Reservoir to meet projected needs for the City of Blanco located in Blanco County in the Lower Colorado Regional Water Planning Area (Region K).

Coleto Creek Reservoir, owned by Coleto Creek Power (a Topaz Power Group Company) and operated by GBRA, is located at the border of Victoria and Goliad Counties in the lower Guadalupe River Basin, and is a cooling reservoir for steam-electric power generation. Sources of water include runoff from the Coleto Creek watershed and diversions from the Guadalupe River, backed by storage in Canyon Reservoir, when needed. The reservoir supplies water for steam-electric power generation at Coleto Creek Power Station located in Goliad County.

Lakes Dunlap, McQueeny, Placid, Nolte, Gonzales, and Wood, on the Guadalupe River between New Braunfels and Gonzales, form pools for hydroelectric power generation and are the sites of hydroelectric power plants providing service to the Guadalupe Valley Electric Cooperative. These reservoirs and water rights are owned by GBRA. In addition to those owned by GBRA, there are other small reservoirs and associated priority and non-priority water rights for hydroelectric power generation located along the Guadalupe River at Seguin, Gonzales, and Cuero. Since hydroelectric power generation is a non-consumptive use of water, water available to these rights is not listed in Table 3-3. All water rights are, however, included on a priority basis in the assessment of surface water supply using the GSA WAM.

3.2.2 Run-of-River Water Rights

In addition to those associated with major reservoirs, surface water rights have been issued by the TCEQ and predecessor agencies to individuals, cities, industries, and water districts and authorities for diversion from flowing streams of the South Central Texas Region. Each right bears a priority date, diversion location, maximum diversion rate, and annual quantity of diversion. Some rights may include off-channel storage authorization, instream flow requirements, and various special conditions. The principle of prior appropriation or “first-in-time-first-in-right” is applied, which means that the most senior, or oldest, right has first call on flows, with the second, third, and more recent rights having second, third, and later priorities for diversions. This procedure gives senior right holders priority when streamflows are low, as in periods of drought, and renders junior rights less reliable during droughts. The most junior water right holders may not be able to divert any water during severe droughts if so directed by the TCEQ acting through the South Texas Watermaster.

It is important to note that many run-of-river rights are for irrigation purposes, where chances are taken at planting time upon whether or not water will be available for crop production during the growing season. In fact, when reviewing applications for irrigation rights, TCEQ staff has traditionally considered whether 75 percent of the proposed diversion would be available in 75 percent of the years. Municipal, industrial, and steam-electric power users, however, typically require more reliable supplies than are available from run-of-river flows.

Hence, these types of users will often develop storage and/or alternative supplies to increase the reliability of their run-of-river rights.

For the Nueces River Basin part of the South Central Texas Region, run-of-river water rights total more than 120,000 acft/yr and are primarily used for irrigation purposes. Consumptive run-of-river rights in the Guadalupe-San Antonio River Basin total over 446,000 acft/yr and are used primarily for irrigation, municipal, and industrial purposes.

3.2.3 Surface Water Availability

Surface water supplies for the vast majority of the South Central Texas Region have been quantified using the Nueces and Guadalupe-San Antonio River Basin Water Availability Models (WAMs).[4,5] These WAMs were originally developed under a contract with the TCEQ and have been modified and improved for more accurate simulation of specific water rights and special conditions including those associated with operations of Canyon Reservoir and the Medina Lake System. Modifications to the basic Guadalupe-San Antonio River Basin WAM also include daily time-step computational procedures necessary to quantify water availability for new appropriations associated with potentially feasible water management strategies subject to Consensus Criteria for Environmental Flow Needs (CCEFN).

Surface water supply analyses for the South Central Texas Region have been completed using the WAMs to quantify the firm diversion associated with run-of-river water rights, calculate the firm yields associated with Canyon Reservoir and the Medina Lake System, and ensure the reliability of authorized consumptive uses associated with steam-electric power generation at major reservoirs. These analyses were performed subject to specific hydrologic assumptions and operational procedures adopted by the SCTRWPG (Section 3.2.3.1) and approved by the TWDB for the assessment of surface water supply. Reliability information, including firm (or minimum annual) diversion, for water rights in the Nueces and Guadalupe – San Antonio River Basins is summarized in Appendix B. Firm diversion and firm yield amounts have been assigned to specific water users, county-aggregated water user groups, river basins,

[4] HDR, "Water Availability in the Guadalupe-San Antonio River Basin," Texas Natural Resource Conservation Commission (TNRCC), December 1999.
[5] HDR, "Water Availability in the Nueces River Basin," TNRCC, October 1999.

and sources as appropriate. This assignment of firm diversion and yield amounts is representative of existing surface water supplies and is detailed by county, river basin, and water user group in the Comprehensive Water Needs Assessment Data included as Appendix C.

3.2.3.1 Hydrologic Assumptions and Operational Procedures for Assessment of Surface Water Supply

1. Full exercise of surface water rights.
2. Edwards Aquifer permitted pumpage of 400,000 acft/yr (plus domestic & livestock pumpage of 12,312 acft/yr) subject to Demand Management and Critical Period rules adopted by the EAA. This is consistent with provisions in the EAA statute (SB1477) regarding permitted pumpage of 400,000 acft/yr after year 2007 and with potential critical period management actions reducing pumpage by up to 15 percent to 340,000 acft/yr. Breakdown of use type and geographical distribution of 400,000 acft/yr pumpage is based on proportional reduction of EAA initial regular permits (including any permanent transfers). Edwards Aquifer simulations necessary to determine resultant springflows for inclusion in the WAMs were performed using the Edwards (Balcones Fault Zone) Aquifer Model (GWSIM-IV.[6,7] Note that, by agreement with the TWDB, an Edwards Aquifer supply of 340,000 acft/yr has been assumed for assessment of regional water needs.
3. Operation of Canyon Reservoir at firm yield in accordance with Certificate of Adjudication No. 18-2074E, including subordination of all senior Guadalupe River hydropower permits to Canyon Reservoir.
4. Delivery of GBRA's present contractual obligations from Canyon Reservoir (about 65,000 acft/yr) to points of diversion. Uncommitted balance of firm yield assumed to be diverted at Lake Dunlap.
5. Effluent discharge / return flow in the Guadalupe - San Antonio River Basin as reported for year 1997 and adjusted for SAWS direct recycled water use of 35,000 acft/yr (of which 7,723 acft/yr is consumed for industrial purposes and 18,994 acft/yr is consumed for landscape irrigation purposes). A reuse commitment on the order of 3.5 MGD by the City of San Marcos for steam-electric power generation in Hays County has also been included.
6. Operation of power plant reservoirs (Braunig, Calaveras, and Coleto Creek) subject to authorized consumptive uses at the reservoir, with makeup diversions as needed to maintain full conservation storage to the extent possible subject to senior water rights, instream flow constraints, and/or applicable contractual provisions.
7. Desired San Antonio River flows at Falls City gage of 55,000 acft/yr, with seasonally varying minimums under a current SAWS/SARA/CPS draft agreement.

[6] Texas Water Development Board, "Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Report 340, July 1992.
[7] Texas Department of Water Resources, "Groundwater Resources and Model Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region," Report 239, October 1979.

8. Operation of Choke Canyon Reservoir / Lake Corpus Christi (CCR/LCC) System at firm yield subject to the Corpus Christi Phase 4 (maximum yield) policy and a TCEQ Agreed Order regarding freshwater inflows to the Nueces Estuary.
9. Historical Edwards Aquifer recharge estimates developed for the Edwards Underground Water District and others[8,9] as updated in the Trans-Texas Water Program[10] and recent studies of the Nueces and Blanco Recharge Basins for the EAA.[11]

3.3 Reuse Supplies

Current water supplies in the South Central Texas Region involving reuse of treated wastewater are associated with the Recycled Water Program of the San Antonio Water System (SAWS) and contractual commitments by the Guadalupe-Blanco River Authority (GBRA) and the City of San Marcos. SAWS has installed a distribution system capable of transmitting up to about 35,000 acft/yr of recycled water from its Leon, Salado, and Dos Rios Water Recycling Centers to a number of customers in the San Antonio area. For regional planning purposes, current reuse supplies of 18,994 acft/yr for landscape irrigation (municipal) use and 7,723 acft/yr for industrial use from the SAWS Recycled Water Program have been included for water users of Bexar County. Pursuant to a commitment by GBRA from their Dunlap Wastewater Treatment Plant, a reuse supply of 1,120 acft/yr has been included as supply for steam-electric use in Guadalupe County. Similarly, a contractual commitment of 3,936 acft/yr by the City of San Marcos has been included as a reuse supply for steam-electric use in Hays County.

[8] HDR, "Nueces River Basin Regional Water Supply Planning Study, Phase I," Nueces River Authority, May 1991.
[9] HDR, "Guadalupe – San Antonio River Basin Recharge Enhancement Study, Phase I," Edwards Underground Water District, September 1993.
[10] HDR, Op. Cit., March 1998.
[11] HDR, "Pilot Recharge Models of the Nueces and Blanco River Basins," Edwards Aquifer Authority, June 2002.

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Section 4A
Comparison of Supply and Demand Projections to Determine Needs [31 TAC §357.7(a)(5-7)]

4A.1 Water Needs Projections by Water User Group

In this section, the demand projections from Section 2 and the supply projections from Section 3 are brought together to estimate projected water needs in the South Central Texas Region through the year 2060. If projected demands exceed projected supplies for a water user group, the difference or shortage, is identified as a water need for that water user group. As a recap, Section 2 presents demand projections for six types of use: municipal, industrial, steam-electric, mining, irrigation, and livestock. The projections are for dry-year demands. Municipal water demand projections are shown for each entity that supplied more than 280 acft of water in the year 2000, and for the County-Other category in each county. Section 3 presents estimates of surface water and groundwater availability.

This section contains a summary of the water needs (shortages) for each Water User Group (WUG) located in the South Central Texas Region. For a detailed analysis of water needs in the region by river and coastal basin as well as supply sources and amount supplied from each source, see Appendix C, entitled, "Comprehensive Water Needs Assessment Data." Table 4A-1 provides a summary of the water needs for each WUG located in the planning area by county. If a WUG is located in multiple counties, it is shown in its "primary" county in Table 4A-1. Table 4A-2 shows WUGs that are located in multiple counties and the "primary" county to which that WUG has been assigned for presentation herein. Region L has a projected annual water needs of 156,596 acft in 2010, increasing to 416,855 acft by 2060 (Table 4A-1, end of table).

Table 4A-1.
Summary of Water Needs (Shortages) by WUG

Water User Group	*Year* 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Atascosa County						
Benton City WSC	0	144	385	627	869	1,058
Charlotte	0	0	0	0	0	0
Jourdanton	0	0	0	0	0	0
Lytle	196	207	217	224	234	243
McCoy WSC	515	838	1,107	1,321	1,520	1,675
Pleasanton	0	0	0	0	0	0
Poteet	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**711**	**1,189**	**1,709**	**2,172**	**2,623**	**2,976**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	874	2,212	3,952
Mining	0	0	0	0	0	0
Irrigation	1,961	1,022	111	0	0	0
Livestock	0	0	0	0	0	0
County Total	**2,672**	**2,211**	**1,820**	**3,046**	**4,835**	**6,928**
Bexar County						
Alamo Heights	515	578	580	576	590	614
Atascosa Rural WSC	561	732	884	1,011	1,121	1,233
Balcones Heights	0	0	0	0	0	0
Bexar Met Water District	7,067	7,690	8,466	8,891	9,476	10,136
Castle Hills	96	83	69	56	47	47
China Grove	0	0	0	0	0	0
Converse	0	199	597	912	1,179	1,432
East Central WSC	0	0	251	495	716	942
Elmendorf	0	0	0	0	0	0
Fair Oaks Ranch	0	0	0	0	0	0
Helotes	0	0	0	0	0	0
Hill Country Village	730	727	723	720	718	718
Hollywood Park	1,969	2,044	2,113	2,166	2,220	2,271
Kirby	299	298	301	295	307	328
Lackland AFB (CDP)	857	833	809	785	769	769
Leon Valley	0	0	0	0	0	0
Leon Valley (SAWS)	0	0	0	0	0	0
Live Oak	0	0	0	0	0	0
Olmos Park	0	0	0	0	0	0
San Antonio (SAWS)	53,165	78,095	101,584	122,024	138,025	153,980
San Antonio (BMWD)	10,455	17,272	19,958	21,988	23,951	25,908
San Antonio (Others)	184	217	248	271	294	316

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Table 4A-1 continued

Water User Group	Year					
	2010 (acft)	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**	**2060 (acft)**
Bexar County (continued)						
Selma	757	1,232	1,705	1,703	1,694	1,695
Shavano Park	499	515	527	536	548	560
Somerset	0	0	0	0	0	0
St. Hedwig	0	0	0	0	0	0
Terrell Hills	0	0	0	0	0	0
Universal City	141	449	708	658	634	634
Water Ser Inc (Apex Water Ser)	908	1,145	1,381	1,596	1,798	2,015
Windcrest	0	0	0	0	0	0
County-Other (SAWS)	0	0	0	0	0	0
County-Other	0	0	108	106	105	106
Municipal Total	**78,203**	**112,109**	**141,012**	**164,789**	**184,192**	**203,704**
Manufacturing	3,258	6,804	10,082	13,375	16,272	19,419
Steam-Electric Power	0	0	0	0	0	0
Mining	23	22	953	1,046	1,142	1,229
Irrigation	184	150	529	489	452	417
Livestock	0	0	80	84	88	91
County Total	**81,668**	**119,085**	**152,656**	**179,783**	**202,146**	**224,860**
Caldwell County						
Aqua WSC	49	121	178	240	300	362
Creedmoor-Maha WSC	0	0	0	0	0	0
Lockhart	341	984	1,519	2,070	2,615	3,175
Luling	168	311	400	485	587	695
Martindale	0	0	0	0	0	0
Martindale WSC	0	0	0	2	19	41
Maxwell WSC	0	0	73	249	479	692
Mustang Ridge	19	62	99	137	175	213
Polonia WSC	0	0	137	331	520	719
County-Other	0	0	0	0	0	0
Municipal Total	**577**	**1,478**	**2,406**	**3,514**	**4,695**	**5,897**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**577**	**1,478**	**2,406**	**3,514**	**4,695**	**5,897**

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Table 4A-1 continued

Water User Group	Year					
	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Calhoun County						
Calhoun County WSC	0	0	0	0	0	0
Point Comfort	46	145	322	499	489	489
Port Lavaca	0	0	0	0	0	0
Seadrift	0	0	0	0	0	0
County-Other (Port O'Connor MUD)	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**46**	**145**	**322**	**499**	**489**	**489**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**46**	**145**	**322**	**499**	**489**	**489**
Comal County						
Bulverde	653	1,342	2,128	2,910	3,723	4,595
Canyon Lake WSC	0	769	2,838	4,898	7,034	9,331
Garden Ridge	285	423	580	738	901	1,080
New Braunfels	91	1,462	4,599	7,706	10,916	14,475
County-Other	1,752	1,492	1,211	1,405	1,770	2,071
Municipal Total	**2,781**	**5,488**	**11,356**	**17,657**	**24,344**	**31,552**
Manufacturing	0	0	59	789	1,416	2,297
Steam-Electric Power	0	0	0	0	0	0
Mining	1,905	2,094	2,210	2,324	2,590	2,694
Irrigation	0	0	0	0	0	0
Livestock	109	111	111	112	120	120
County Total	**4,795**	**7,693**	**13,736**	**20,882**	**28,470**	**36,663**
DeWitt County						
Cuero	0	0	0	0	0	0
Yoakum	0	0	0	0	0	0
Yorktown	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**0**	**0**	**0**	**0**	**0**	**0**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**0**	**0**	**0**	**0**	**0**	**0**

Continued on next page

Table 4A-1 continued

Water User Group	***Year*** 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Dimmit County						
Asherton	0	0	0	0	0	0
Big Wells	0	0	0	0	0	0
Carrizo Springs	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	0	0	0	0	0	0
Frio County						
Dilley	0	0	0	0	0	0
Pearsall	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	0	0	0	0	0	0
Goliad County						
Goliad	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	2,010	4,842
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	0	0	0	0	2,010	4,842
Gonzales County						
Gonzales	0	0	0	0	0	0
Gonzales County WSC	0	14	75	208	254	255
Nixon	0	0	0	0	0	0
Waelder	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**0**	**14**	**75**	**208**	**254**	**255**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**0**	**14**	**75**	**208**	**254**	**255**

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Table 4A-1 continued

Water User Group	Year					
	2010 (acft)	***2020 (acft)***	***2030 (acft)***	***2040 (acft)***	***2050 (acft)***	***2060 (acft)***
Guadalupe County						
Cibolo	66	0	0	0	0	0
Crystal Clear WSC	0	2	494	1,123	1,911	2,701
Green Valley SUD	229	443	710	842	1,069	1,816
Marion	0	0	13	28	48	70
Santa Clara	76	205	348	485	642	810
Schertz	0	24	635	2,122	3,813	5,621
Seguin	0	0	0	0	0	0
Springs Hill WSC	0	0	0	0	0	0
County-Other	48	37	25	15	7	0
Municipal Total	**419**	**711**	**2,225**	**4,615**	**7,490**	**11,018**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	3,225	7,567	10,004	12,974	16,595	21,008
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**3,644**	**8,278**	**12,229**	**17,589**	**24,085**	**32,026**
Hays County						
County Line WSC	44	1,096	1,416	1,582	1,900	2,365
Goforth WSC	79	532	969	1,415	1,963	2,408
Kyle	1,388	2,588	2,865	3,025	3,522	3,851
Mountain City	0	0	0	0	24	50
Niederwald	35	95	160	221	294	354
Plum Creek Water Company	0	73	274	479	738	941
San Marcos	0	2,634	5,807	9,260	12,995	15,875
Wimberley WSC	177	400	628	847	1,248	1,479
Woodcreek	118	187	257	325	436	506
Woodcreek Utilities Inc	475	872	1,292	1,702	2,255	2,651
County-Other	1,033	1,233	1,444	1,667	1,978	2,201
Municipal Total	**3,349**	**9,710**	**15,112**	**20,523**	**27,353**	**32,681**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	1,231	2,522	4,095	6,013	8,351
Mining	82	87	91	94	106	107
Irrigation	0	0	0	0	0	0
Livestock	82	82	82	82	82	82
County Total	**3,513**	**11,110**	**17,807**	**24,794**	**33,554**	**41,221**

Continued on next page

Table 4A-1 continued

Water User Group	Year 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Karnes County						
El Oso WSC	0	0	0	0	0	0
Falls City	0	0	0	0	0	0
Karnes City	0	0	0	0	0	0
Kenedy	0	0	0	0	0	0
Runge	0	0	0	0	0	0
County-Other (TDCJ)	187	250	298	336	385	417
County-Other	0	0	0	0	0	0
Municipal Total	**187**	**250**	**298**	**336**	**385**	**417**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**187**	**250**	**298**	**336**	**385**	**417**
Kendall County						
Boerne	0	0	23	549	1,092	1,542
County-Other	221	865	1,612	2,527	3,385	4,163
Municipal Total	**221**	**865**	**1,635**	**3,076**	**4,477**	**5,705**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	148	145	141	138	143	140
Livestock	25	25	25	25	28	28
County Total	**394**	**1,035**	**1,801**	**3,239**	**4,648**	**5,873**
LaSalle County						
Cotulla	0	0	0	0	0	0
Encinal	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**0**	**0**	**0**	**0**	**0**	**0**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**0**	**0**	**0**	**0**	**0**	**0**

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Table 4A-1 continued

Water User Group	***Year*** 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Medina County						
Castroville	274	337	396	448	502	555
Devine	0	0	0	0	0	0
East Medina SUD	0	0	95	184	278	372
Hondo	804	1,021	1,225	1,395	1,568	1,737
La Coste	96	113	130	142	156	172
Natalia	198	242	283	318	353	387
Yancey WSC	577	758	925	1,073	1,214	1,348
County-Other	180	507	799	1,058	1,326	1,567
Municipal Total	**2,129**	**2,978**	**3,853**	**4,618**	**5,397**	**6,138**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	4,651	2,887	1,200	0	0	0
Livestock	0	0	0	0	0	0
County Total	**6,780**	**5,865**	**5,053**	**4,618**	**5,397**	**6,138**
Refugio County						
Refugio	0	0	0	0	0	0
Woodsboro	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**0**	**0**	**0**	**0**	**0**	**0**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**0**	**0**	**0**	**0**	**0**	**0**
Uvalde County						
Sabinal	139	135	130	125	121	121
Uvalde	3,793	3,830	3,850	3,854	3,856	3,884
County-Other	0	0	0	0	0	0
Municipal Total	**3,932**	**3,965**	**3,980**	**3,979**	**3,977**	**4,005**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**3,932**	**3,965**	**3,980**	**3,979**	**3,977**	**4,005**

Continued on next page

Table 4A-1 concluded

Water User Group	Year 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Victoria County						
Victoria	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**0**	**0**	**0**	**0**	**0**	**0**
Manufacturing	0	0	0	1,008	3,624	6,566
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**0**	**0**	**0**	**1,008**	**3,624**	**6,566**
Wilson County						
Floresville	0	0	0	0	137	411
La Vernia	0	0	0	0	8	114
Oak Hills WSC	0	0	81	366	673	990
Poth	0	0	0	0	0	0
SS WSC	223	864	1,546	2,214	2,939	3,690
Stockdale	0	0	0	0	0	0
Sunko WSC	0	0	0	95	237	392
County-Other	0	0	0	0	0	0
Municipal Total	**223**	**864**	**1,627**	**2,675**	**3,994**	**5,597**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
County Total	**223**	**864**	**1,627**	**2,675**	**3,994**	**5,597**
Zavala County						
Crystal City	0	0	0	0	0	0
County-Other	0	0	0	0	0	0
Municipal Total	**0**	**0**	**0**	**0**	**0**	**0**
Manufacturing	0	0	0	0	0	0
Steam-Electric Power	0	0	0	0	0	0
Mining	0	0	0	0	0	0
Irrigation	48,165	45,344	42,621	40,005	37,492	35,078
Livestock	0	0	0	0	0	0
County Total	**48,165**	**45,344**	**42,621**	**40,005**	**37,492**	**35,078**
Region L (All Counties)						
Municipal	92,778	139,766	185,609	228,661	269,670	310,434
Manufacturing	3,258	6,804	10,141	15,172	21,312	28,282
Steam-Electric Power	3,225	8,798	12,526	17,943	26,830	38,153
Mining	2,010	2,203	3,254	3,464	3,838	4,030
Irrigation	55,109	49,548	44,602	40,632	38,087	35,635
Livestock	216	218	298	303	318	321
Region L Total	**156,596**	**207,337**	**256,430**	**306,175**	**360,055**	**416,855**

Table 4A-2.
WUGs Located in Multiple Counties

WUG	Counties Served (Primary County Highlighted)			
Benton City WSC	Atascosa	Frio	Medina	
Bexar Met Water District	Atascosa	Bexar	Comal	Medina
County Line WSC	Caldwell	Hays		
Creedmoor-Maha WSC	Caldwell	Hays		
Crystal Clear WSC	Comal	Guadalupe	Hays	
East Central WSC	Bexar	Guadalupe	Wilson	
El Oso WSC	Karnes	Wilson		
Fairoaks Ranch	Bexar	Comal	Kendall	
Goforth WSC	Caldwell	Hays		
Gonzales County WSC	Caldwell	DeWitt	Gonzales	
Green Valley SUD	Bexar	Comal	Guadalupe	
Lytle	Atascosa	Bexar	Medina	
Martindale WSC	Caldwell	Guadalupe		
Maxwell WSC	Caldwell	Hays		
McCoy WSC	Atascosa	Wilson		
New Braunfels	Comal	Guadalupe		
Niederwald	Caldwell	Hays		
Schertz	Bexar	Comal	Guadalupe	
Selma	Bexar	Comal	Guadalupe	
Sunko WSC	Karnes	Wilson		
Water Ser Inc.	Bexar	Comal	Guadalupe	Kendall

4A.1.1 Municipal WUGs with Needs

By the year 2060, there are over 60 municipal WUGs with a projected need (shortage). The total municipal need for the region in 2030 is 185,609 acft/yr, increasing to 310,434 acft/yr in 2060 (Table 4A-1). Thirteen counties (Atascosa, Bexar, Caldwell, Calhoun, Comal, Gonzales, Guadalupe, Hays, Karnes, Kendall, Medina, Uvalde, and Wilson) are projected to have at least one WUG with a municipal need (shortage) during the planning period, as shown in Figure 4A-1.

4A1.2 Industrial WUGs with Needs

The total industrial need for the region in 2030 is 10,141 acft, increasing to 28,282 acft in 2060 (Table 4A-1). Three counties (Bexar, Comal, and Victoria) are projected to have an industrial need (shortage) during the planning period, as shown in Figure 4A-2.

4A.1.3 Steam-Electric WUGs with Needs

The total steam-electric need for the region in 2030 is 12,526 acft, increasing to 38,153 acft in 2060 (Table 4A-1). Four counties (Atascosa, Goliad, Guadalupe, and Hays) are projected to have a steam-electric need (shortage) during the planning period, as shown in Figure 4A-3.

4A.1.4 Mining WUGs with Needs

The total mining need for the region in 2030 is 3,254 acft, increasing to 4,030 acft in 2060 (Table 4A-1). Three counties (Bexar, Comal, and Hays) are projected to have a mining need (shortage) during the planning period, as shown in Figure 4A-4.

4A.1.5 Irrigation WUGs with Needs

The total irrigation need for the region in 2030 is 44,602 acft, decreasing to 35,635 acft in 2060 (Table 4A-1). Five counties (Atascosa, Bexar, Kendall, Medina, and Zavala) are projected to have an irrigation need (shortage) during the planning period, as shown in Figure 4A-5.

4A.1.6 Livestock WUGs with Needs

The total livestock need for the region in 2030 is 298 acft, increasing to 321 acft in 2060 (Table 4A-1). Four counties (Bexar, Comal, Hays, and Kendall) are projected to have a livestock need (shortage) during the planning period, as shown in Figure 4A-6.

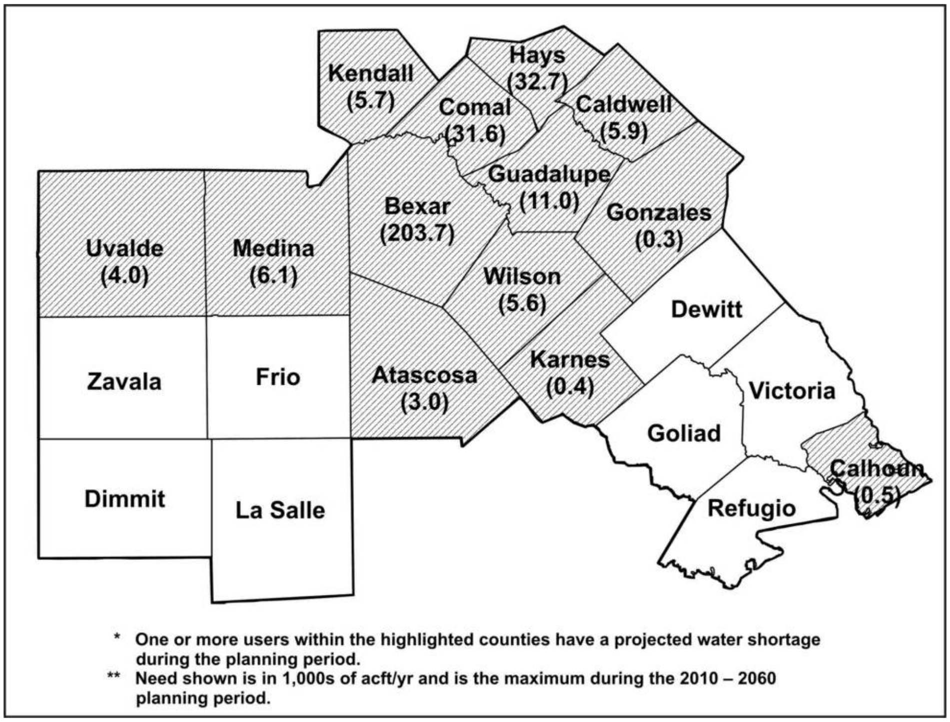

Figure 4A-1. Municipal Water Needs

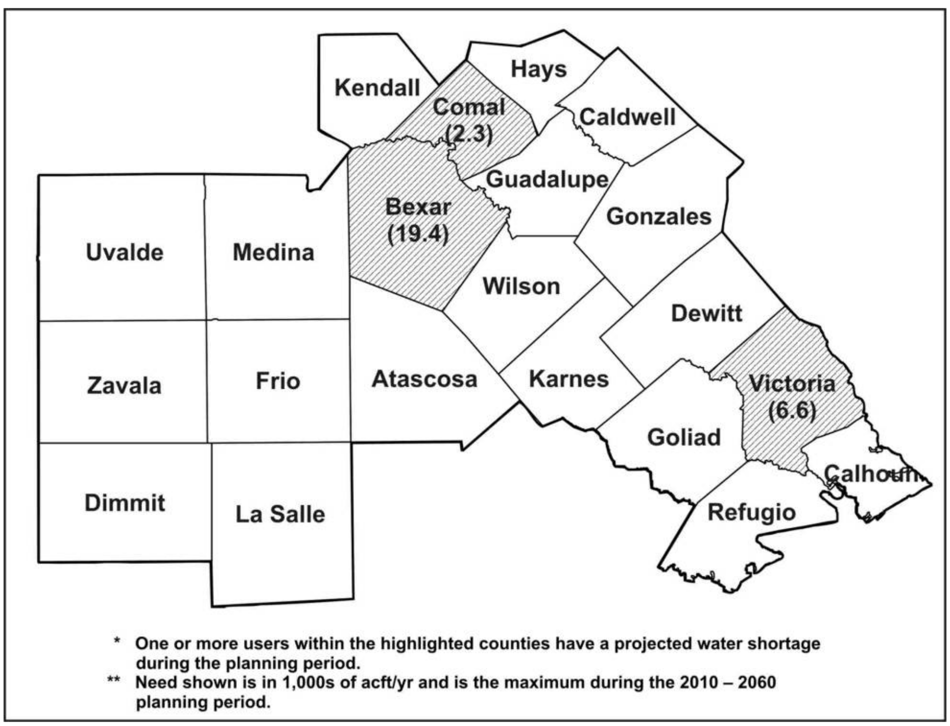

Figure 4A-2. Industrial Water Needs

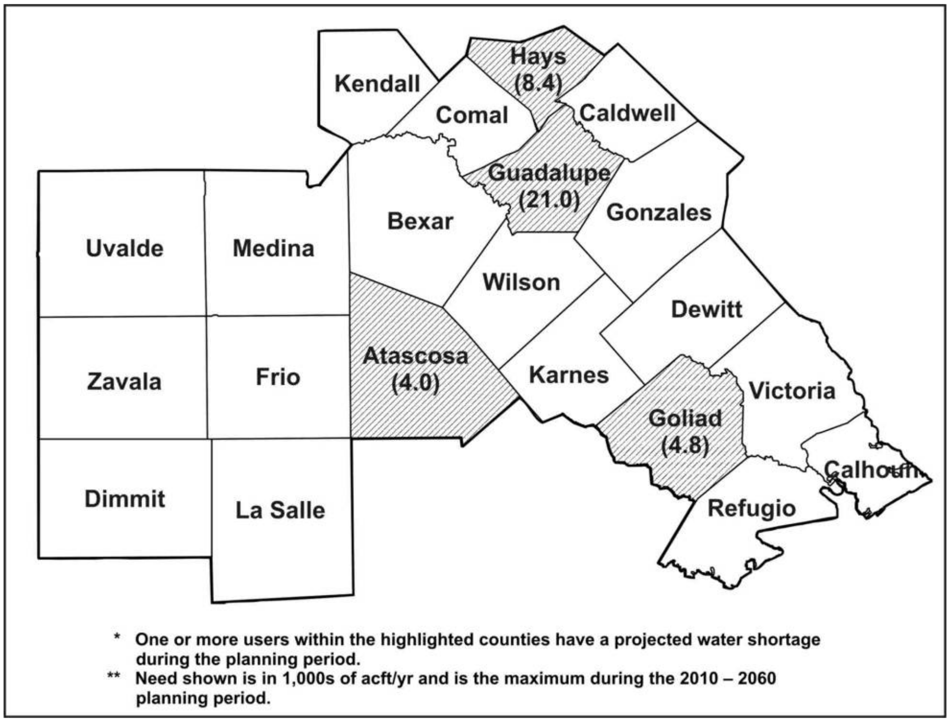

Figure 4A-3. Steam-Electric Water Needs

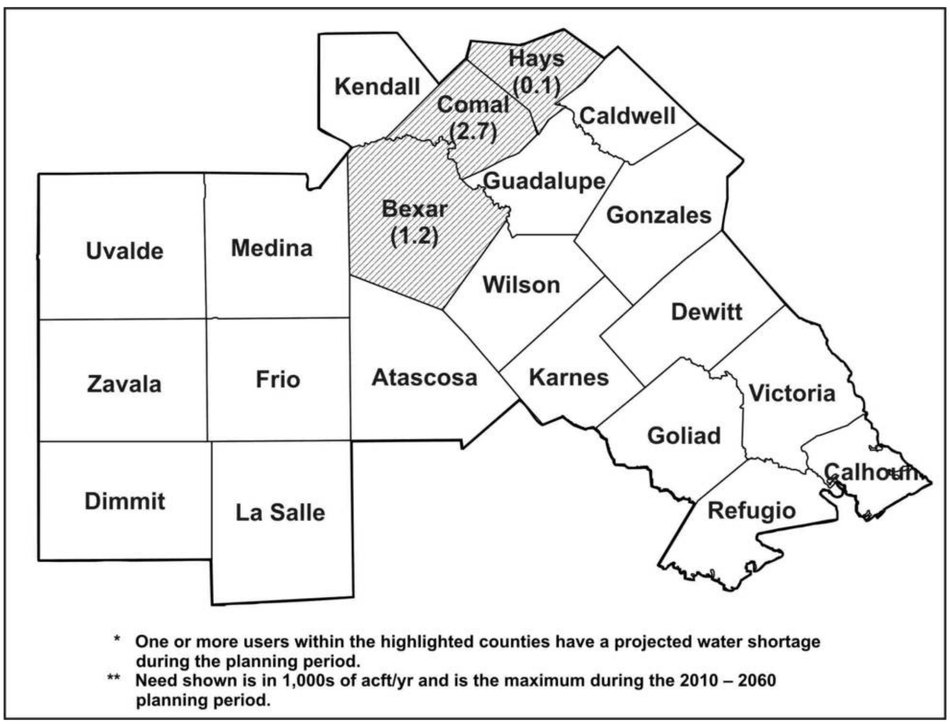

Figure 4A-4. Mining Water Needs

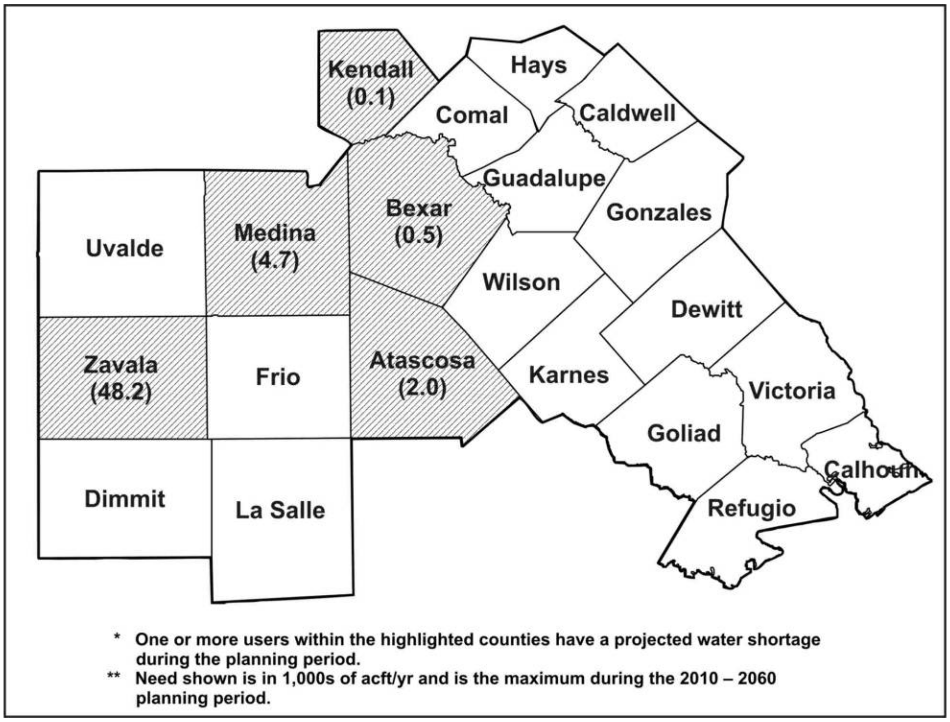

Figure 4A-5. Irrigation Water Needs

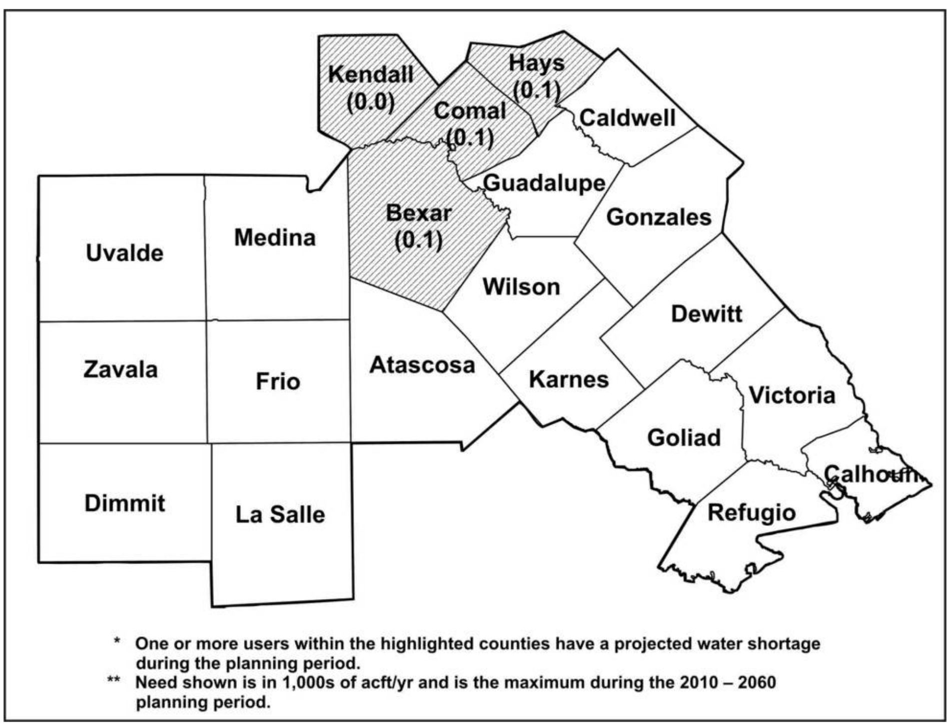

Figure 4A-6. Livestock Water Needs

4A.2 Water Needs Projections by Wholesale Water Provider

A summary of projected water demands, existing supplies, and needs (shortages) for each Wholesale Water Provider (WWP) in the South Central Texas planning region is provided in Table 4A-3. Projected water demands for each WWP are estimated on the basis of existing and/or future contracts with water user groups (WUGs) expected to continue receiving water or acquire new water supplies from the WWP. Supplies for each WWP are determined in accordance with procedures and assumptions described in Section 3 and are identified by source in Table 4A-3. The Regional Water Provider for Bexar County (RWPBC), San Antonio Water System (SAWS), Bexar Metropolitan Water District (BMWD), Canyon Regional Water Authority (CRWA), and Schertz-Seguin Local Government Corporation (SSLGC) each have projected needs for additional water supply throughout the planning period. The Guadalupe-Blanco River Authority (GBRA) and Springs Hill WSC (SHWSC), on the other hand, have existing supplies in excess of projected demands throughout the planning period. These existing supplies in excess of projected demand are identified in Table 4A-3 as System Management Supplies. While GBRA does not show projected needs overall (due to System Management Supplies in the lower basin), it is important to note that needs are projected in the upper- and mid-basin portions of the GBRA district presently served by Canyon Reservoir and run-of-river rights on the San Marcos River.

Table 4A-3. Water Demands, Supplies, and Needs (Shortages) by Wholesale Water Providers

Regional Water Provider for Bexar County (RWPBC)

Projected Demands:

Water Purchaser	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Bexar Metropolitan Water District (BMWD)			4,000	4,000	4,000	4,000	4,000
Selma			1,000	1,000	1,000	1,000	1,000
County-Other (Bexar)				200	200	200	200
Mining (Bexar)				1,300	1,300	1,300	1,300
Total Demand	**0**	**0**	**5,000**	**6,500**	**6,500**	**6,500**	**6,500**

Supply:

Source	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Total Supply	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Projected Needs:

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Needs	0	0	5,000	6,500	6,500	6,500	6,500

San Antonio Water System (SAWS)

Projected Demands:

Water Purchaser	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Balcones Heights	480	514	555	578	600	633	670
China Grove	288	376	457	531	591	645	695
Elmendorf	99	112	123	132	140	148	156
Helotes	845	1,537	2,249	2,820	3,264	3,679	4,047
Leon Valley	407	397	388	382	375	372	377
Olmos Park	381	403	424	441	452	468	484
San Antonio	166,813	192,007	213,943	234,865	250,671	265,958	281,204
Terrell Hills	815	863	914	956	983	1,018	1,057
East Central WSC	2,240	0	0	0	0	0	0
East Central WSC (Palm Park)	1,120	1,120	1,120	0	0	0	0
Rural	5,595	5,661	5,747	5,796	5,796	5,884	6,012
Industrial (Bexar County)	7,723	12,000	16,000	18,000	22,000	30,000	30,000
Total Demand	**186,806**	**214,990**	**241,920**	**264,501**	**284,872**	**308,805**	**324,702**

Supply:

Source	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Edwards Aquifer	116,931	116,931	116,931	116,931	116,931	116,931	116,931
Carrizo Aquifer	6,400	6,400	6,400	5,400	5,327	5,256	5,195
Direct Reuse	26,717	26,717	26,717	26,717	26,717	26,717	26,717
GBRA (Canyon Reservoir)	0	7,500	5,500	4,000	0	0	0
Total Supply *	**150,048**	**157,548**	**155,548**	**153,048**	**148,975**	**148,904**	**148,843**

Projected Needs:

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Needs *	36,758	57,442	86,372	111,453	135,897	159,901	175,859

* Supplies could be up to 5,000 acft/yr greater (and needs up to 5,000 acft/yr less) as they do not include existing Trinity Aquifer supplies. As indicated in Table 3-1, the Trinity-Glen Rose GCD Management Plan was adopted after completion of the needs assessment for the 2006 regional plan.

Continued on Next Page

Table 4A-3 (Continued)

Bexar Metropolitan Water District (BMWD)

Projected Demands:

Water Purchaser	Year (acft)						
	2000	2010	2020	2030	2040	2050	2060
Bexar Met Water District (Atascosa County)	389	505	621	715	780	843	895
Bexar Met Water District (Bexar County)	8,794	8,897	9,032	9,109	9,110	9,248	9,449
Bexar Met Water District (Comal County)	230	462	748	1,059	1,344	1,654	2,001
Bexar Met Water District (Medina County)	15	24	33	41	47	54	60
Castle Hills	838	820	807	793	780	771	771
Hill Country Village	842	838	835	831	828	826	826
Hollywood Park	2,229	2,314	2,389	2,458	2,511	2,565	2,616
San Antonio	21,419	24,654	27,471	30,157	32,187	34,150	36,107
Somerset	321	405	484	552	609	660	709
East Central WSC	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Converse	0	1,500	1,500	1,500	1,500	1,500	1,500
Live Oak	0	1,000	1,000	1,000	1,000	1,000	1,000
Total Demand	**36,477**	**42,819**	**46,320**	**49,615**	**52,096**	**54,671**	**57,334**

Supply:

Source	Year (acft)						
	2000	2010	2020	2030	2040	2050	2060
Run-of-River (Medina River)	4,531	4,531	4,531	4,531	4,531	4,531	4,531
CRWA (Canyon Reservoir)	4,000	4,000	0	0	0	0	0
Trinity Aquifer (Bexar & Comal Counties)	158	158	158	158	158	150	151
Carrizo Aquifer (Bexar County)	1,000	1,000	1,000	776	767	757	749
Medina Lake System	0	0	0	0	0	0	0
Edwards Aquifer	12,887	12,887	12,887	12,887	12,887	12,887	12,887
Total Supply	**22,576**	**22,576**	**18,576**	**18,352**	**18,343**	**18,325**	**18,318**

Projected Needs:

	Year (acft)						
	2000	2010	2020	2030	2040	2050	2060
Needs	13,901	20,243	27,744	31,263	33,753	36,346	39,016

Guadalupe-Blanco River Authority (GBRA)

Projected Demands (acft/yr):

Water Purchaser	Basin Location	Year (acft)						
		2000	2010	2020	2030	2040	2050	2060
Municipal (Canyon Reservoir)								
Upper Basin - At or above Canyon Reservoir								
Canyon Lake WSC	U	4,000	4,000	4,769	6,838	8,898	11,034	13,331
City of Blanco	U	600	600	600	600	600	600	600
Domestic Contracts	U	25	25	25	25	25	25	25
Rebecca Creek MUD	U	130	130	130	130	130	130	130
Wimberley WSC	U	0	177	400	628	847	1,248	1,479
Woodcreek & Woodcreek Utilities	U	0	593	1,059	1,549	2,027	2,691	3,157
WW Sports	U	1	1	1	1	1	1	1
Yacht Club	U	4	4	4	4	4	4	4
Bulverde (Western Canyon)	U	0	1,053	1,742	2,528	3,310	4,123	4,995
City of Boerne (Western Canyon)	U	0	650	1,300	1,884	2,410	2,953	3,403
City of Fair Oaks Ranch (Western Canyon)	U	0	1,200	1,300	1,400	1,400	1,400	1,400
Comal County-Other (Western Canyon)	U	0	876	955	1,064	1,161	1,343	1,494
Cordillera Ranch (Western Canyon)	U	0	366	660	1,000	1,000	1,000	1,000
DH Invest.-Johnson Ranch (Western Canyon)	U	0	45	400	400	400	400	400
Kendall & Tapatio (Western Canyon)	U	0	366	500	500	500	500	500
Kendall County-Other (Western Canyon)	U	0	221	865	1,612	2,527	3,385	4,163

Continued on Next Page

Table 4A-3 (Continued)

Guadalupe-Blanco River Authority (GBRA) (Continued)								
SARA (Western Canyon)	U	0	0	50	50	0	0	0
SAWS (Western Canyon)	U	0	7,500	5,500	4,000	0	0	0
Western Canyon Sub-Total		*0*	*12,277*	*13,272*	*14,438*	*12,708*	*15,104*	*17,355*
Total Upper Basin Municipal (Canyon Reservoir)		**4,760**	**17,807**	**20,260**	**24,213**	**25,240**	**30,837**	**36,082**
Mid Basin								
Canyon Regional Water Authority (In district after 2018)	M	10,025	10,025	10,025	10,025	10,025	10,025	10,025
NBU + 50% of Comal County-Other	M	6,720	7,687	9,136	12,382	15,586	18,979	22,688
City of Seguin	M	3,000	2,000	2,000	2,000	2,000	2,000	2,000
Dittmar, Gary	M	5	5	5	5	5	5	5
Dittmar, Ray	M	5	5	5	5	5	5	5
Gonzales County WSC	M	700	700	700	700	700	700	700
Green Valley SUD	M	200	200	300	300	700	700	700
Springs Hill WSC	M	2,500	2,500	2,500	2,500	2,500	2,500	2,500
CRWA (Hays/Caldwell or San Marcos WTP)	M	2,038	2,038	2,038	2,038	2,038	2,038	2,038
City of Buda (San Marcos WTP)	M	1,120	1,120	1,120	1,120	1,120	1,120	1,120
City of Kyle (San Marcos WTP)	M	589	2,957	3,177	3,454	3,614	4,111	4,111
City of Mustang Ridge (San Marcos WTP)	M	0	19	62	99	137	175	213
City of Niederwald (San Marcos WTP)	M	0	35	95	160	221	294	354
Plum Creek WC (San Marcos WTP)	M	0	0	73	274	479	738	941
City of San Marcos (San Marcos WTP)	M	5,000	5,000	10,000	10,000	10,000	10,000	10,000
County Line WSC (Hays/Caldwell or San Marcos WTP)	M	0	0	500	1,000	1,000	1,000	1,000
Crystal Clear WSC (Hays/Caldwell or San Marcos WTP)	M	800	800	800	1,300	1,800	1,800	1,800
Maxwell WSC (Hays/Caldwell or San Marcos WTP)	M	0	0	0	100	400	500	700
Martindale WSC (Hays/Caldwell or San Marcos WTP)	M	0	0	0	0	50	50	50
Goforth WSC (San Marcos WTP)	M	250	1,000	1,000	1,500	2,000	2,500	3,000
Hays County-Other (San Marcos WTP)	M	0	4,480	4,480	4,480	4,480	4,480	4,480
San Marcos WTP Sub-Total		*9,797*	*17,449*	*23,345*	*25,525*	*27,339*	*28,806*	*29,807*
Total Mid Basin Municipal (Canyon Reservoir)		**32,952**	**40,571**	**48,016**	**53,442**	**58,860**	**63,720**	**68,430**
Lower Basin								
Calhoun County Rural WSC	L	500	500	500	500	500	500	500
City of Port Lavaca	L	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Port O'Conner MUD	L	60	60	60	60	60	60	60
Total Lower Basin Municipal (Canyon Reservoir)		**2,060**	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**
Industrial/Steam-Electric (Canyon Reservoir)								
Upper Basin								
Harris Road Company	**U**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Mid Basin (Includes no new commitments for Steam-Electric supply)								
Acme	M	25	25	25	25	25	25	25
Boehm (Pecan Dr.)	M	1	1	1	1	1	1	1
Comal Fair	M	1	1	1	1	1	1	1
Comal Road Department	M	3	3	3	3	3	3	3
GPP (Panda Energy)	M	6,840	6,840	5,720	5,720	5,720	5,720	5,720
Guadalupe County	M	1	1	1	1	1	1	1
Hays Energy LP	M	2,464	2,464	2,464	2,464	2,464	2,464	2,464
SMI	M	700	700	700	700	700	700	700
Std. Gypsum	M	258	258	258	258	258	258	258
Total Mid Basin Industrial/SE (Canyon Reservoir)		**10,293**	**10,293**	**9,173**	**9,173**	**9,173**	**9,173**	**9,173**
Lower Basin								
Coleto Creek	L	4,000	4,000	6,000	6,000	6,000	6,000	6,000
BP Chemical	L	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Seadrift Coke	L	334	334	334	334	334	334	334
UCC	L	100	100	100	100	100	100	100

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Table 4A-3 (Continued)

Guadalupe-Blanco River Authority (GBRA) (Continued)								
Total Lower Basin Industrial/SE (Canyon Reservoir)		**5,534**	**5,534**	**7,534**	**7,534**	**7,534**	**7,534**	**7,534**
Irrigation (Canyon Reservoir)								
Irrigation Contracts	**U**	**173**	**173**	**173**	**173**	**173**	**173**	**173**
Irrigation Contracts	**M**	**736**	**736**	**736**	**736**	**736**	**736**	**736**
Canyon Reservoir Total		**56,514**	**77,180**	**87,958**	**97,337**	**103,782**	**114,239**	**124,194**
Mid-Basin Municipal (Run-of-River)								
Lockhart	M	1,120	1,120	1,120	1,120	1,120	1,120	1,120
Luling	M	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Mid-Basin Municipal (Run-of-River) Total		**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**
Lower Basin Municipal (Run-of-River)								
Calhoun County Rural WSC	L	1,000	1,000	1,000	1,000	1,000	1,000	1,000
City of Victoria (pursuant to Canyon Amendment)	L	1,240	1,240	1,240	1,240	1,240	1,240	1,240
Port Lavaca	L	2,980	2,980	2,980	2,980	2,980	2,980	2,980
Port O'Conner MUD	L	1,060	1,060	1,060	1,060	1,060	1,060	1,060
Total Lower Basin Municipal (Run-of-River)		**6,280**	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**
Lower Basin Industrial/SE (Run-of-River)								
BP Chemical	L	2,200	2,200	2,200	2,200	2,200	2,200	2,200
Coleto Creek	L	0	0	0	0	0	2,010	4,842
Seadrift Coke	L	666	666	666	666	666	666	666
Victoria County Industry	L	0	0	0	0	1,008	3,624	6,566
UCC	L	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Other Existing & New Industry	L	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Total Lower Basin Industrial/SE (Run-of-River)		**42,866**	**42,866**	**42,866**	**42,866**	**43,874**	**48,500**	**54,274**
Lower Basin Irrigation (Run-of-River)								
Irrigation Agreements (Includes Losses)	**L**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**
Lower Basin (Run-of-River) Total		**75,146**	**75,146**	**75,146**	**75,146**	**76,154**	**80,780**	**86,554**
Total Demand		**134,460**	**155,126**	**165,904**	**175,283**	**182,736**	**197,819**	**213,548**
Total Upper Basin Demand	U	4,939	17,986	20,439	24,392	25,419	31,016	36,261
Total Mid Basin Demand	M	46,781	54,400	60,725	66,151	71,569	76,429	81,139
Total Lower Basin Demand	L	82,740	82,740	84,740	84,740	85,748	90,374	96,148
Total Demand		**134,460**	**155,126**	**165,904**	**175,283**	**182,736**	**197,819**	**213,548**

Supply (acft/yr):

		Year (acft)						
Source		***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Canyon Reservoir		88,232	88,107	87,982	87,857	87,732	87,607	87,484
Mid-basin Rights		193	193	193	193	193	193	193
Lower Basin Rights		150,057	150,057	150,057	150,057	150,057	150,057	150,057
Total Supply		**238,482**	**238,357**	**238,232**	**238,107**	**237,982**	**237,857**	**237,734**

Projected Management Supplies (Needs) (acft/yr):

		Year (acft)						
		2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Canyon Management Supplies/(Needs)		31,718	10,927	24	(9,480)	(16,050)	(26,632)	(36,710)
Mid Basin Run-of-River Management Supplies/(Needs)		(2,607)	(2,607)	(2,607)	(2,607)	(2,607)	(2,607)	(2,607)
Lower Basin Run-of-River Management Supplies/(Needs)		74,911	74,911	74,911	74,911	73,903	69,277	63,503
Total System Management Supplies / (Needs)		**104,022**	**83,231**	**72,328**	**62,824**	**55,246**	**40,038**	**24,186**

U = Upper = At or above Canyon Dam
M = Mid = Below Canyon Dam to Above Victoria
L = Lower = At or below Victoria

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Table 4A-3 (Continued)

Canyon Regional Water Authority (CRWA)

Projected Demands:

Water Purchaser	*Year (acft)*						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Bexar Met Water District	4,000	5,500	6,600	7,500	7,500	7,500	7,500
City of Cibolo	800	866	2,800	2,800	2,800	2,800	2,800
County Line WSC	1,267	1,267	1,767	1,767	2,267	2,267	2,267
East Central WSC	1,400	1,400	1,400	551	795	1,016	1,242
Green Valley SUD	1,800	1,800	5,600	6,000	6,400	7,200	8,000
City of La Vernia	0	0	0	0	0	8	114
City of Marion	100	100	100	113	128	148	170
Martindale	158	158	158	158	158	158	158
Martindale WSC	288	288	288	288	288	288	288
Springs Hill WSC	1,925	1,925	1,925	1,925	1,925	1,925	1,925
SS WSC	0	0	0	0	0	0	690
City of Santa Clara (served by Green Valley SUD)	0	100	300	400	500	700	900
Guadalupe County-Other	56	48	37	25	15	7	0
Maxwell WSC	867	867	867	867	867	867	867
Crystal Clear WSC	382	382	382	382	382	882	882
Total Demand	**13,043**	**14,701**	**22,224**	**22,776**	**24,025**	**25,766**	**27,803**

Supply:

Source	*Year (acft)*						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
GBRA - Lake Dunlap	10,025	10,025	10,025	10,025	10,025	10,025	10,025
GBRA - Hays/Caldwell	2,038	2,038	2,038	2,038	2,038	2,038	2,038
Water Right Leases	924	924	924	924	924	924	924
Total Supply	**12,987**	**12,987**	**12,987**	**12,987**	**12,987**	**12,987**	**12,987**

Projected Needs:

	Year (acft)						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Needs	56	1,714	9,237	9,789	11,038	12,779	14,816

Schertz-Seguin Local Government Corporation (SSLGC)

Projected Demands:

Water Purchaser	*Year (acft)*						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Schertz	5,420	5,420	5,444	6,055	7,542	9,233	11,041
Seguin	5,420	5,420	5,718	6,454	7,203	8,069	9,047
Selma	800	1,500	1,500	1,500	1,500	1,500	1,500
Springs Hill WSC	560	560	560	560	560	560	560
Universal City	800	800	800	800	800	800	800
Green Valley SUD	0	200	500	500	500	500	500
Crystal Clear WSC	0	0	300	600	900	900	900
Garden Ridge	0	170	252	346	440	537	644
Total Demand	**13,000**	**14,070**	**15,074**	**16,815**	**19,445**	**22,099**	**24,992**

Supply:

Source	*Year (acft)*						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Carrizo Aquifer (Gonzales County)[1]	12,200	12,200	12,200	12,200	12,200	12,200	12,200
Total Supply	**12,200**	**12,200**	**12,200**	**12,200**	**12,200**	**12,200**	**12,200**

[1] Permitted production as of August 2004.

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Table 4A-3 (Concluded)

Schertz-Seguin Local Government Corporation (SSLGC) (Continued)

Projected Needs:

	Year (acft)						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Needs	800	1,870	2,874	4,615	7,245	9,899	12,792

Springs Hill Water Supply Corporation (SHWSC)

Projected Demands:

	Year (acft)						
Water Purchaser	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Springs Hill WSC	2,076	2,349	2,679	3,056	3,424	3,849	4,330
La Vernia (via CRWA)	400	400	400	400	400	400	400
Crystal Clear WSC	250	250	250	250	250	250	250
East Central WSC (via CRWA)	385	385	385	385	385	385	385
Total Demand	**3,111**	**3,384**	**3,714**	**4,091**	**4,459**	**4,884**	**5,365**

Supply:

	Year (acft)						
Source	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
GBRA (Canyon Reservoir)	2,500	2,500	2,500	2,500	2,500	2,500	2,500
CRWA (Canyon Reservoir)	1,925	1,925	1,925	1,925	1,925	1,925	1,925
Carrizo Aquifer (Guadalupe County)	1,605	1,605	1,605	1,605	1,605	1,605	1,605
Carrizo Aquifer (Gonzales County) (SSLGC)	560	560	560	560	560	560	560
Total Supply	**6,590**	**6,590**	**6,590**	**6,590**	**6,590**	**6,590**	**6,590**

Projected Management Supplies / (Needs):

	Year (acft)						
	2000	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
System Management Supplies / (Needs)	3,479	3,206	2,876	2,499	2,131	1,706	1,225

4A.3 Social and Economic Impacts of Not Meeting Projected Water Needs

Section 357.7(4) of the rules for implementing Senate Bill 1 requires that the social and economic impacts of not meeting regional water supply needs be evaluated by the SCTRWPG. TWDB is required to provide technical assistance, upon request, to complete the evaluations. SCTRWPG requested technical assistance of TWDB to perform the required analyses. TWDB conducted the required analysis of the impacts of the identified needs for the South Central Texas Region using the same methodology that was used for all other regions.

The purpose of this element of Senate Bill 1 planning is to provide an estimate of the social and economic importance of meeting projected water needs or, conversely, provides estimates of potential costs of not meeting projected needs of each water user group. The social and economic effects of not meeting a projected water need can be viewed as the potential benefit to be gained from implementing a strategy to meet the particular need. The summation of all the impacts gives a view of the ultimate magnitude of the impacts caused by not meeting all of the projected needs.

The projected total water demands for the South Central Texas Region increase from 896,250 acft/yr in 2000 to 1.10 million acft/yr in 2030, and 1.27 million acft/yr in 2060 (Table 2-10). Under historic drought of record water supply conditions, and with no water management strategies in place, water shortages amount to 156,596 acft/yr in 2010, increasing to 256,430 acft/yr in 2030 and to 416,855 acft/yr by 2060 (Table 4A-1).

The water needs (shortages) of the region amount to about 16 percent of the projected demand by 2010, increasing to 23 percent in 2030, and to 32 percent in 2060. This means that by 2060 the region would be able to supply only 68 percent of the projected water demands unless supply development or other water management strategies are implemented.

The SCTRWPG identified 87 individual WUGs that showed an unmet need during drought-of-record supply conditions (Table 4A-1). Of the 21 counties of the South Central Texas Region, 16 have water user groups with projected water needs (shortages). The water user groups having projected water needs, together with the quantities of projected needs (shortages), are listed by county and river basin of location in the region (Table 4A-1). For example, the projected municipal needs for the City of Lytle (Atascosa County) are 196 acft/yr in 2010, 217 acft/yr in 2030, and 243 acft/yr in 2060 (Table 4A-1). The projected needs for irrigation in Atascosa County are 1,961 acft/yr in 2000, 1,022 acft/yr in 2020, and 0 acft/yr after

2030 (Table 4A-1). The total projected need for Atascosa County in 2060 is 6,928 acft/yr (Table 4A-1). The projected quantities of water needed (shortages) for each of the other WUGs of each county can be viewed in Table 4A-1).

The detailed results of the social and economic analyses of not meeting the projected water needs (shortages) are shown in Appendix E, Tables B-1 through B-8 for counties, and Appendix E, Tables C-1 through C-6 for River Basins. Each water user group with a need is evaluated in terms of effects upon gross business, personal income, tax payments to governments, employment, population, and school enrollment (Appendix E).[1] The total regional effects upon gross business, personal income, tax payments to governments, employment, population and school enrollment are summarized below.

4A.3.1 Gross Business Value

The estimated effect of water shortages projected for the South Central Texas Region upon gross value of business, which includes the direct and indirect effects, are $910.48 million per year in 2010, $4.7 billion per year in 2030, and $10.8 billion per year in 2060 (Table 4A-4). The estimates pertain to value of business, income, and taxes at each of the projections points, but do not include the effects upon property values. The economic impact of unmet water needs varies depending on the water user group for which the shortage is projected. The largest impacts result from shortages in manufacturing and municipal uses, which includes water intensive commercial establishments, while shortages for irrigation typically result in the smallest impact.

4A.3.2 Employment and Personal Income Effects

Failure to meet the projected water needs would result in an estimated loss of personal income of $664.22 million in 2010, $2.26 billion in 2030, and $5.47 billion in 2060 (Table 4A-4).

The largest percentage of the personal income impacts of unmet water needs in the South Central Texas Region results from manufacturing water shortages in 2030 and beyond (Table 4A-4). In 2030, manufacturing projected unmet needs are 10,141 acft—4 percent of the total unmet needs, but result in $1.25 billion(55 percent of total) in lost personal income (Table 4A-4). The impact of not meeting manufacturing needs increases with each decade. In

[1] Norvell, Stuart, and Kevin Kluge, "Socioeconomic Impacts of Unmet Water Needs in the South Central Water Planning Area," Texas Water Development Board, Austin, Texas, April 2005.

2010, manufacturing has unmet needs of 6,804 acft, 3.2 percent of the total unmet needs. In 2060, unmet manufacturing needs are 28,282 acft (6.7 percent of the total) resulting in $$7.3 billion in lost output (67.8 percent of the total output impact) (Table 4A-4).

By 2060, unmet municipal needs total 310,434 acft (74 percent of the total) resulting in 46,900 jobs not created, reductions of $3.0 billion in potential output in the commercial sector, and $2.67 billion (55 percent of the 2060 total) in potential income effects (lost wages, salaries, benefits, and increased costs to operate households due to water shortages) (Table 4A-4).

In 2010, irrigation has unmet needs of 55,109 acft, 35 percent of the total. The economic impacts of the shortage is $19.30 million in output, and $$10.61 million in income) represents 1.6 percent of the total economic impact in 2010 (Table 4A-4).

If the water needs are left entirely unmet, the level of shortage in 2010 results in 10,200, fewer jobs than would be expected if the water needs of 2010 are fully met. The gap in job growth due to water shortages grows to 34,230, by 2030 and to 97,940 by 2060.

The potential loss of $910.48 billion in production in the region in 2010 amounts to about $664 million less income to people in 2010. The potential loss of production valued at $10.81 billion in 2060, results in income losses of $5.47 billion in 2060 (Table 4A-4).

4A.3.3 Tax Effects

The economic effects of unmet water needs in 2010 upon tax payments to units of local, state, and federal governments is $32.34 million, in 2030 is $118.08 million, and in 2060 is $335.18 million (Table 4A-4).

Table 4A-4.
Socioeconomic Impacts of Unmet Water Needs
South Central Texas Region

Impacts	*Units*	*Years*					
		2010	*2020*	*2030*	*2040*	*2050*	*2060*
Projected Water Needs (Shortages)[1]	**acft**	**156,596**	**207,337**	**256,430**	**306,175**	**360,055**	**416,855**
Gross Business Sales – Annual							
Manufacturing	$ million	300.61	1,257.80	3,729.51	4,955.18	6,101.83	7,338.59
Commercial (Water Intensive)	$ million	250.95	289.12	348.03	439.96	1,709.90	2,427.45
Horticulture Industry	$ million	90.64	133.74	175.00	207.28	234.11	259.70
Utility Revenues Lost	$ million	108.64	156.06	174.55	242.13	281.50	322.26
Steam-Electric Power	$ million	27.51	91.28	120.66	160.44	212.19	293.99
Mining	$ million	112.83	119.77	132.39	137.74	150.94	152.36
Irrigation	$ million	19.30	18.11	17.73	17.32	16.90	16.47
Total	**$ million**	**910.48**	**2,065.88**	**4,697.87**	**6,160.05**	**8,707.37**	**10,810.82**
Personal Income – Annual							
Manufacturing	$ million	100.55	420.72	1,247.50	1,661.42	2,067.52	2,503.77
Commercial (Water Intensive)	$ million	145.15	166.86	201.49	258.53	986.74	1,402.69
Horticulture Industry	$ million	58.69	86.60	113.31	134.21	151.58	168.15
Utilities (Not applicable)	$ million						
Steam-Electric Power	$ million	18.53	61.47	81.26	108.02	142.81	197.67
Mining	$ million	64.12	68.07	75.23	78.11	85.58	86.36
Irrigation	$ million	10.61	9.98	9.76	9.54	9.31	9.07
HH & Commercial (non-water Int)[2]	costs $ m	265.78	360.09	527.98	727.99	906.30	1,107.42
Livestock	costs $ m	0.79	0.80	1.35	1.38	1.48	1.50
Total	**$ million**	**664.22**	**1,174.59**	**2,257.88**	**2,979.20**	**4,351.32**	**5,476.63**
Taxes Not Paid – Annual							
Manufacturing	$ million	5.72	23.92	70.93	94.32	115.85	139.13
Commercial (Water Intensive)	$ million	14.82	17.06	20.53	25.93	101.08	143.50
Horticulture Industry	$ million	1.93	2.84	3.72	4.41	4.98	5.52
Utilities Taxes Lost	$ million	1.91	2.75	3.07	4.26	4.95	5.67
Steam-Electric Power	$ million	3.32	11.01	14.56	19.35	25.58	35.41
Mining	$ million	3.88	4.12	4.55	4.78	5.24	5.30
Irrigation	$ million	0.76	0.72	0.70	0.69	0.67	0.65
Total	**$ million**	**32.34**	**62.42**	**118.06**	**153.74**	**258.35**	**335.18**

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Table 4A-4 (Concluded)

Impacts	*Units*	*Years*					
		2010	*2020*	*2030*	*2040*	*2050*	*2060*
Jobs Lost – Annual							
Manufacturing	Number	1,710	7,170	21,250	28,310	34,880	41,990
Commercial (Water Intensive)	Number	4,870	5,600	6,770	8,710	32,990	46,900
Horticulture Industry	Number	2,290	3,380	4,420	5,235	5,910	6,560
Steam-Electric Power	Number	100	345	450	600	785	1,050
Mining	Number	760	810	900	930	1,020	1,030
Irrigation	Number	470	445	440	430	420	410
Total	**Number**	**10,200**	**17,750**	**34,230**	**44,215**	**76,005**	**97,940**
Population Losses/Unemployment[3]	**Number**	**14,230**	**25,080**	**49,180**	**62,970**	**107,830**	**138,890**
Declines in School Enrollment[3]	**Number**	**3,620**	**6,370**	**12,490**	**15,990**	**27,390**	**35,280**
Population Without Water[4]	**Number**	**562,264**	**871,226**	**1,165,034**	**1,460,220**	**1,706,040**	**1,954,807**
School Enrollment/Population WoW[4]	**Number**	**143,036**	**221,280**	**295,878**	**370,794**	**433,353**	**496,548**

[1] See Table 4A-2 for water needs by county by type of water use, and Region L Totals.
[2] Individual Households and Non-water Intensive Commercial Establishments.
[3] Population and associated school enrollment losses due to jobs lost from unmet water needs.
[4] Population and associated school enrollment for case of unmet municipal water needs, with population projections of the Region L Water Plan.

Source: "Socioeconomic Impacts of Unmet Water Needs in the South Central Water Planning Area," TWDB, April 2005.

4A.3.4 Population

The projected population growth of the region would be restricted by curtailed potential job creation. This would result in out-migration of some current population, reduced in-migration, and reduced future population growth. The region could expect 14,230 fewer people in 2010, 49,180 fewer in 2030, and 138,890 fewer in 2060 due to the employment or unemployment effects of unmet water needs (Table 4A-4). In addition, it is estimated that in 2010 there would be an additional 562,264 people for which there would be unmet water needs, in 2030 the number of people for which there would be no municipal water is 1,165,034, and in 2060 the number is 1,954,807 (Table 4A-4).[2]

[2] Estimated by HDR Engineering, Inc. based upon the projected municipal water needs (shortages) as a percent of projected municipal water demand, and applying these percentages to projected population. For estimates of school age numbers, used same ratio as was used for the case of population losses due to employment effects of unmet water needs.

4A.3.5 School Enrollment

School enrollment is related to the size of the population of childbearing age, which is dependent upon employment, as mentioned above. Failure to meet the projected water needs of the region, such that employment opportunities are affected, would result in lower population and reduced school enrollment. School enrollment estimates for the region, as a result of population losses due to unemployment resulting from unmet water needs are 3,620 less in 2010, 12,490 less in 2030, and 35,280 less in 2060 than if the projected water needs are met (Table 4A-4). The estimated school age population for that part of the population for which there is unmet water needs is 143,036 in 2010, 295,878 in 2030, and 496,548 in 2060 (Table 4A-4).

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Section 4B
Water Supply Plans
[31 TAC §357.7(a)(5-7)

The South Central Texas Regional Water Planning Group (SCTRWPG) has used a planning process (Figure 4B-1) focused on the development of a Regional Water Plan to meet the needs of every water user group in the region for a planning period extending through the year 2060. Given the history of sharp and divisive conflict concerning water planning in this region, the planning process has provided extraordinary opportunities for participation by water user groups in providing input to achieve the goal of a plan that will "provide for the orderly development, management, and conservation of water resources…" 31 TAC §357.5(a). In order to build consensus among the constituencies represented by the members of the SCTRWPG, the planning process has emphasized the coordination and careful integration of technical information with information provided through public participation.

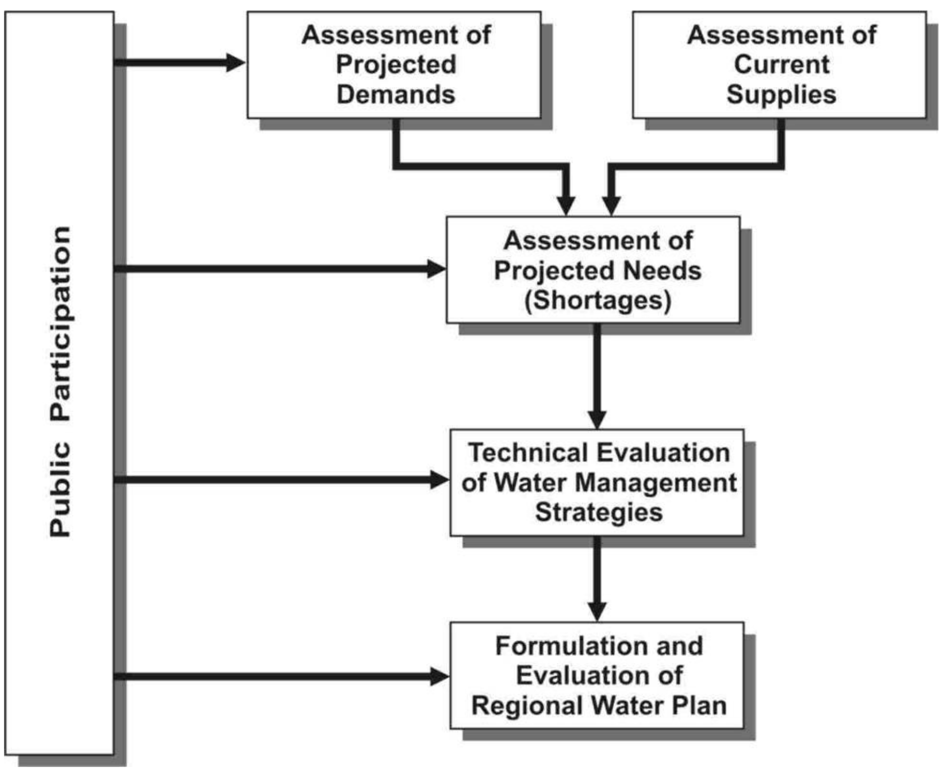

Figure 4B.1-1. Planning Process

Conflict over the past several decades in this region has focused on how to manage the Edwards Aquifer so as to meet the needs of many water user groups. Central to progress in resolving this conflict, and thus in achieving the formulation of a water plan acceptable to all constituencies represented in the SCTRWPG, is the assurance that all of the different, competing strategies for meeting water needs are given consideration. It has thus been central to the viability of the planning process itself that the evaluation of diverse water management strategies as a cohesive regional plan receive extraordinary attention.

To this end, the SCTRWPG adopted a planning process that ensures evaluation of virtually all the water management strategies that have been proposed or discussed in the past, together with new ones that had been subject to only limited technical evaluation. To achieve confidence by all constituencies in the planning process, it was necessary in the development of the 2001 South Central Texas Regional Water Plan to evaluate water management strategies both on a stand-alone basis and in various combinations in the context of five alternative plans. In keeping with logical and acceptable planning methods, the SCTRWPG was able to recommend the best components of these alternative plans and adopt the 2001 South Central Texas Regional Water Plan, which then became a part of the 2002 State Water Plan.

In the development of the 2006 Regional Water Plan, the following process for Identification of Potentially Feasible Water Management Strategies was used:[1]

1) Developed draft scope of work including necessary updates to recommended water management strategies included in the 2001 Regional Water Plan, with technical evaluation of several specific water management strategies that are potentially feasible for meeting needs in the region. Draft scope of work also included identification and evaluation of unspecified water management strategies to meet needs for new retail utility water user groups previously aggregated in County-Other (Rural Area Residential & Commercial).
2) Presented scope of work at a series of public meetings (January 29–31, 2002) and received comments.
3) Refined scope of work and obtained TWDB approval in August 2002.
4) Solicited current water planning information, including specific water management strategies of interest, from water user groups.
5) Compared water demand projections and available supplies to obtain projections of water needs (shortages) by water user group.

[1] Pursuant to 357.5(e)(4) of the Regional Water Planning Guidelines which states: "Before a regional water planning group begins the process of identifying potentially feasible water management strategies, it shall document the process by which it will list all possible water management strategies and identify the water management strategies that are potentially feasible for meeting a need in the region."

6) Prepared a draft list of water management strategies that were potentially feasible to meet projected needs of water user groups subject to changed conditions and of new retail utility water user groups that were aggregated in County-Other in the 2001 Regional Water Plan. Draft list included the recommended water management strategies in the 2001 Regional Water Plan, and specific water management strategies submitted in response to the solicitation for current water planning information.
7) Presented draft list of potentially feasible water management strategies during public meetings of the RWPG and received comments.
8) Refined list of potentially feasible water management strategies for water user groups subject to changed conditions and new retail utility water user groups for RWPG consideration and approval.
9) Performed technical evaluations of water management strategies approved by RWPG.

Development of the 2006 South Central Texas Regional Water Plan has focused on refinement of the 2001 Regional Water Plan as a result of significant changes in population and water demand projections and the need to integrate water supply planning for numerous small municipal water supply utilities previously grouped in the unincorporated "County-Other." In addition, the availability of new Groundwater Availability Models (GAMs) has provided the tools for more detailed technical assessment of the potential effects of water management strategies including withdrawals from the Carrizo-Wilcox and Gulf Coast Aquifers. In addition, the GAMs have provided a basis for discussions regarding the consistency of groundwater conservation district management plans and the Regional Water Plan.

4B.1 Water Management Strategies

4B.1.1 Regional Summary

The South Central Texas Regional Water Plan includes recommended water management strategies that emphasize water conservation; maximize utilization of available resources, water rights, and reservoirs; engage the efficiency of conjunctive use of surface and groundwater, avoid development of large new reservoirs; and limit depletion of storage in aquifers. There are additional strategies that have significant support within the region, yet require further study regarding quantity of dependable water supply made available during severe drought, feasibility, and/or cost of implementation, that are also included in the Plan. Water management strategies recommended to meet projected needs in the South Central Texas Region could produce new supplies in excess of 738,000 acft/yr in 2060 and may be categorized by source as shown in Figure 4B.1-2. The plan does not propose any changes to existing water contracts or option agreements. Further, the plan was created in close cooperation with each Wholesale Water Provider in the region, and no strategy contained in the plan would adversely affect any existing water contracts or option agreements.

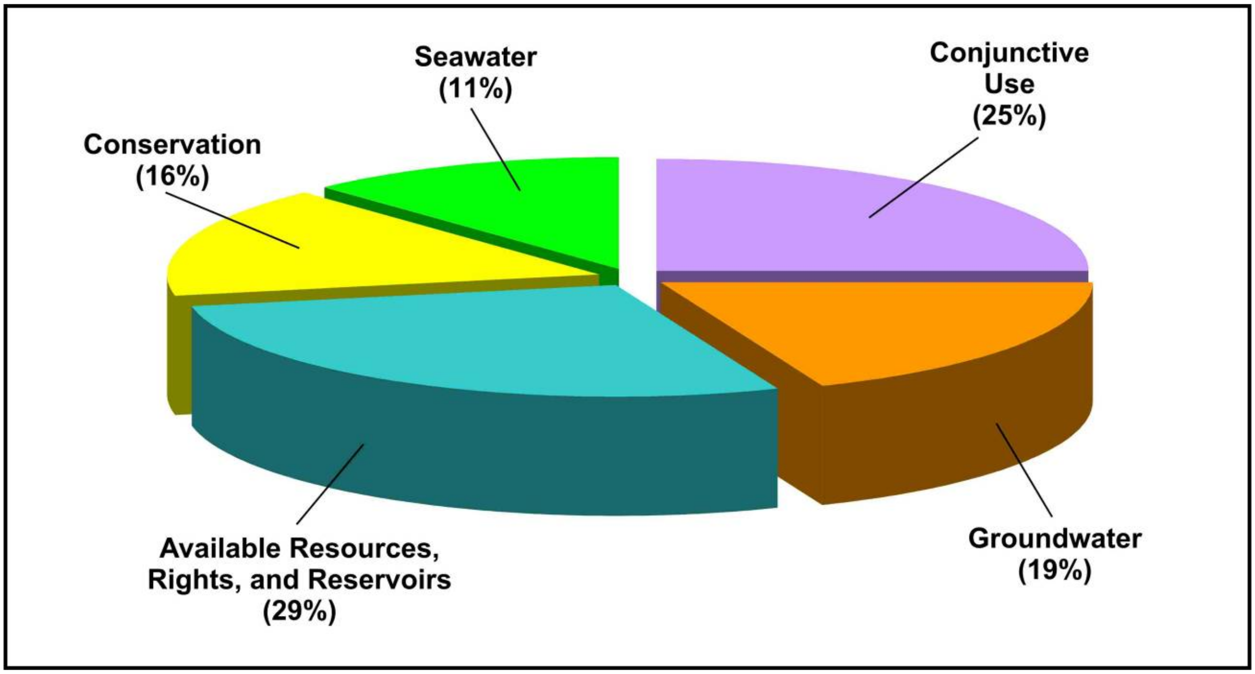

Figure 4B.1-2. Sources of New Supply in 2060

Specific recommended water management strategies in the Plan are summarized by approximate timing of potential implementation in Figure 4B.1-3 and Appendix D, and by geographic location in Figure 4B.1-4. Water management strategies emphasizing conservation comprise about 16 percent of recommended new supplies and include:

- Municipal Water Conservation (72,570 acft/yr);
- Steam-Electric Water Conservation (28,459 acft/yr);
- Irrigation Water Conservation (14,089 acft/yr); and
- Mining Water Conservation (1,425 acft/yr).

Water management strategies maximizing use of available resources, water rights, and reservoirs comprise about 29 percent of recommended new supplies and include:

- Edwards Transfers (71,335 acft/yr);
- SAWS Recycled Water Program Expansion and other Recycled Water (46,634 acft/yr);
- Canyon Reservoir (27,150 acft/yr);
- Wimberley & Woodcreek Water Supply from Canyon Reservoir (4,636 acft/yr);

- Purchase from Wholesale Water Provider (LNRA) (489 acft/yr);
- Surface Water Rights (2,867+ acft/yr); and
- Increased LGWSP Capacity for GBRA Needs (63,072 acft/yr).

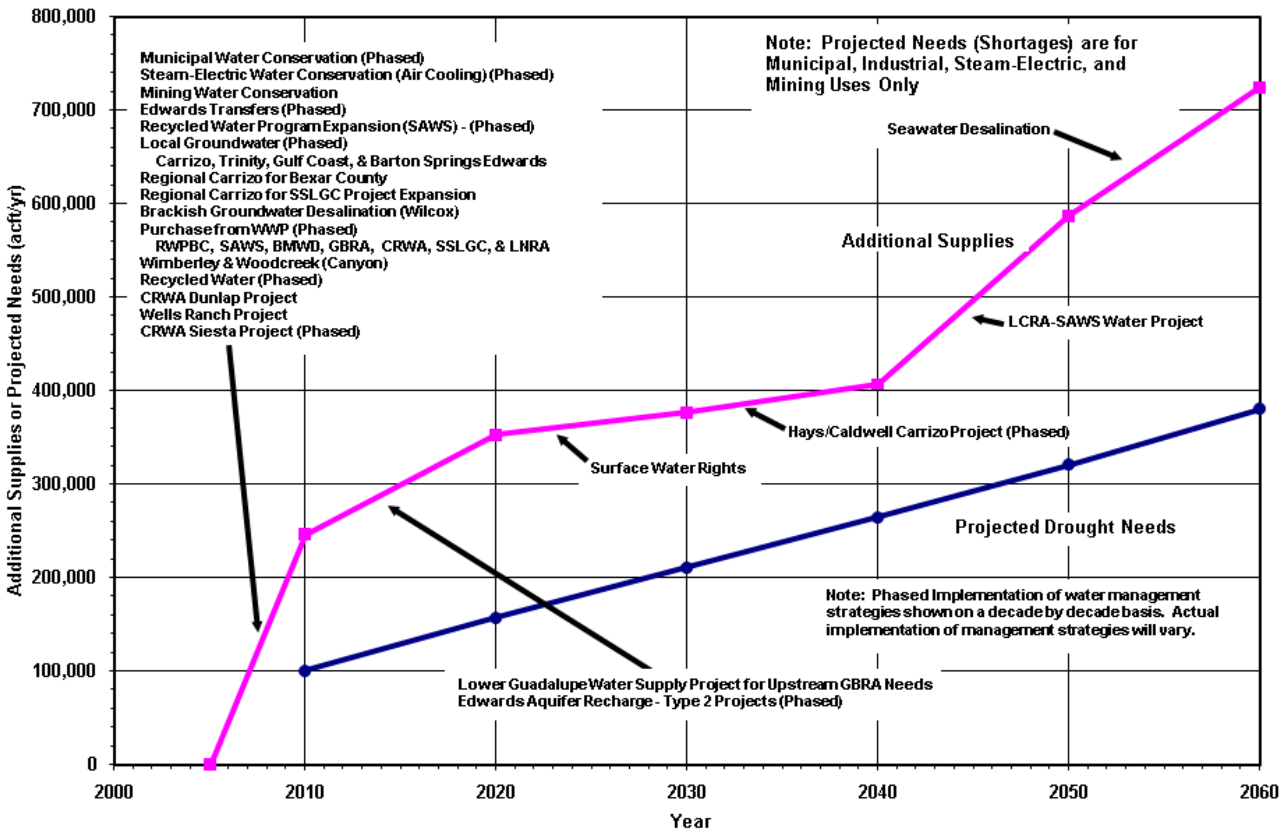

Figure 4B.1-3. Phased Implementation of Water Management Strategies

Water management strategies that simultaneously develop groundwater supplies and limit depletion of storage in regional aquifers comprise about 19 percent of recommended new supplies and include:

- Local Carrizo, Gulf Coast, Trinity, and Barton Springs Edwards (46,917 acft/yr);
- Regional Carrizo for Bexar County Supply (56,188+ acft/yr);
- Regional Carrizo for SSLGC Project Expansion (12,800 acft/yr);
- Hays/Caldwell Carrizo Project (15,000 acft/yr);
- Wells Ranch Project (3,400 acft/yr); and
- Brackish Groundwater Desalination – Wilcox Aquifer (5,662 acft/yr).

Recommended water management strategies that engage the efficiency of conjunctive use of surface and groundwater as well as maximize the use of available resources and water rights comprise approximately 25 percent of recommended new supplies and include:

- Edwards Recharge – Type 2 Projects (L-18a) (21,577 acft/yr);
- CRWA Dunlap Project (5,600 acft/yr);
- CRWA Siesta Project (5,042 acft/yr); and
- LCRA-SAWS Water Project (150,000 acft/yr).

Finally, the Regional Water Plan includes the development of a Seawater Desalination water management strategy which could represent approximately 11 percent of the recommended new supplies in 2060.

The Regional Water Plan includes several water management strategies that require further study and funding prior to implementation. Several of these strategies rely upon technologies that have been used previously, but further research is necessary to determine the cost of implementation, optimal scale and location, and quantity of dependable water supply that would be available in severe drought. These strategies are:

- Brush Management;
- Weather Modification;
- Rainwater Harvesting;
- Small Aquifer Recharge Dams;
- Simsboro Aquifer Project (GBRA);
- Brackish Groundwater Desalination – Edwards Aquifer (SAWS);
- Mesa Water Supply Project (SAWS);
- Cooperation with Corpus Christi for New Water Sources;
- Drought Management; and
- Additional Storage (ASR and/or Surface).

Although specific quantities of new, dependable supply during drought have not been determined for these strategies, it is understood that their implementation will contribute positively to storage and system management of many diverse strategies in the Regional Water Plan. The SCTRWPG recommends that State funding be made available to cooperatively support the refinement and implementation of these strategies.

The 2006 South Central Texas Regional Water Plan also recognizes Edwards Aquifer Recharge and Recirculation Systems (R&R) as a water management strategy requiring further

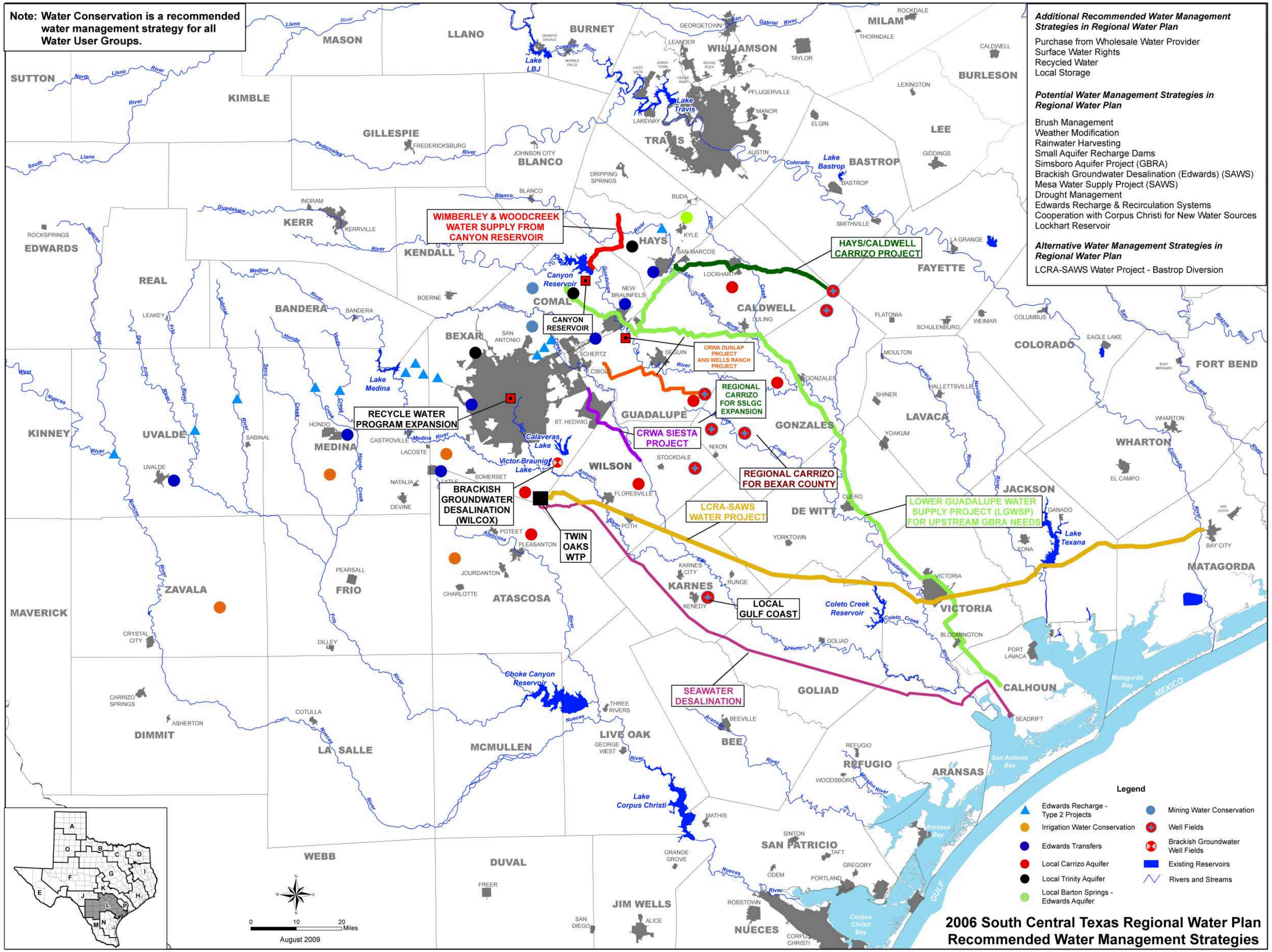

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Figure 4B.1-4. 2006 South Central Texas Regional Water Plan Water Management Strategies

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evaluation. As it did in the 2001 Regional Water Plan, the SCTRWPG recommends State and local funding for research at a level that ensures due consideration of this strategy.

In early 2005, the SCTRWPG received a request from Canyon Regional Water Authority (in cooperation with Bexar Metropolitan Water District) to amend the 2001 South Central Texas Regional Water Plan to include water management strategies identified as the Dunlap, Siesta, and Wells Ranch Projects. Technical evaluations of these three potentially feasible water management strategies were completed in accordance with TWDB guidance for regional water planning. Pursuant to an October 13, 2005 public hearing and consideration of public comment, the SCTRWPG amended the 2001 Plan and modified the 2006 Plan to include recommendation of these three strategies to meet projected needs.

There are significant quantities of projected water supply needs or shortages in the region for municipal, industrial, steam-electric, and mining uses. As indicated in Figure 4B.1-3, implementation of a number of water management strategies on an expedited basis will be necessary to avoid significant hardship, water rationing, and/or cessation of discharge from Comal Springs in the event of severe drought during the next decade. Substantial water supply needs or shortages are also projected for irrigation use in the South Central Texas Region. The Irrigation water Conservation Water Management Strategy is projected to meet approximately 42 percent of projected irrigation needs (shortages) in 2010, and 66 percent in 2060, including all of the projected shortages in Atascosa, Bexar, and Medina Counties. However, based upon present economic conditions for agriculture and the fact that there are no really low-cost water supplies to be developed, the SCTRWPG has determined that it is not economically feasible to meet all projected irrigation needs in Kendall and Zavala Counties at this time, since the net farm income to pay for water is less than the costs of water at the potential sources, to say nothing of the cost delivered to farms where water is needed.

Implementation of the 2006 South Central Texas Regional Water Plan will result in the development of new water supplies that will be reliable in the event of a repeat of the most severe drought on record. However, it is evident in Figure 4B.1-3 that implementation of all recommended water management strategies is not likely to be necessary in order to meet projected needs within the planning period. The SCTRWPG explicitly recognizes the difference between additional supplies and projected needs as System Management Supplies and has recommended the associated water management strategies in the Regional Water Plan for the following reasons:

- To recognize both the long lead times and the uncertainty associated with risk factors that may prevent implementation of water management strategies and necessitate replacement strategies;
- To preserve flexibility for water user groups or wholesale water suppliers to select the most feasible projects among several consistent with the Regional Plan and therefore ensure that such projects are potentially eligible for permitting and funding;
- To serve as additional supplies in the event that rules, regulations, or other restrictions limit use of any planned strategies; and/or
- To ensure adequate supplies in the event of a drought more severe than that which occurred historically.

Costs associated with the implementation and long-term operations and maintenance of water management strategies have been estimated in accordance with TWDB rules and general guidelines and reflect regional water treatment capacity and balancing storage facilities sufficient to meet peak daily and seasonal water demands in the larger urban areas. Total estimated project cost (in 2002 dollars) for the recommended water management strategies for municipal supply that will likely require long-term financing for implementation is about $5.034 billion. Annual unit costs for recommended water management strategies for municipal supply in the 2006 South Central Texas Regional Water Plan (in 2002 dollars) are estimated to range from a low of about $135/acft/yr ($0.41 per 1,000 gallons) for Edwards Transfers to a high of about $1,502/acft/yr ($4.61 per 1,000 gallons) for Brackish Groundwater Desalination – Wilcox Aquifer and average about $870/acft/yr ($2.67 per 1,000 gallons). No costs have been included for projects that are presently under construction and potentially feasible water management strategies requiring further study.

4B.1.2 Water Management Strategy Descriptions

A brief description of each of the water management strategies included in the 2006 South Central Texas Regional Water Plan is included in the following text. Descriptions include the dependable (firm) water supply during drought and an estimated annual unit cost (in Second Quarter 2002 dollars) for water at full operating capacity during the debt service period (if applicable).

Municipal Water Conservation (L-10 Mun.)

The Municipal Water Conservation water management strategy includes conservation practices and programs to reduce per capita water use in cities by amounts in addition to reductions already incorporated into the TWDB water demand projections. The SCTRWPG established municipal water conservation goals as follows:

- For municipal WUGs with water use of 140 gpcd and greater, the goal is to reduce per capita water use by one percent per year until the level of 140 gpcd is reached, after which, the goal is to reduce per capita water use by one-fourth percent per year for the remainder of the planning period; and
- For municipal WUGs having year 2000 water use of less than 140 gpcd, the goal is to reduce per capita water use by one-fourth percent per year (0.25% per year).

Best Management Practices (BMPs) for water conservation, as identified by the Water Conservation Implementation Task Force[2], are recommended as means of achieving these municipal water conservation goals. The objective of municipal water conservation programs is to reduce the per capita water use parameter without adversely affecting the quality of life of the people involved. Planned municipal water conservation focuses on the following specific BMPs:

- Use of low flow plumbing fixtures (e.g., toilets, shower heads, and faucets that are designed for low quantities of flow per unit of use);
- The selection and use of more efficient water-using appliances (e.g., clothes washers and dishwashers);
- Modifying and/or installing lawn and landscaping systems to use grass and plants that require less water;
- Repair of plumbing and water-using appliances to reduce leaks; and
- Modification of personal behavior that controls the use of plumbing fixtures, appliances, and lawn watering methods.

The SCTRWPG recognizes that meeting the water conservation goals through implementation of these, or other, BMPs represents the highest practicable level of water conservation pursuant to 31 TAC 357.7(a)(7)(A)(iii). Planned additional municipal water conservation focused on these BMPs could effectively increase supply through demand reduction in the South Central Texas Region by about 72,570 acft/yr in the year 2060 at unit costs ranging from $432 per acft/yr to $494 per acft/yr. Volume II, Section 4C.1 includes a detailed discussion of this water management strategy.

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

Industrial Water Conservation

The Industrial Water Conservation strategy can achieve water conservation through the use of BMPs such as water audits, waste reduction submetering, cooling towers, reuse of process water, landscape water conservation, and specific water conservation plans designed for individual manufacturing plants (See Section 4C.1.3). The SCTRWPG recommends that water conservation be considered by individual industries, as a means to meet a part of the projected water needs.

Steam-Electric Water Conservation

The Steam-Electric Water Conservation strategy achieves water conservation through the use of BMPs such as air-cooling or other cooling systems that can significantly reduce existing and projected water demands for steam-electric power generation. Volume II, Section 4C.1 includes a listing of other potential BMPs. It is recommended that implementation of this strategy would reduce projected demands assigned to Guadalupe and Hays Counties by 28,459 acft/yr in 2060. Costs for this strategy have not been estimated due to lack of available data. The SCTRWPG recognizes that it may not be economically feasible to satisfy all projected water needs for steam-electric power generation in Guadalupe and Hays Counties.

Irrigation Water Conservation (L-10 Irr.)

The Irrigation Water Conservation strategy achieves water conservation through the installation of Low Energy Precision Application (LEPA) irrigation systems and furrow dikes. Recommended implementation of these conservation measures in Atascosa, Bexar, Medina, and Zavala Counties could effectively increase supply for irrigation through demand reduction by up to 23,074 acft/yr at a unit cost of $113 per acft/yr. Volume II, Section 4C.1 includes a detailed discussion of this water management strategy.

Mining Water Conservation (L-10 Min.)

The Mining Water Conservation strategy achieves water conservation through the use of recommended BMPs such as onsite collection and use of precipitation runoff and onsite reuse of process water. Volume II, Section 4C.1 includes a listing of other potential BMPs. It is recommended that implementation of this strategy could reduce projected demands assigned to

Bexar Comal Counties by 1,425 acft/yr in 2060. Costs for this strategy have not been estimated due to lack of available data.

Edwards Transfers (L-15)

The Edwards Transfers water management strategy is based upon the provisions of Senate Bill 1477, as amended, which provides for the creation of the Edwards Aquifer Authority, establishes a withdrawal permit system, and potentially allows a permit holder to sell or lease up to 50 percent of his irrigation rights. In the 2006 Regional Water Plan, irrigation transfers are included to meet projected needs of 23 municipal water user groups, in 2010 of 64,312 acft/yr, increasing to 67,834 acft/yr in 2030, and to 71,335 acft/yr in 2060 (quantities are part of the 340,000 acft/yr of firm yield used in the development of the 2006 plan). Initial Regular Permit (IRP) value of permits needed to obtain these quantities of firm yield increase from 108,618 acft/yr in 2010 to 114,566 acft/yr in 2030, and 120,479 acft/yr in 2060. Based on available data for transactions to date, typical unit costs are $135 per acft/yr for lease of withdrawal rights and $209 per acft/yr for permanent acquisition. Volume II, Section 4C.2 includes a detailed discussion of this management strategy.

Recycled Water Programs

The Recycled Water Use water management strategy involves expansion of programs that reclaim municipal wastewater for non-potable uses such as irrigation of golf courses, parks, and open spaces of cities, landscape watering of large office and business complexes, cooling of large office and business complexes, steam-electric power plant cooling, process or wash water for mining operations, irrigation of farms that produce livestock feed and forage, irrigation of farms that produce sod, ornamentals, and landscape plants, and for instream uses such as riverwalks and waterways. This strategy is being used within the region by entities including SAWS, SARA, New Braunfels Utilities, the City of Seguin and the City of San Marcos and can be expanded as the quantities of municipal wastewater increase with population growth. An advantage of this strategy is that the water has already been developed and brought to the locations of many of the uses listed above.

One specific example of this water management strategy involves the phased expansion of SAWS Recycled Water Program to provide dependable water supplies for non-potable uses and meet about 20 about percent of SAWS projected municipal and industrial water demands.

The existing SAWS recycled water system is capable of delivering about 35,000 acft/yr and consumptive reuse of about 25,000 acft/yr is included in the 2006 Regional Water Plan as current supply. Planned phased implementation of this water management strategy will provide additional dependable annual supplies of about 18,700 acft in 2010 and about 36,250 acft in 2060 at an estimated unit cost of $434 per acft/yr. Facilities for future expansion are expected to include a southern interconnection between the Leon Creek and Dos Rios Water Recycling Centers and a northern interconnection linking the Leon Creek and Salado Creek transmission lines.

The SCTRWPG recognizes that SAWS and other water suppliers throughout the region may choose to reuse or reclaim the increased treated wastewater volumes associated with increased municipal water use, especially such wastewater volumes that are derived from privately owned groundwater and interbasin transfer of surface water. The SCTRWPG further recognizes that this reuse may be accomplished directly (“flange-to-flange”) or indirectly through bed and banks delivery to downstream diversion and/or storage sites subject to applicable law. Such lawful reuse of treated wastewater is consistent with the 2006 South Central Texas Regional Water Plan. Volume II, Section 4C.3 includes a detailed discussion of this water management strategy.

Canyon Reservoir

The Canyon Reservoir water management strategy involves the purchase of Canyon Reservoir stored water from the Guadalupe-Blanco River Authority (GBRA), transmission and treatment facilities, and integration of additional supply. Planned implementation of this strategy includes diversions directly from Canyon Reservoir and diversions from the Guadalupe River at various locations downstream of Canyon Dam. Presently uncontracted supplies of firm stored water from Canyon Reservoir are between 20,000 acft/yr and 25,000 acft/yr. This water management strategy is more generally identified as “Purchase from Wholesale Water Provider (GBRA)” and is recommended for entities with projected water needs in Caldwell, Comal, Guadalupe, Hays, Kendall, and Victoria Counties. Unit costs for this water supply are dependent upon location and appurtenant transmission and treatment facilities unique for each customer. Volume II, Section 4C.5 includes a detailed discussion of this water management strategy.

Wimberley & Woodcreek Water Supply from Canyon Reservoir

The Wimberley & Woodcreek Water Supply water management strategy involves the purchase of Canyon Reservoir stored water from GBRA, direct diversion from Canyon Reservoir, transmission and treatment facilities, and integration of an additional dependable supply of 4,636 acft/yr for Wimberley, Woodcreek, and Woodcreek Utilities in rural Hays County at an estimated unit cost of $989 per acft/yr. Volume II, Section 4C.6 includes a detailed discussion of this strategy.

Lower Guadalupe Water Supply Project (LGWSP) for Upstream GBRA Needs

The Lower Guadalupe Water Supply Project (LGWSP) for Upstream GBRA Needs water management strategy involves the diversion of water from the Guadalupe River at the Saltwater Barrier located 3.5 miles north of Tivoli, transmission to approximately 19,000 acft of off-channel storage reservoirs, transmission to water treatment plants near Luling, Lake Dunlap, San Marcos, New Braunfels, and near Canyon Reservoir, and integration into municipal water supply systems. Specific sources of water for this strategy include presently underutilized surface water rights from the Guadalupe-Blanco River Authority (GBRA). As other sources of water become available near the end of the current planning horizon (e.g., seawater desalination), they could be used to supplement or replace supplies from GBRA surface water rights. This water management strategy serves to ensure that long-term, reliable, and renewable surface water supplies will be available throughout the GBRA statutory district including Calhoun, Refugio, and Victoria Counties.

Planned implementation of the LGWSP will provide a dependable supply of 60,000 acft/yr beginning in 2020 at an estimated unit cost of $1,226 per acft/yr. Volume II, Section 4C.33 includes a detailed discussion of this water management strategy.

LCRA-SAWS Water Project (LSWP)

The LCRA-SAWS Water Project (LSWP) is based on a 2002 Definitive Agreement between the San Antonio Water System (SAWS) and the Lower Colorado River Authority (LCRA) for the purchase and use of water from the Colorado River. The point of diversion is the subject of ongoing studies; however the Bay City diversion point used in the 2001 Regional Water Plan has been assumed for cost estimation purposes. Sources of water include presently under-utilized surface water rights, stored water from the Highland Lakes System, new appropriations, and groundwater from the Gulf Coast Aquifer. Facilities include approximately 250,000 acft of off-channel storage, transmission pump stations and pipeline to a terminal storage reservoir, water treatment in southern Bexar County, and facilities for integration of the new supply. Planned implementation of this strategy will provide a dependable supply of 150,000 acft/yr to SAWS by 2050 at an estimated unit cost of $1,326/acft/yr. Allocation of the full projected dependable supply of 150,000 acft/yr to this potential diversion location does not preclude development of an upstream alternative or additional diversion location. Volume II, Section 4C.9 includes a more detailed discussion of this water management strategy.

Surface Water Rights

The Surface Water Rights water management strategy is included to explicitly recognize that use of water supplies made available under existing water rights by lease or purchase agreements between willing buyers and willing sellers is consistent with the 2006 Regional Water Plan. The addition of diversion points or types and places of use for existing surface water rights is also consistent with the 2006 Regional Water Plan if necessary authorizations are obtained pursuant to TCEQ rules and applicable law. Volume II, Section 4C.11 includes a more detailed discussion and specific examples of this water management strategy.

Local Trinity

The local Trinity water management strategy involves the development of 21,208 acft/yr of water supply from the Trinity Aquifer in northern Bexar and western Caldwell Counties for SAWS, BMWD, County Line WSC, and Goforth WSC. Estimated unit costs range from $329 per acft/yr to $365 per acft/yr. Volume II, Section 4C.12.1 includes a detailed discussion of this management strategy.

Local Carrizo

The local Carrizo water management strategy involves the phased development or expansion of well fields in the Carrizo-Wilcox Aquifer for the purposes of meeting local municipal and steam-electric needs in Atascosa, Caldwell, Gonzales, Guadalupe, and Wilson Counties. Planned implementation of this strategy provides new dependable supplies totaling about 24,729 acft/yr for the South Central Texas Region in 2060 at estimated unit costs ranging from $114 per acft/yr to $443 per acft/yr. Volume II, Section 4C.12.2 includes a detailed discussion of this management strategy.

Local Gulf Coast

The local Gulf Coast water management strategy involves development of 780 acft/yr from two new local supply wells in the Gulf Coast Aquifer near Kenedy in Karnes County. Estimated unit cost for the new supply is $904 per acft/yr. Volume II, Section 4C.12.3 includes a detailed discussion of this management strategy. Simulated long-term cumulative effects of this water management strategy, along with other recommended strategies drawing from the Gulf Coast Aquifer, are presented in terms of projected drawdown in water levels in Section 7.1 and Volume II, Section 4C.19.

Local Barton Springs Edwards

The Local Barton Springs Edwards water management strategy involves the phased development of new groundwater supplies from the Barton Springs Edwards Aquifer through construction of new wells and/or acquisition of rights to pump from existing wells. Planned new supplies total 150 acft/yr by 2010 and 200 acft/yr by 2050 at an estimated cost of $135/acft/yr. Volume II, Section 4C.12.4 includes a detailed discussion of this management strategy.

Regional Carrizo for Bexar County

The Regional Carrizo for Bexar County water management strategy involves development of well fields in the Carrizo Aquifer in Bexar, Gonzales, and Wilson Counties, a collection system, transmission to a regional water treatment facility, and integration of the new supply in Bexar County. Planned implementation of this strategy includes annual production of 62,588 acft/yr throughout the planning period with 6,400 acft/yr from south Bexar County (included as existing supply for SAWS), 11,000 acft/yr from Wilson County, and the balance from Gonzales County. The estimated unit cost for this strategy is $862/acft/yr. This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the

Gonzales UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3. The 11,000 acft/yr from Wilson County is consistent with the current management plan of the Evergreen Underground Water Conservation District (EUWCD), though the EUWCD has recently adopted rules that could affect the estimated cost of this strategy. Volume II, Section 4C.14 includes a detailed discussion of this water management strategy. Simulated long-term cumulative effects of this water management strategy, along with other recommended strategies drawing from the Carrizo-Wilcox Aquifer, are presented in terms of projected drawdown in water levels in Section 7.1 and Volume II, Section 4C.18.

Regional Carrizo for Schertz-Seguin Local Government Corporations (SSLGC) Project Expansion

The Regional Carrizo for Schertz-Seguin Local Government Corporation (SSLGC) Project Expansion water management strategy involves the expansion of well fields located in southern Gonzales and Guadalupe Counties by the SSLGC. The SSLGC was created to develop and operate a wholesale water supply system to serve the long-term needs of several communities located in Guadalupe and Bexar Counties. This strategy focuses on the development of additional well fields and associated collection and treatment systems as primary transmission facilities for delivery of water to customers are operating at this time. Planned implementation of this strategy will provide an additional dependable annual supply of approximately 12,800 acft at an estimated cost of $411 per acft/yr. This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3. Volume II, Section 4C.15 includes a detailed discussion of this management strategy. Simulated long-term cumulative effects of this water management strategy, along with other recommended strategies drawing from the Carrizo-Wilcox Aquifer, are presented in terms of projected drawdown in water levels in Section 7.1 and Volume II, Section 4C.18.

Wells Ranch Project

The Wells Ranch Project is a water management strategy proposed by Bexar Metropolitan Water District (BMWD) and Canyon Regional Water Authority (CRWA) that would involve development of 9,000 acft/yr of groundwater from the Carrizo Aquifer in Gonzales and Guadalupe Counties. Some 5,600 acft/yr of the 9,000 acft/yr may be committed to the CRWA Dunlap Project pursuant to an agreement between CRWA and BMWD, with the balance of 3,400 acft/yr being delivered directly to BMWD. Planned implementation of this strategy will provide an additional dependable annual supply of approximately 3,400 acft at an estimated cost of $690 per acft/yr. In early 2005, the SCTRWPG received a request from CRWA (in cooperation with BMWD) to amend the 2001 South Central Texas Regional Water Plan to include water management strategies identified as the Dunlap, Siesta, and Wells Ranch Projects. Technical evaluations of these three potentially feasible water management strategies were completed in accordance with TWDB guidance for regional water planning. Pursuant to an October 13, 2005 public hearing and consideration of public comment, the SCTRWPG amended the 2001 Plan and modified the 2006 Plan to include recommendation of these three strategies to meet projected needs.

Simulated long-term cumulative effects of this water management strategy, along with other recommended strategies drawing from the Carrizo-Wilcox Aquifer, are presented in terms of projected drawdown in water levels in Section 7.1 and Volume II, Section 4C.18. This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Hays/Caldwell Carrizo Project

The Hays/Caldwell Carrizo Project involves the development of about 15,000 acft/yr of dependable supply from the Carrizo Aquifer in Bastrop, Caldwell, Fayette, and Gonzales Counties. Planned facilities include well field(s) and transmission and treatment systems for delivery to water users in Caldwell and Hays Counties at an estimated unit cost of $694/acft/yr. This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3. Volume II, Section 4C.17 includes a detailed discussion of this water management strategy. Simulated long-term cumulative effects of this water management strategy, along with other recommended strategies drawing from the Carrizo-Wilcox Aquifer, are presented in terms of projected drawdown in water levels in Section 7.1 and Volume II, Section 4C.18.

Edwards Recharge – Type 2 Projects

The Edwards Recharge – Type 2 Projects involves the construction of recharge enhancement structures located atop the Edwards Aquifer recharge zone (Type 2 Projects) on streams that are often dry. These structures impound water only for a few days or weeks following storm events and recharge water very quickly to the aquifer, typically draining at a rate of 2 to 3 feet per day. Planned projects include Indian Creek, Lower Frio, Lower Sabinal, Lower Hondo, Lower Verde, San Geronimo, Northern Bexar / Medina County Projects (Limekiln, Culebra, Government Canyon, Deep Creek, Salado Dam No. 3), Salado Creek FRS, Cibolo Dam No. 1, Dry Comal, and Lower Blanco. Consensus Criteria for Environmental Flow Needs were applied in the technical evaluations of projects comprising this management strategy located on streams which typically flow. Implementation of these projects could enhance spring discharge and increase dependable municipal water supply for Bexar County by about 21,600 acft/yr. It is specifically recognized by the SCTRWPG that alternative projects at these locations that may be larger in size and storage capacity are consistent with the 2006 Regional Water Plan. Volume II, Section 4C.20 includes a detailed discussion of this management strategy.

Brackish Groundwater Desalination (Wilcox)

The Brackish Groundwater Desalination (Wilcox) water management strategy involves the development of 5,662 acft/yr of groundwater from the brackish area of the Wilcox Aquifer in southeastern Bexar County. The facilities for the peak 20 MGD (5 MGD yearly average) alternatives include a well field with production capacity of 25,163 acft/yr (54 wells at 300 gpm, including 4 back-up wells), brackish groundwater desalination plant with finished water capacity of 10,065 acft/yr, deep well injection of desalination concentrate, finished water tank, finished water pump station, and 33-inch transmission pipeline. Desalination treatment facilities would likely be located adjacent to the well field and are sized to treat half the brackish water to produce a finished blended water supply that meets all potable water regulatory requirements including concentrations of the dissolved constituents TDS, chloride, and sulfate. Assuming delivery to the W.W. White tank, the estimated unit cost of this strategy is $1,502 per acft/yr. Delivery to the Twin Oaks WTP has a unit cost estimate of $1,533 per acft/yr. Volume II, Section 4C.21.1 includes a detailed discussion of this management strategy.

Seawater Desalination

The Seawater Desalination water management strategy involves the long-term development of intake and treatment facilities on the north shore of San Antonio Bay near Seadrift and transmission of treated water for integration and use in Bexar County. This water management strategy utilizes a source of water that is essentially unlimited; however, costs of treatment and location for brine discharge (as may affect marine habitat and species) remain concerns. Planned implementation of this strategy will provide a dependable annual supply of approximately 84,000 acft by 2060 at an estimated unit cost of $1,390 per acft/yr. Volume II, Section 4C.22 includes a detailed discussion of this management strategy.

CRWA Dunlap Project

The Canyon Regional Water Authority (CRWA) Dunlap Project is envisioned as a conjunctive use project using interruptible diversions from the Guadalupe River at Lake Dunlap along with groundwater from a well field in to be located in Gonzales and Guadalupe Counties (the Wells Ranch Project). These raw water sources would be treated and distributed as a new municipal water supply for CRWA members. The surface water component of the Dunlap Project involves the amendment of a surface water right held by CRWA in order to increase authorized diversions from the Guadalupe River at Lake Dunlap from 18.52 acft/yr to 5,600 acft/yr and to obtain authorization for interbasin transfer of this water. The groundwater component of this project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3. Volume II, Section 4C.24 includes a detailed discussion of this water management strategy. Simulated long-term cumulative effects of this water management strategy, along with other recommended strategies drawing from the Carrizo-Wilcox Aquifer, are presented in terms of projected drawdown in water levels in Section 7.1 and Volume II, Section 4C.18. Planned implementation of this strategy will provide an additional dependable annual supply of approximately 5,600 acft at an estimated cost of $956 per acft/yr.

In early 2005, the SCTRWPG received a request from CRWA (in cooperation with Bexar Metropolitan Water District) to amend the 2001 South Central Texas Regional Water Plan to include water management strategies identified as the Dunlap, Siesta, and Wells Ranch Projects. Technical evaluations of these three potentially feasible water management strategies were completed in accordance with TWDB guidance for regional water planning. Pursuant to an October 13, 2005 public hearing and consideration of public comment, the SCTRWPG amended the 2001 Plan and modified the 2006 Plan to include recommendation of these three strategies to meet projected needs.

CRWA Siesta Project

The Canyon Regional Water Authority (CRWA) Siesta Project is envisioned as a conjunctive use project using interruptible diversions from Cibolo Creek in Wilson County along with treated effluent from wastewater treatment facilities operated by San Antonio River Authority (SARA) as raw water sources for treatment and distribution as a new municipal water supply for CRWA members. The Siesta Project involves the acquisition/lease of additional water rights and amendment of a surface water right presently held by CRWA in order to increase authorized diversions from Cibolo Creek by CRWA from 42 acft/yr to 5,042 acft/yr. Planned implementation of this strategy will provide an additional dependable annual supply of approximately 5,042 acft at an estimated cost of $853 per acft/yr. Volume II, Section 4C.25 includes a detailed discussion of this water management strategy.

In early 2005, the SCTRWPG received a request from CRWA (in cooperation with Bexar Metropolitan Water District) to amend the 2001 South Central Texas Regional Water Plan to include water management strategies identified as the Dunlap, Siesta, and Wells Ranch Projects. Technical evaluations of these three potentially feasible water management strategies were completed in accordance with TWDB guidance for regional water planning. Pursuant to an October 13, 2005 public hearing and consideration of public comment, the SCTRWPG amended the 2001 Plan and modified the 2006 Plan to include recommendation of these three strategies to meet projected needs.

Purchase from Wholesale Water Provider

The Purchase from Wholesale Water Provider water management strategy involves the purchase of water supplies from, or participation in the development of new water supplies with, an identified Wholesale Water Provider. Wholesale water providers include the San Antonio Water System (SAWS), Bexar Metropolitan Water District (BMWD), Guadalupe-Blanco River Authority (GBRA), Canyon Regional Water Authority (CRWA), Schertz-Seguin Local Government Corporation (SSLGC), Springs Hill Water Supply Corporation (SHWSC), and Lavaca-Navidad River Authority (LNRA). This strategy may also involve the purchase of water supplies from, or participation in the development of new water supplies with the Regional Water Provider for Bexar County (RWPBC). Costs for this management strategy include those for purchase, treatment, transmission, and distribution of water, and are specific to each project or source of water. For example, purchase by a WUG from a Wholesale Water Provider would be at the unit cost of water from the source and would vary from water source to water source.

Small Aquifer Recharge Dams

The Small Aquifer Recharge Dams management strategy is the construction of small dams on ephemeral waterways to capture runoff and hold it for seepage into aquifers of the planning region. The strategy is needed and appears to be applicable in the northern parts of the northern counties of the South Central Texas Water Planning Region overlying the Trinity Group of Aquifers that are being heavily stressed by a rapidly growing population. This strategy can be implemented by individual landowners of the area, but would probably need cost sharing by organized groups who obtain and depend upon the aquifers to be recharged, and to the extent that such structures reduce soil erosion, may qualify for technical and financial assistance from state and federal agencies.

Local Storage

The Local Storage water management strategy involves implementing large, regional scale Aquifer Storage and Recovery (ASR) and/or surface storage facilities adequate in size to store surplus flows of surface water during periods of high streamflows, including flood flows, to be available during extended periods of drought. Present management strategies of the South Central Texas Regional Water Plan are sized and scheduled to meet seasonal and daily variations of demand, but some current supplies may not be fully reliable during extended or multi-year droughts. Thus the need for surface reservoirs, large scale ASR Systems, or multipurpose reservoirs. If the water management question or problem is a supply for emergencies or drought, water could be stored in the Carrizo or Gulf Coast Aquifers for several years before it is recovered. Water treatment capacity necessary to meet peak day demands may be available at non-peak times (fall, winter, and spring) to treat water for aquifer storage and subsequent recovery.

Brush Management

The Brush Management water management strategy involves the selective removal of brush from rangeland watersheds in counties of the South Central Texas Region located in the Edwards Plateau Vegetational Area that have significant projected shortages. In other counties, it is assumed that the quantities of brush are not large enough to produce water supply benefits. There are 1.1 million acres of brush infested land in the 12.8 million acre planning region. The practice has been studied, some watersheds have been treated, and others are presently being selectively cleared. The Texas State Soil and Water Conservation Board, and agencies of the U.S. Department of Agriculture have landowner cost sharing and technical assistance programs for well-planned wildlife habitat compatible brush management/clearing programs. Although it is not possible to estimate the quantities of water that this strategy would contribute during drought, the strategy could contribute to increased streamflows and increased aquifer recharge during non-drought periods. To the extent that such additions to these water resources are stored for use later, the strategy could contribute to supplies available during drought. The water from this strategy would be available for development or recovery by individual water user groups and by water suppliers that serve several different water user groups. Volume II, Section 4C.28 includes a detailed discussion of this management strategy.

Weather Modification

The Weather Modification water management strategy involves the seeding of clouds with silver iodide by licensed professionals to increase precipitation within the planning region. This management strategy has been studied and was being practiced in year 2005 in 15 counties of the region's 21 county area. Although it is not possible to estimate the quantities of water that this strategy would contribute during drought, the strategy could contribute to increased precipitation on rangeland and cropland, as well as increasing stream flows and aquifer recharge during non-drought periods. Increased precipitation on range and cropland would contribute directly to crop, livestock, and wildlife production, and in the case of irrigated crop production would reduce the need to apply irrigation water. To the extent that such additions to these water resources are stored for use later, the strategy could contribute to supplies available during drought. The water from this strategy would be available for development or recovery by individual water user groups and by water suppliers that serve several different water user groups. Volume II, Section 4C.29 includes a detailed discussion of this management strategy.

Rainwater Harvesting

The Rainwater Harvesting water management strategy is the catching and storing of rainwater from roofs of homes and other buildings largely for use at or very near the sites from which the water is caught. The strategy is being used in parts of the South Central Texas Planning Region for household water supplies for both potable and non-potable uses. Although this strategy is limited due to rainfall levels, time of rainfall events, and capacities of storage facilities, the strategy can supply a part, or in some cases all, of the water needed by individual households and business establishments in areas that are too distant or too sparsely settled to be served efficiently by public systems. Rainwater harvesting in the Trinity Aquifer area of the region (Northern Bexar, Comal, Hays, Medina, and Uvalde Counties) can supplement supplies from wells completed in this aquifer, and thereby extend the capabilities of this aquifer to support the demands that are projected to be placed upon it. Volume II, Section 4C.30 includes a detailed discussion of this management strategy.

Recharge and Recirculation Studies

The Recharge and Recirculation water management strategy involves artificial recharge of the Edwards Aquifer, capture of the resulting increased springflows, and returning these quantities of water to further recharge the aquifer. Artificial recharge could be done using runoff from the Edwards Plateau, water imported from other watersheds, the subsequent increment of springflow resulting from artificial recharge, and/or a combination of these sources. The purpose of this strategy is to maintain springflows at satisfactory levels to protect the habitats of endangered species that exist in the springs and specified reaches of spring fed streams, while at the same time increasing the quantity of water that can be withdrawn from the aquifer to meet the needs of water user groups. The quantities of water that could be withdrawn from the aquifer depend upon the quantities of recharge, the location(s) at which the recharge is made to the aquifer, levels of the aquifer at the time of recharge, residence time of recharged water in the aquifer, and perhaps other factors that are not known or well understood. The major reason for the Recharge and Recirculation strategy is to use the aquifer to store and distribute water to water user groups that have already established themselves in proximity to the aquifer.

Cooperation with Corpus Christi for New Water Sources

This water management strategy involves cooperation and partnership with Corpus Christi of the Coastal Bend Water Planning Region (Region N) in the development of additional or "New Water Sources." The potentials include desalination, surface water from the Lower Colorado River that might be conveyed via Corpus Christi's Mary Rhodes Pipeline from Lake Texana to the City of Corpus Christi in exchange for water to recharge the Edwards Aquifer that is now included in Corpus Christi's permit for Choke Canyon Reservoir, groundwater along and near the Mary Rhodes Pipeline, surface water from the Brazos River Basin via the Mary Rhodes Pipeline, and perhaps other sources in or adjacent to the coastal areas of Regions L and N. In any case, the objective of this option is to benefit both regions by improving efficiency and lowering costs of developing New Sources of water for both regions. One of the ways to accomplish parts of this objective is to increase the usage of already existing facilities and sources of water. Volume II, Section 4C.10 includes a detailed discussion of this management strategy.

Simsboro Aquifer Project (GBRA)

The Guadalupe-Blanco River Authority (GBRA) and Sustainable Water Resources LLC have executed a November 16, 2005 Letter of Interest regarding a water supply project involving the development of groundwater from the Simsboro Aquifer and conveyance of such water for use within GBRA's statutory district. The SCTRWPG recognizes this as a potential water management strategy requiring further evaluation and study prior to implementation.

Brackish Groundwater Desalination – Edwards Aquifer (SAWS)

The San Antonio Water System (SAWS) is studying desalination of brackish groundwater from the Edwards Aquifer outside of the Edwards Aquifer Authority district as a potential source of municipal and industrial water supply. The SCTRWPG recognizes this as a potential water management strategy requiring further evaluation and study prior to implementation.

Mesa Water Supply Project (SAWS)

In a September 20, 2005 letter to the SCTRWPG, SAWS requested that the Mesa Water Supply Project be included in the 2006 regional water plan for further consideration. This strategy involves the production of groundwater from the Ogallala and Simsboro Aquifers and surface water from the Brazos River and transmission of same via pipelines and the bed and banks of the Brazos River to San Antonio. The SCTRWPG recognizes this as a potential water management strategy requiring further evaluation and study prior to implementation.

Lockhart Reservoir (G-21)

The Lockhart Reservoir, in Caldwell County near the City of Lockhart, is recommended as a potential reservoir site. Although the Regional Water Plan recommends other means of meeting projected water needs in Caldwell County, the SCTRWPG recognizes the strong interest of the local area in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by local public officials to be an important economic development project to create growth opportunities for the area. At the time of this planning report, there are questions about economic feasibility, but the SCTRWPG recognizes the efforts in Caldwell County and by the Guadalupe Blanco River Authority to find a viable strategy to move the project forward. When that strategy is ready, the RWPG will review the Lockhart Reservoir water management strategy as a possible amendment to the Regional Water Plan. Volume II, Section 4C.27 includes a detailed discussion of this management strategy.

Drought Management

Drought Management is not a recommended water management strategy to meet projected water needs in Region L, in part because it cannot be demonstrated to be an economically feasible strategy. The TWDB socioeconomic impact analysis of unmet water needs in Region L shows business production and sales impacts due to unmet water needs (shortages) of $5,785 per acft/yr in 2010 increasing to $25,935 per acft/yr in 2060, personal income losses of $4,225 per acft/yr in 2010, increasing to $13,139 per acft/yr in 2060, and tax losses per acft/yr increasing from $205 in 2010 to $804 in 2060 (Table 4B.1-1).

Clearly, the cost for water to meet projected water needs is only a fraction of the business, personal income, and tax revenue losses from not having the quantities of water needed. For example, in 2010 business losses are $5,784 per acft of shortage, income losses are $4,225 per acft, and tax losses are $205 per acft, while short-term costs of water for recommended water management strategies in the 2006 Regional Water Plan range from $135/acft/yr for Edwards Irrigation Transfers (by lease), up to $1,390/acft/yr for Seawater Desalination.

Table 4B.1-1.
Projected Water Needs (Shortages) and Business, Personal Income, and Tax Losses from Unmet Water Needs
South Central Texas Region

Year	Projected Water Need (Shortage) (acft/yr)	Business Sales Losses ($millions/yr)	Personal Income Loss ($millions/yr)	Taxes Lost ($ millions/yr)
2010	156,596	910	664	32
2020	207,337	2,066	1,175	62

2030	256,430	4,698	2,258	118
2040	306,175	6,160	2,979	154
2050	360,055	8,707	4,351	258
2060	416,855	10,810	5,477	335
		$/acft	***$/acft***	***$/acft***
2010		5,784	4,225	205
2020		9,970	5,668	301
2030		18,322	8,806	460
2040		20,121	9,731	502
2050		24,185	12,086	718
2060		25,935	13,139	804

The Water Conservation water management strategies recommended in the 2006 Regional Water Plan, together with the other water management strategies appear to the SCTRWPG to be superior to the use of Drought Management strategies that are costly to the economy and the people of the region, and unpredictable as to time of occurrence and duration. The uncertainty and the cost associated therewith is not acceptable to the SCTRWPG, thus Drought Management is not included as a recommended water management strategy to meet projected needs. However, the SCTRWPG recommends that a more thorough analysis of Drought Management as a water management strategy be conducted during the planning interim (See Section 8.6 for further discussion).

4B.1.3 Summary of Key Information

Pursuant to 31 TAC§357.7(a)(7), regional water plan development shall include evaluations of water management strategies providing certain key information pursuant to TWDB criteria. Key information regarding the 2006 South Central Texas Regional Water Plan is summarized by subject area below.

Quantity, Reliability, and Cost

- Plan reflects substantial commitment to Water Conservation throughout the South Central Texas Region, thereby encouraging efficient utilization of existing water supplies and reducing quantities of new supply needed.
- Plan includes reliable new water supplies sufficient to meet projected drought needs for municipal, industrial, steam-electric power, and mining uses through the year 2060.
- Plan recognizes that water management strategies such as brush management, weather modification, rainwater harvesting, and small recharge dams contribute positively to storage and system management of diverse sources of supply.

- Unit costs associated with new supplies delivered to each water user group range from $113 per acft to $1,502 per acft and average about $870 per acft/yr or $2.67 per 1,000 gallons based on second quarter 2002 dollars.

Environmental Factors

- See Section 7.3 for summary of environmental benefits and concerns.

Impact on Water Resources

- Plan implementation results in no unmitigated reductions in water available to existing rights.
- Long-term reductions in water levels in the Carrizo Aquifer.

Impacts on Agricultural and Natural Resources

- Inclusion of water management strategies to meet projected irrigation needs (shortages) in full is estimated to be economically infeasible at this time. Irrigation Water Conservation through the installation of Low Energy Precision Application (LEPA) systems is recommended to offset a portion of projected irrigation needs (shortages) in four counties.
- Plan includes Brush Management and Weather Modification which are expected to contribute positively to storage and system management of diverse water management strategies. Weather Modification assists irrigation and dry-land agriculture (crops and ranching), increases water supply for wildlife habitat, and increases Edwards Aquifer recharge.
- Plan includes about 98 percent of potential maximum of unrestricted voluntary transfer of Edwards Aquifer irrigation permits to municipal use through lease or purchase.

Other Relevant Factors per SCTRWPG

- Potential effects of Plan implementation on Edwards Aquifer springflows has been identified as a relevant factor by the SCTRWPG. As shown in Section 7.1, implementation of Plan is expected to increase long-term average discharges from both Comal Springs and San Marcos Springs.
- Flexibility in the phasing and order of implementation of management strategies comprising the Plan has been identified as a relevant factor or concern by the SCTRWPG. Wholesale Water Provides and water user groups need the ability to expedite or reschedule implementation of any specific management strategy as necessary and appropriate.

Comparison of Strategies to Meet Needs

- Selection of water management strategies comprising the 2006 Regional Water Plan is based upon guiding principles and assumptions of the SCTRWPG as discussed in Section 6.3 of the 2001 Regional Water Plan.

Interbasin Transfer Issues

- Plan includes two potential interbasin transfers from the Lower Colorado River near Bay City to Bexar County and from the Guadalupe River at Lake Dunlap to Bexar County.
- Projected needs (shortages) in basins of origin are met throughout the planning period.

Third-Party Impacts of Voluntary Transfers

- Positive effects for municipal water user groups associated with Edwards Transfers.
- Payment to farmers for voluntary irrigation water transfer provides capital for farmers to install higher efficiency irrigation systems. In many cases, this allows irrigation to continue at present levels so that the transfer does not adversely affect the regional economy.
- Lower water levels in some portions of the Carrizo Aquifer.

Regional Efficiency

- Edwards Transfers require no new facilities. Transferred water would likely be available at or very near locations having projected municipal and industrial water needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Regional water treatment and balancing storage facilities in Bexar County increase efficiency, improve reliability, and reduce unit cost.

Water Quality Considerations

- Assuming that wastewater treatment standards and plant performance continue to improve over time, no significant impacts on water quality are expected to result from implementation of the 2006 South Central Texas Regional Water Plan.

Impacts on Navigation

- None of the recommended water management strategies of the plan have any identifiable effect on navigation.

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4B.2 Water User Group Plans by County

The proposed plan to meet the specific needs of municipal, industrial, steam-electric power, and mining water user groups located within the region is to implement water conservation programs to reduce water demands to the extent possible, and develop additional groundwater and surface water supplies located as near as possible to each respective water user to the extent that supplies are available. As local supply development potentials for each respective user group are exhausted, water management strategies located at greater distances from the water users are recommended.

In the case of the irrigation water user group, the South Central Texas Regional Water Planning Group found that, at the present time, it is not economically feasible to meet all of the projected irrigation water need (shortage). However, the proposed plan includes the Irrigation Water Conservation strategy to meet as much as possible of the projected irrigation needs of the region. Therefore, each individual irrigation water user will need to install Low Energy Precision Application (LEPA), or other efficient irrigation systems which will result in irrigation water savings due to lower irrigation water application requirements.

In the case of "Rural Area Residential and Commercial" (individual households and business establishments) water users, the projections have included local surface and groundwater quantities to meet projected needs. However, no specific plans have been formulated to supply the projected quantities of water needed. Instead, it is presumed that those individual households and businesses that are located in rural areas, and rural and investor owned water supply districts, authorities, and companies (those that supplied less than 280 acft or had populations less than 500 in year 2000) that operate public water supply systems to serve rural areas will meet these needs either from locally available supplies, or through arrangements to obtain water from other water utilities. Plans are included for all public water suppliers (cities and water supply districts and authorities) that provided 280 acft or more and/or had populations of 500 or more in year 2000.

Water management strategies recommended for implementation to meet projected needs or shortages in each of the 21 counties within the South Central Texas Region are summarized in a series of figures and tables included as Appendix D. These figures and tables illustrate the phased implementation of water management strategies within each county to meet the needs of WUGs located within the county. Counties are presented in alphabetical order from Atascosa

County to Zavala County. The counties having the greatest combined municipal, industrial, steam-electric, and mining needs and, hence, needing the greatest quantities of new water supply are Bexar, Comal, Guadalupe, and Hays. Particular attention to the notes in each county table is encouraged. More detailed information regarding allocation of new water supplies to specific cities and other water user groups within each county may be found in the detailed plans for each of the 21 counties of the South Central Texas Planning Region, which are presented in alphabetic order in the following subsections. In each county plan, each water user group of the county is listed, and water conservation has been included in the plan for each municipal water user and the irrigation user group, where appropriate. In addition, if the water user group has a need (shortage) during the planning horizon, one or more water management strategies are recommended to meet the need.

The total unit costs of potable water (surface water treated to regulatory standards for public supply and/or groundwater that meets regulatory standards for public supply), delivered to the water user groups' retail distribution systems were computed as follows. For water user groups whose needs can be met from a single local source by an individual water management strategy that can be scheduled and sized to meet that particular need, such as local groundwater for the City of Floresville, annual and unit costs in Second Quarter 2002 prices are presented for additional wells to be added at the time of the projected need. Costs were calculated in accordance with TWDB guidance and are presented in Volume II and the following county tables. In this case, and in many cases described herein, water treatment and associated facilities were sized to meet peak day demands, which are approximately twice average day demands. Both debt service and operation and maintenance costs are calculated accordingly.

For water user groups that do not have the potential to adopt readily available individual water management strategies using local sources of supply to meet their individual needs at the time these needs are projected to occur, such as utilities of Bexar, Caldwell, Comal, Guadalupe, and Hays Counties, large-scale water management strategies to meet regional needs involving two or more water user groups are recommended by the SCTRWPG in the regional water plan. In the latter cases, total and unit costs (Second Quarter 2002 prices) are calculated to obtain, convey, treat, and deliver potable water (surface and/or groundwater that meets regulatory standards for public supply) to the respective water user groups' retail distribution systems. As was the case for individual local systems, the costs are computed according to TWDB guidance and are reported in Volume II and are tabulated in the respective county tables on the following pages.

It was necessary to allocate the costs of large-scale, regional water management strategies among the water user groups they are intended to serve. The allocation procedure was to prorate the total annual costs to each water user group to be supplied from a water management strategy based on the water user group's proportion or share of quantity obtained from that strategy in each decade. In this way, a unit cost representative of the strategy in full operation is shown for all participating water user groups. Water user groups may actually be required to begin paying their prorata share of annual debt service at the time the strategy is implemented based on their ultimate share of the new supply whether or not they have begun taking water. The basis for this principle of dividing debt service among water user groups is to facilitate the development of a strategy to its relevant size, and to assure that those user groups who need the water will have invested in and thereby reserved their respective shares so that water will be there when needed. In the case of the South Central Texas Region, many water user groups will need the water as soon as the water management strategy can be implemented. It is important to note that individual water user groups could participate in the development of a water management strategy in the cost sharing manner outlined here, and then lease part or all of their respective shares to others until they have grown enough to fully utilize them. Therefore, few, if any user groups would be paying debt service for idle capacity.

In the case of water to meet the projected needs of the large number of water user groups in Bexar County, it has been assumed that one or more wholesale water providers will implement the large-scale, distantly located water management strategies recommended in the Regional Plan, and since these supplies are needed as soon as possible, the water user groups (customers) will begin paying debt service and operation and maintenance costs on the basis of their prorata share of the quantities of water taken. For example, if SAWS implements a strategy, SAWS and its customers will use the water and pay all the costs. If some other supplier implements a strategy, the costs would be prorated among the users on the basis of the proportion of the quantity taken.

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4B.2.1 Atascosa County Water Supply Plan

Table 4B.2.1-1 lists each water user group in Atascosa County and its corresponding management supply or shortage in 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.1-1.
Atascosa County Management Supply/Shortage by Water User Group

Water User Group	*Management Supply/Shortage*		*Comment*
	2010 (acft/yr)	*2060 (acft/yr)*	
Benton City WSC	323	-1,058	Projected shortage (2020 through 2060)
Bexar Metropolitan Water District			See Bexar County
City of Charlotte	708	759	
City of Jourdanton	828	773	
City of Lytle	-196	-243	Projected shortage (2010 through 2060)
McCoy WSC	-515	-1,675	Projected shortage (2010 through 2060)
City of Pleasanton	651	672	
City of Poteet	142	216	
Rural Area Residential and Commercial	85	502	
Industrial	1	2	
Steam-Electric Power	961	-3,952	Projected shortage (2040 through 2060)
Mining	7	151	
Irrigation	-1,961	1,874	Projected shortage (2010 through 2030)
Livestock	0	0	

4B.2.1.1 Benton City WSC

Current water supply for Benton City WSC is obtained from the Carrizo Aquifer. Benton City WSC is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Benton City WSC implement the following water supply plan to meet their projected needs (Table 4B.2.1-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 24 acft/yr by 2040, increasing to 153 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo Aquifer development to be implemented prior to 2010. This strategy can provide an additional 800 acft/yr from 2010 to 2040, 900 acft/yr in 2050, and 1,400 acft/yr in 2060. Information received from Benton City WSC indicates that they are currently seeking permits to drill two new wells in the Carrizo Aquifer.

Table 4B.2.1-2.
Recommended Water Supply Plan for Benton City WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	144	385	627	869	1,058
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	24	85	153
Local Carrizo	807	807	807	807	1,613	1,613
Total New Supply	**807**	**807**	**807**	**831**	**1,698**	**1,766**

Estimated costs of the recommended plan to meet Benton City WSC's projected needs are shown in Table 4B.2.1-3.

Table 4B.2.1-3.
Recommended Plan Costs by Decade for Benton City WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$13,964	$49,748	$89,732
Unit Cost ($/acft)	—	—	—	$588	$588	$588
Local Carrizo						
Annual Cost ($/yr)	$240,500	$240,500	$280,500	$280,500	$381,000	$381,000
Unit Cost ($/acft)	$298	$298	$298	$236	$236	$236

4B.2.1.2 City of Charlotte

The City of Charlotte is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Charlotte implement the following water supply plan (Table 4B.2.1-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 20 acft/yr by 2010, increasing to 43 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.1-4.
Recommended Water Supply Plan for the City of Charlotte

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	20	23	25	26	34	43
Total New Supply	**20**	**23**	**25**	**26**	**34**	**43**

Estimated costs of the recommended plan for the City of Charlotte are shown in Table 4B.2.1-5.

Table 4B.2.1-5.
Recommended Plan Costs by Decade for the City of Charlotte

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$11,829	$13,277	$13,293	$12,567	$15,497	$18,898
Unit Cost ($/acft)	$588	$588	$537	$485	$454	$444

4B.2.1.3 City of Jourdanton

The City of Jourdanton is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Jourdanton implement the following water supply plan (Table 4B.2.1-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 60 acft/yr by 2010, increasing to 222 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.1-6.
Recommended Water Supply Plan for the City of Jourdanton

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	60	123	156	173	195	222
Total New Supply	**60**	**123**	**156**	**173**	**196**	**222**

Estimated costs of the recommended plan for the City of Jourdanton are shown in Table 4B.2.1-7.

Table 4B.2.1-7.
Recommended Plan Costs by Decade for the City of Jourdanton

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$35,191	$58,966	$69,591	$74,735	$82,723	$93,565
Unit Cost ($/acft)	$588	$478	$446	$432	$423	$421

4B.2.1.4 City of Lytle

Current water supply for the City of Lytle is obtained from the Edwards Aquifer. Lytle is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Lytle implement the following water supply plan to meet the projected needs for the city (Table 4B.2.1-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 38 acft/yr by 2010, increasing to 108 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 196 acft/yr by 2010, increasing to 243 acft/yr by 2060.

Table 4B.2.1-8.
Recommended Water Supply Plan for the City of Lytle

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	196	207	217	224	234	243
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	38	72	82	86	96	108
Edwards Transfers (L-15)	196	207	217	224	234	243
Total New Supply	**234**	**279**	**299**	**310**	**330**	**351**

Estimated costs of the recommended plan to meet the City of Lytle's projected needs are shown in Table 4B.2.1-9.

Table 4B.2.1-9.
Recommended Plan Costs by Decade for the City of Lytle

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$19,859	$32,851	$35,789	$36,249	$39,754	$44,723
Unit Cost ($/acft)	$520	$453	$436	$422	$416	$415
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$26,460	$27,945	$29,295	$30,240	$31,590	$32,805
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.1.5 McCoy WSC

Current water supply for McCoy WSC is obtained from the Carrizo Aquifer. McCoy WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that McCoy WSC implement the following water supply plan to meet their projected needs (Table 4B.2.1-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 13 acft/yr by 2040, increasing to 129 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo Aquifer development to be implemented prior to 2010. This strategy can provide an additional 807 acft/yr by 2010, increasing to 2,421 acft/yr of supply in 2060.

Table 4B.2.1-10.
Recommended Water Supply Plan for McCoy WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	515	838	1,107	1,321	1,520	1,675
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	13	68	129
Local Carrizo	807	1,614	1,614	1,614	1,614	2,421
Total New Supply	**807**	**1,614**	**1,614**	**1,627**	**1,682**	**2,550**

Estimated costs of the recommended plan to meet McCoy WSC's projected needs are shown in Table 4B.2.1-11.

Table 4B.2.1-11.
Recommended Plan Costs by Decade for McCoy WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$7,775	$39,895	$75,669
Unit Cost ($/acft)	—	—	—	$588	$588	$588
Local Carrizo						
Annual Cost ($/yr)	$264,667	$529,333	$529,333	$398,667	$268,000	$532,667
Unit Cost ($/acft)	$328	$328	$328	$247	$166	$220

4B.2.1.6 City of Pleasanton

The City of Pleasanton is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Pleasanton implement the following water supply plan (Table 4B.2.1-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 156 acft/yr by 2010, increasing to 615 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.1-12.
Recommended Water Supply Plan for the City of Pleasanton

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	156	300	448	523	565	615
Total New Supply	**156**	**300**	**448**	**523**	**565**	**615**

Estimated costs of the recommended plan for the City of Pleasanton are shown in Table 4B.2.1-13.

Table 4B.2.1-13.
Recommended Plan Costs by Decade for the City of Pleasanton

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$79,904	$133,442	$189,471	$215,921	$231,640	$251,800
Unit Cost ($/acft)	$513	$445	$423	$413	$410	$409

4B.2.1.7 City of Poteet

The City of Poteet is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Poteet implement the following water supply plan (Table 4B.2.1-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 60 acft/yr by 2010, increasing to 213 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.1-14.
Recommended Water Supply Plan for the City of Poteet

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	60	116	163	185	198	213
Total New Supply	**60**	**116**	**163**	**185**	**198**	**213**

Estimated costs of the recommended plan for the City of Poteet are shown in Table 4B.2.1-15.

Table 4B.2.1-15.
Recommended Plan Costs by Decade for the City of Poteet

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$34,691	$55,102	$71,316	$77,899	$82,078	$88,313
Unit Cost ($/acft)	$578	$476	$436	$420	$416	$415

4B.2.1.8 Rural Area Residential and Commercial

Rural areas are projected to have adequate water supplies available from the Carrizo and Sparta Aquifers to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.1-16).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 11 acft/yr by 2010, decreasing to 0 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.1-16.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	11	17	11	1	0	0
Total New Supply	**11**	**17**	**11**	**1**	**0**	**0**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.1-17.

Table 4B.2.1-17.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$6,532	$9,779	$6,515	$810	—	—
Unit Cost ($/acft)	$588	$588	$588	$588	—	—

4B.2.1.9 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.1.10 Steam-Electric Power

Current water supply for steam-electric power is obtained from the Carrizo Aquifer. Steam-electric power is projected to need additional water supplies in the year 2040. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual steam-electric power operations implement the following water supply plan to meet the projected needs for steam-electric power (Table 4B.2.1-18).

- Local Carrizo to be implemented in 2040. This strategy can provide an additional 1,120 acft/yr of supply in 2040 increasing to 4,480 acft/yr in 2060.

Table 4B.2.1-18.
Recommended Water Supply Plan for Steam-Electric Power

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	874	2,212	3,952
Recommended Plan						
Local Carrizo	—	—	—	1,120	2,240	4,480
Total New Supply	—	—	—	**1,120**	**2,240**	**4,480**

Estimated costs of the recommended plan to meet the steam-electric power projected needs are shown in Table 4B.2.1-19.

Table 4B.2.1-19.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	2010	2020	2030	2040	2050	2060
Local Carrizo						
Annual Cost ($/yr)	—	—	—	$127,750	$255,500	$511,000
Unit Cost ($/acft)	—	—	—	$114	$114	$114

4B.2.1.11 Mining

Mining is projected to have adequate water supplies available from the Carrizo and Queen City Aquifers to meet the water user group's projected demand during the planning period.

4B.2.1.12 Irrigation

Current water supply for irrigation is obtained from the Edwards, Carrizo, Sparta, and Queen City Aquifers, and run-of-river rights. Irrigation is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual irrigators implement the following water supply plan to meet the projected needs for irrigation (Table 4B.2.1-20).

- Irrigation water conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 1,961 acft/yr of supply.

Table 4B.2.1-20.
Recommended Water Supply Plan for Irrigation

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	1,961	1,022	111	0	0	0
Recommended Plan						
Irrigation Water Conservation (L-10 Irr.)	1,961	1,022	111	—	—	—
Total New Supply	**1,961**	**1,022**	**111**	—	—	—

Estimated costs of the recommended plan to meet the irrigation projected needs are shown in Table 4B.2.1-21.

Table 4B.2.1-21.
Recommended Plan Costs by Decade for Irrigation

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Irrigation Water Conservation (L-10 Irr.)						
Annual Cost ($/yr)	$276,501	$144,102	$15,651	—	—	—
Unit Cost ($/acft)	$141	$141	$141	—	—	—

4B.2.1.13 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group’s projected demand during the planning period.

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4B.2.2 Bexar County Water Supply Plan

Table 4B.2.2-1 lists each water user group in Bexar County and its corresponding management supply or shortage in 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.2-1.
Bexar County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage		Comment
	2010 (acft/yr)	2060 (acft/yr)	
City of Alamo Heights	-515	-614	Projected shortage (2010 through 2060)
Atascosa Rural WSC	-561	-1,233	Projected shortage (2010 through 2060)
City of Balcones Heights	0	0	
Bexar Metropolitan Water District	-7,067	-10,136	Projected shortage (2010 through 2060)
City of Castle Hills	-96	-47	Projected shortage (2010 through 2060)
City of China Grove	0	0	
City of Converse	225	-1,432	Projected shortage (2020 through 2060)
East Central SUD	1,428	-942	Projected shortage (2030 through 2060)
City of Elmendorf	0	0	
City of Fair Oaks Ranch	10	121	
Green Valley SUD			See Guadalupe County
City of Helotes	0	0	
City of Hill Country Village	-730	-718	Projected shortage (2010 through 2060)
City of Hollywood Park	-1,969	-2,271	Projected shortage (2010 through 2060)
City of Kirby	-299	-328	Projected shortage (2010 through 2060)
Lackland AFB (CDP)	-857	-769	Projected shortage (2010 through 2060)
City of Leon Valley	59	94	
City of Live Oak	863	724	
City of Lytle			See Atascosa County
City of Olmos Park	0	0	
City of San Antonio (SAWS)	-53,165	-153,980	Projected shortage (2010 through 2060)
City of San Antonio (BMWD)	-10,455	-25,908	Projected shortage (2010 through 2060)
City of San Antonio (Others)	-184	-316	Projected shortage (2010 through 2060)

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Table 4B.2.2-1 Concluded

Water User Group	***Management Supply/Shortage*** ***2010 (acft/yr)***	***2060 (acft/yr)***	***Comment***
City of Schertz			See Guadalupe County
City of Selma	-757	-1,695	Projected shortage (2010 through 2060)
City of Shavano Park	-499	-560	Projected shortage (2010 through 2060)
City of Somerset	0	0	
City of St. Hedwig	0	0	
City of Terrell Hills	0	0	
City of Universal City	-141	-634	Projected shortage (2010 through 2060)
Water Service Inc. (Apex)	-908	-2,015	Projected shortage (2010 through 2060)
Windcrest (WC&ID No. 10)	0	0	
Rural Area Residential and Commercial	7,497	5,601	Projected shortage (Nueces Basin)
Industrial	-3,258	-19,419	Projected shortage (2010 through 2060)
Steam-Electric Power	31,591	15,510	
Mining	-23	-1,229	Projected shortage (2010 through 2060)
Irrigation	6,853	9,034	Projected shortage (Nueces Basin)
Livestock	0	-91	Projected shortage (2030 through 2060)

4B.2.2.1 Regional Water Provider for Bexar County

Bexar County represents the major municipal demand center of the South Central Texas Region and encompasses not only the City of San Antonio, but numerous suburban cities and communities (water user groups). It is apparent that the most economical development of additional water supplies to meet the present and future needs of Bexar County can best be accomplished on a regional, rather than city-by-city, basis. Development of additional water supplies for Bexar County will most likely be accomplished strategy by strategy, with a single sponsor or varying groups of sponsors involved in the cooperative implementation of each major strategy. Hence, for the purposes of this regional water plan, the concept of a Regional Water Provider for Bexar County is employed. Designation of Regional Water Provider for Bexar County accounts for the fact that water supplies may be developed by individual sponsors and/or coalitions of sponsors. Furthermore, it ensures the flexibility necessary to facilitate activities of identified wholesale water providers, water user groups, and others in their independent or collective efforts to develop additional water supplies for Bexar County.

Bexar County's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Victor Braunig Lake, Calaveras Lake, the Medina Lake System, direct reuse, and run-of-river rights. Bexar County is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Regional Water Provider for Bexar County implement the following water supply plan to meet the projected needs for portions of the county (Table 4B.2.2-2).

- Edwards Aquifer Recharge – Type 2 Project to be implemented prior to 2020. This strategy can provide an additional 13,451 acft/yr of supply by 2020, increasing to 21,577 acft/yr of additional supply in 2060.
- Seawater Desalination to be implemented prior to 2060. This strategy can provide an additional 84,012 acft of supply by 2060.

Table 4B.2.2-2.
Recommended Water Supply Plan for the
Regional Water Provider for Bexar County

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Recommended Plan						
Edwards Aquifer Recharge Type 2 Projects	—	13,451	13,451	13,451	13,451	21,577
Seawater Desalination	—	—	—	—	—	84,012

Estimated costs of the recommended plan to meet the irrigation projected needs are shown in Table 4B.2.2-3.

Table 4B.2.2-3.
Recommended Plan Costs by Decade for the Regional Water Provider for Bexar County

Plan Element	2010	2020	2030	2040	2050	2060
Edwards Aquifer Recharge – Type 2 Projects						
Annual Cost ($/yr)	—	$8,578,000	$8,578,000	$8,578,000	$8,036,000	$22,218,000
Unit Cost ($/acft)	—	$638	$638	$638	$597	$1,030
Seawater Desalination						
Annual Cost ($/yr)	—	—	—	—	—	$116,764,505
Unit Cost ($/acft)	—	—	—	—	—	$1,390

4B.2.2.2 City of Alamo Heights

Current water supply for the City of Alamo Heights is obtained from the Edwards Aquifer. Alamo Heights is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Alamo Heights implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 175 acft/yr by 2010, increasing to 865 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 515 acft/yr by 2010, increasing to 614 acft/yr of additional supply by 2060.

Table 4B.2.2-4.
Recommended Water Supply Plan for the City of Alamo Heights

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	515	578	580	576	590	614
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	175	337	488	625	769	865
Edwards Transfers (L-15)	515	578	580	576	590	614
Total New Supply	**690**	**915**	**1,068**	**1,201**	**1,359**	**1,479**

Estimated costs of the recommended plan to meet the City of Alamo Heights's projected needs are shown in Table 4B.2.2-5.

Table 4B.2.2-5. Recommended Plan Costs by Decade for the City of Alamo Heights

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$85,345	$146,709	$204,126	$255,717	$311,979	$350,401
Unit Cost ($/acft)	$488	$435	$418	$409	$406	$405
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$69,525	$78,030	$78,300	$77,760	$79,650	$82,890
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.3 Atascosa Rural WSC

Current water supply for Atascosa Rural WSC is obtained from the Edwards Aquifer. Atascosa Rural WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Atascosa Rural WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.2-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 22 acft/yr by 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 561 acft/yr by 2010, increasing to 1,233 acft/yr of additional supply by 2060.

Table 4B.2.2-6.
Recommended Water Supply Plan for Atascosa Rural WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	561	732	884	1,011	1,121	1,233
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	22
Edwards Transfers (L-15)	561	732	884	1,011	1,121	1,233
Total New Supply	**561**	**732**	**884**	**1,011**	**1,121**	**1,255**

Estimated costs of the recommended plan to meet Atascosa Rural WSC's projected needs are shown in Table 4B.2.2-7.

Table 4B.2.2-7.
Recommended Plan Costs by Decade for Atascosa Rural WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$13,044
Unit Cost ($/acft)	—	—	—	—	—	$588
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$75,735	$98,820	$119,340	$136,485	$151,335	$166,455
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.4 City of Balcones Heights

The City of Balcones Heights is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Balcones Heights implement the following water supply plan (Table 4B.2.2-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 4 acft/yr by 2010, increasing to 37 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-8.
Recommended Water Supply Plan for the City of Balcones Heights

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	4	6	7	9	20	37
Total New Supply	**4**	**6**	**7**	**9**	**20**	**37**

Estimated costs of the recommended plan to meet the City of Balcones Heights' projected needs are shown in Table 4B.2.2-9.

Table 4B.2.2-9.
Recommended Plan Costs by Decade for the City of Balcones Heights

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$1,895	$2,918	$3,799	$4,574	$10,368	$17,173
Unit Cost ($/acft)	$520	$520	$520	$520	$520	$469

4B.2.2.5 Bexar Metropolitan Water District

Current water supply for the Bexar Metropolitan Water District (BMWD) is obtained from the Edwards, Trinity, and Carrizo Aquifers as well as the Medina Lake System and run-of-river water rights. BMWD is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the BMWD implement the following water supply plan to meet the projected needs for the District (Table 4B.2.2-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 293 acft/yr by 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (BMWD) to be implemented prior to 2010. This strategy can provide an additional supply of 7,067 acft/yr by 2010, increasing to 10,136 acft/yr of supply in 2060. See Section 4B.3.3 for a list of recommended water management strategies.

Table 4B.2.2-10.
Recommended Water Supply Plan for Bexar Metropolitan Water District

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	7,067	7,690	8,466	8,891	9,476	10,136
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	293
Purchase from WWP (BMWD)	7,067	7,690	8,466	8,891	9,476	10,136
Total New Supply	**7,067**	**7,690**	**8,466**	**8,891**	**9,476**	**10,429**

Estimated costs of the recommended plan to meet BMWD's projected needs are shown in Table 4B.2.2-11.

Table 4B.2.2-11.
Recommended Plan Costs by Decade for Bexar Metropolitan Water District

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$172,219
Unit Cost ($/acft)	—	—	—	—	—	$588
Purchase from WWP (BMWD)						
Annual Cost ($/yr)	$2,523,718	$3,978,139	$4,467,194	$3,305,168	$3,033,814	$4,140,468
Unit Cost ($/acft)	$357	$517	$528	$372	$320	$408

4B.2.2.6 City of Castle Hills

Current water supply for the City of Castle Hills is obtained from the Edwards Aquifer through BMWD. Castle Hills is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Castle Hills implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 61 acft/yr by 2010, increasing to 166 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (BMWD) to be implemented prior to 2010. This strategy can provide an additional 96 acft/yr by 2010, decreasing to 47 acft/yr of additional supply by 2060.

Table 4B.2.2-12.
Recommended Water Supply Plan for the City of Castle Hills

	2010 (acft/yr)	**2020 (acft/yr)**	**2030 (acft/yr)**	**2040 (acft/yr)**	**2050 (acft/yr)**	**2060 (acft/yr)**
Projected Need (Shortage)	96	83	69	56	47	47
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	61	120	142	144	151	166
Purchase from WWP (BMWD)	96	83	69	56	47	47
Total New Supply	**157**	**203**	**211**	**200**	**198**	**213**

Estimated costs of the recommended plan to meet the City of Castle Hill's projected needs are shown in Table 4B.2.2-13.

Table 4B.2.2-13.
Recommended Plan Costs by Decade for the City of Castle Hills

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$31,905	$54,174	$61,423	$60,537	$61,950	$68,114
Unit Cost ($/acft)	$520	$452	$432	$420	$411	$410
Purchase from WWP (BMWD)						
Annual Cost ($/yr)	$34,283	$42,937	$36,409	$20,818	$15,047	$19,199
Unit Cost ($/acft)	$357	$517	$528	$372	$320	$408

4B.2.2.7 City of China Grove

The City of China Grove is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of China Grove implement the following water supply plan (Table 4B.2.2-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 28 acft/yr by 2010, increasing to 217 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-14.
Recommended Water Supply Plan for the City of China Grove

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	28	66	116	166	190	217
Total New Supply	**28**	**66**	**116**	**166**	**190**	**217**

Estimated costs of the recommended plan to meet the City of China Grove's projected needs are shown in Table 4B.2.2-15.

Table 4B.2.2-15.
Recommended Plan Costs by Decade for the City of China Grove

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$13,924	$28,976	$48,692	$68,699	$78,158	$89,080
Unit Cost ($/acft)	$506	$438	$420	$413	$411	$410

4B.2.2.8 City of Converse

Current water supply for the City of Converse is obtained from the Edwards Aquifer. Converse is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Converse implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-16).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 21 acft/yr by 2050, increasing to 110 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (BMWD) to be implemented prior to 2020. This strategy can provide an additional 1,500 acft/yr of supply from 2010 to 2060.

Table 4B.2.2-16.
Recommended Water Supply Plan for the City of Converse

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	199	597	912	1,179	1,432
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	21	110
Purchase from WWP (BMWD)	—	1,500	1,500	1,500	1,500	1,500
Total New Supply	—	**1,500**	**1,500**	**1,500**	**1,521**	**1,610**

Estimated costs of the recommended plan to meet the City of Converse's projected needs are shown in Table 4B.2.2-17.

Table 4B.2.2-17.
Recommended Plan Costs by Decade for the City Converse

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$10,804	$57,160
Unit Cost ($/acft)	—	—	—	—	$520	$520
Purchase from WWP (BMWD)						
Annual Cost ($/yr)	—	$775,970	$791,494	$557,615	$480,236	$612,737
Unit Cost ($/acft)	—	$517	$528	$372	$320	$408

4B.2.2.9 East Central SUD

Current water supply for East Central SUD is obtained from the Edwards and Carrizo Aquifers and Canyon Reservoir. East Central SUD is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that East Central SUD implement the following water supply plan to meet the projected needs for the SUD (Table 4B.2.2-18).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 32 acft/yr by 2050, increasing to 104 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (CRWA) to be implemented prior to 2030. This strategy can provide an additional 251 acft/yr of supply beginning in 2030, increasing to 942 acft/yr of additional supply in 2060.

Table 4B.2.2-18.
Recommended Water Supply Plan for East Central SUD

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	251	495	716	942
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	32	104
Purchase from WWP (CRWA)	—	—	251	495	716	942
Total New Supply	—	—	**251**	**495**	**748**	**1,086**

Alternative water management strategies identified by East Central SUD include CRWA Dunlap Project, Wells Ranch Carrizo Project, Local Carrizo, CRWA Siesta Project, Purchase from WWP (BMWD), Purchase from WWP (SAWS), and/or Rainwater Harvesting.

Estimated costs of the recommended plan to meet East Central SUD's projected needs are shown in Table 4B.2.2-19.

Table 4B.2.2-19.
Recommended Plan Costs by Decade for East Central SUD

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$18,972	$61,215
Unit Cost ($/acft)	—	—	—	—	$588	$588
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	—	$227,579	$194,273	$293,391	$400,523
Unit Cost ($/acft)	—	—	$907	$392	$410	$425

4B.2.2.10 City of Elmendorf

The City of Elmendorf is projected to have adequate water supplies available from the Edwards Aquifer through the San Antonio Water System (SAWS) to meet the city's projected demands during the planning period. Working within the planning criteria established by the

SCTRWPG and the TWDB, it is recommended that the City of Elmendorf implement the following water supply plan (Table 4B.2.2-20).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 2 acft/yr by 2050, increasing to 6 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Alternative water management strategies identified by the City of Elmendorf include Purchase from Wholesale Water Provider and/or Local Carrizo.

Table 4B.2.2-20.
Recommended Water Supply Plan for the City of Elmendorf

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	2	6
Total New Supply	—	—	—	—	**2**	**6**

Estimated costs of the recommended plan to meet the City of Elmendorf's projected needs are shown in Table 4B.2.2-21.

Table 4B.2.2-21.
Recommended Plan Costs by Decade for the City of Elmendorf

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$1,063	$3,094
Unit Cost ($/acft)	—	—	—	—	$520	$520

4B.2.2.11 City of Fair Oaks Ranch

The City of Fair Oaks Ranch is projected to have adequate water supplies available from the Trinity Aquifer and Canyon Reservoir to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the

TWDB, it is recommended that the City of Fair Oaks Ranch implement the following water supply plan (Table 4B.2.2-22).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 125 acft/yr by 2010, increasing to 509 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-22. Recommended Water Supply Plan for the City of Fair Oaks Ranch

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	125	246	358	460	481	509
Total New Supply	**125**	**246**	**358**	**460**	**481**	**509**

Estimated costs of the recommended plan to meet the City of Fair Oaks Ranch's projected needs are shown in Table 4B.2.2-23.

Table 4B.2.2-23. Recommended Plan Costs by Decade for the City of Fair Oaks Ranch

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$63,099	$111,147	$155,084	$195,084	$202,635	$214,133
Unit Cost ($/acft)	$507	$451	$433	$424	$422	$421

4B.2.2.12 City of Helotes

The City of Helotes is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Helotes implement the following water supply plan (Table 4B.2.2-24).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 115 acft/yr by 2010, increasing to 993 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-24.
Recommended Water Supply Plan for the City of Helotes

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	115	345	539	674	832	993
Total New Supply	**115**	**345**	**539**	**674**	**832**	**993**

Estimated costs of the recommended plan to meet the City of Helotes' projected needs are shown in Table 4B.2.2-25.

Table 4B.2.2-25.
Recommended Plan Costs by Decade for the City of Helotes

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$59,630	$156,913	$239,591	$295,221	$361,541	$428,713
Unit Cost ($/acft)	$520	$455	$444	$438	$435	$432

4B.2.2.13 City of Hill Country Village

Current water supply for the City of Hill Country Village is obtained from the Edwards Aquifer. Hill Country Village is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Hill Country Village implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-26).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 77 acft/yr by 2010, increasing to 365 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (BMWD) to be implemented prior to 2010. This strategy can provide an additional 730 acft/yr by 2010, decreasing to 718 acft/yr of additional supply by 2060.

Table 4B.2.2-26.
Recommended Water Supply Plan for the City of Hill Country Village

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	730	727	723	720	718	718
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	77	146	209	265	316	365
Purchase from WWP (BMWD)	730	727	723	720	718	718
Total New Supply	**807**	**873**	**932**	**985**	**1,034**	**1,083**

Estimated costs of the recommended plan to meet the City of Hill Country Village's projected needs are shown in Table 4B.2.2-27.

Table 4B.2.2-27.
Recommended Plan Costs by Decade for the City of Hill Country Village

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$32,886	$60,205	$84,741	$106,759	$127,099	$146,577
Unit Cost ($/acft)	$427	$411	$406	$403	$402	$402
Purchase from WWP (BMWD)						
Annual Cost ($/yr)	$260,693	$376,087	$381,500	$267,655	$229,873	$293,297
Unit Cost ($/acft)	$357	$517	$528	$372	$320	$408

4B.2.2.14 City of Hollywood Park

Current water supply for the City of Hollywood Park is obtained from the Edwards Aquifer. Hollywood Park is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Hollywood Park implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-28).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 212 acft/yr by 2010, increasing to 1,154 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (BMWD) to be implemented prior to 2010. This strategy can provide an additional 1,969 acft/yr by 2010, increasing to 2,271 acft/yr of additional supply by 2060.

Table 4B.2.2-28.
Recommended Water Supply Plan for the City of Hollywood Park

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	1,969	2,044	2,113	2,166	2,220	2,271
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	212	414	612	798	980	1,154
Purchase from WWP (BMWD)	1,969	2,044	2,113	2,166	2,220	2,271
Total New Supply	**2,181**	**2,458**	**2,725**	**2,964**	**3,200**	**3,425**

Estimated costs of the recommended plan to meet the City of Hollywood Park's projected needs are shown in Table 4B.2.2-29.

Table 4B.2.2-29.
Recommended Plan Costs by Decade for the City of Hollywood Park

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$90,990	$170,525	$248,451	$321,466	$393,873	$463,576
Unit Cost ($/acft)	$430	$412	$406	$403	$402	$402
Purchase from WWP (BMWD)						
Annual Cost ($/yr)	$703,156	$1,057,388	$1,114,952	$805,196	$710,750	$927,684
Unit Cost ($/acft)	$357	$517	$528	$372	$320	$408

4B.2.2.15 City of Kirby

Current water supply for the City of Kirby is obtained from the Edwards Aquifer. Kirby is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Kirby implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-30).

- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 299 acft/yr by 2010, increasing to 328 acft/yr of additional supply by 2060.

Table 4B.2.2-30.
Recommended Water Supply Plan for the City of Kirby

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	299	298	301	295	307	328
Recommended Plan						
Edwards Transfers (L-15)	299	298	301	295	307	328
Total New Supply	**299**	**298**	**301**	**295**	**307**	**328**

Estimated costs of the recommended plan to meet the City of Kirby's projected needs are shown in Table 4B.2.2-31.

Table 4B.2.2-31.
Recommended Plan Costs by Decade for the City of Kirby

Plan Element	2010	2020	2030	2040	2050	2060
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$40,365	$40,230	$40,635	$39,825	$41,445	$44,280
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.16 Lackland AFB (CDP)

Current water supply for Lackland AFB is obtained from the Edwards Aquifer. Lackland AFB is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Lackland AFB implement the following water supply plan to meet the projected needs for the AFB (Table 4B.2.2-32).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 268 acft/yr by 2010, increasing to 1,300 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 857 acft/yr by 2010, decreasing to 769 acft/yr of additional supply by 2060.

Table 4B.2.2-32.
Recommended Water Supply Plan for Lackland AFB

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	857	833	809	785	769	769
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	268	515	736	934	1,119	1,300
Edwards Transfers (L-15)	857	833	809	785	769	769
Total New Supply	**1,125**	**1,348**	**1,545**	**1,719**	**1,888**	**2,069**

Estimated costs of the recommended plan to meet Lackland AFB's projected needs are shown in Table 4B.2.2-33.

Table 4B.2.2-33.
Recommended Plan Costs by Decade for Lackland AFB

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$113,643	$211,143	$298,272	$376,021	$448,943	$521,501
Unit Cost ($/acft)	$424	$410	$405	$402	$401	$401
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$115,695	$112,455	$109,215	$105,975	$103,815	$103,815
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.17 City of Leon Valley

The City of Leon Valley is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Leon Valley implement the following water supply plan (Table 4B.2.2-34).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 12 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-34.
Recommended Water Supply Plan for the City of Leon Valley

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	12
Total New Supply	—	—	—	—	—	**12**

Estimated costs of the recommended plan to meet the City of Leon Valley's projected needs are shown in Table 4B.2.2-35.

Table 4B.2.2-35.
Recommended Plan Costs by Decade for the City of Leon Valley

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$6,079
Unit Cost ($/acft)	—	—	—	—	—	$520

4B.2.2.18 City of Live Oak

The City of Live Oak is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period.

4B.2.2.19 City of Olmos Park

The City of Olmos Park is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Olmos Park implement the following water supply plan (Table 4B.2.2-36).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 9 acft/yr by 2010, increasing to 33 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-36.
Recommended Water Supply Plan for the City of Olmos Park

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	9	11	13	14	21	33
Total New Supply	**9**	**11**	**13**	**14**	**21**	**33**

Estimated costs of the recommended plan to meet the City of Olmos Park's projected needs are shown in Table 4B.2.2-37.

Table 4B.2.2-37.
Recommended Plan Costs by Decade for the City of Olmos Park

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$4,844	$5,861	$6,778	$7,531	$10,278	$15,077
Unit Cost ($/acft)	$520	$520	$520	$520	$480	$453

4B.2.2.20 City of San Antonio

Current water supply for the City of San Antonio is obtained from the Edwards, Trinity, and Carrizo Aquifers, Canyon Reservoir, run-of-river rights, and direct reuse. San Antonio is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that San Antonio implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-38).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 5,752 acft/yr by 2010, increasing to 23,711 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (SAWS) to be implemented prior to 2010. This strategy can provide an additional supply of 53,165 acft/yr by 2010, increasing to 153,980 acft/yr

of additional supply by 2060. See Section 4B.3.2 for a list of recommended water management strategies.

- Purchase from WWP (BMWD) to be implemented prior to 2010. This strategy can provide an additional supply of 10,455 acft/yr by 2010, increasing to 25,908 acft/yr of additional supply by 2060. See Section 4B.3.3 for a list of recommended water management strategies.

Table 4B.2.2-38.
Recommended Water Supply Plan for the City of San Antonio

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	63,804	95,584	121,790	144,283	162,270	180,204
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	5,752	7,318	8,795	10,490	15,698	23,711
Purchase from WWP (SAWS)	53,165	78,095	101,584	122,024	138,025	153,980
Purchase from WWP (BMWD)	10,455	17,272	19,958	21,988	23,951	25,908
Total New Supply	**69,372**	**102,685**	**130,337**	**154,502**	**177,674**	**203,599**

[1] Includes water to be developed by Bexar Metropolitan WD, SAWS, and/or other providers serving the City of San Antonio.

Estimated costs of the recommended plan to meet the City of San Antonio's projected needs are shown in Table 4B.2.2-39.

Table 4B.2.2-39.
Recommended Plan Costs by Decade for the City of San Antonio

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$2,634,520	$3,351,788	$4,027,936	$4,682,712	$6,669,335	$9,896,973
Unit Cost ($/acft)	$458	$458	$458	$446	$425	$417
Purchase from WWP (SAWS)						
Annual Cost ($/yr)	$31,336,497	$44,770,504	$56,782,248	$25,004,741	$105,793,902	$117,332,283
Unit Cost ($/acft)	$589	$573	$559	$205	$766	$762
Purchase from WWP (BMWD)						
Annual Cost ($/yr)	$3,733,618	$8,935,035	$10,531,097	$8,173,888	$7,668,095	$10,583,192
Unit Cost ($/acft)	$357	$517	$528	$372	$320	$408

4B.2.2.21 City of Selma

Current water supply for the City of Selma is obtained from the Edwards and Carrizo Aquifers. Selma, with nearly 2,000 acft/yr of water supply from its Edwards Permits and SSLGC Contract (as reported in a letter to the SCTRWPG of August 19, 2005), and water conservation (as recommended in the Regional Plan) may not need additional water supplies prior to about 2040. However, it is important for Selma to be aware that its Edwards Initial Regular Permits (IRPs) may not be firm supplies. For the purposes of regional water planning, Edwards supplies have been included on the basis of a 400,000 acft/yr permitted pumpage cap with 15 percent reductions under critical period rules or 340,000 acft/yr, which is about 59 percent of the sum of the IRPs.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Selma implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-40).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 135 acft/yr by 2010, increasing to 1,122 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (SSLGC) to be implemented prior to 2040. This strategy can provide an additional 700 acft/yr of supply from 2040 to 2060.
- Purchase from WWP (RWPBC) to be implemented prior to 2020. This strategy can provide an additional 1,000 acft/yr of supply from 2020 to 2060.

Table 4B.2.2-40.
Recommended Water Supply Plan for the City of Selma

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	757	1,232	1,705	1,703	1,694	1,695
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	135	344	617	801	966	1,122
Purchase from WWP (SSLGC)	700	700	700	700	700	700
Purchase from WWP (RWPBC)	—	1,000	1,000	1,000	1,000	1,000
Total New Supply	**835**	**2,044**	**2,317**	**2,501**	**2,666**	**2,822**

Estimated costs of the recommended plan to meet the City of Selma's projected needs are shown in Table 4B.2.2-41.

Table 4B.2.2-41.
Recommended Plan Costs by Decade for the City of Selma

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$62,452	$146,047	$254,992	$327,732	$392,519	$455,193
Unit Cost ($/acft)	$463	$425	$413	$409	$406	$406
Purchase from WWP (SSLGC)						
Annual Cost ($/yr)	$287,820	$287,820	$287,820	$181,945	$181,945	$181,945
Unit Cost ($/acft)	$411	$411	$411	$260	$260	$260
Purchase from WWP (RWBPC)						
Annual Cost ($/yr)	—	$637,722	$637,722	$637,722	$597,428	$1,316,259
Unit Cost ($/acft)	—	$638	$638	$638	$597	$1,316

4B.2.2.22 City of Shavano Park

Current water supply for the City of Shavano Park is obtained from the Edwards Aquifer. Shavano Park is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Shavano Park implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-42).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 73 acft/yr by 2010, increasing to 382 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 499 acft/yr by 2010, increasing to 560 acft/yr of additional supply by 2060.

Table 4B.2.2-42.
Recommended Water Supply Plan for the City of Shavano Park

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	499	515	527	536	548	560
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	73	142	205	265	324	382
Edwards Transfers (L-15)	499	515	527	536	548	560
Total New Supply	**572**	**657**	**732**	**801**	**872**	**942**

Estimated costs of the recommended plan to meet the City of Shavano Park's projected needs are shown in Table 4B.2.2-43.

Table 4B.2.2-43.
Recommended Plan Costs by Decade for the City of Shavano Park

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$32,782	$59,754	$83,897	$107,125	$130,752	$153,711
Unit Cost ($/acft)	$450	$421	$410	$405	$403	$403
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$67,365	$69,525	$71,145	$72,360	$73,980	$75,600
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.23 City of Somerset

The City of Somerset is projected to have adequate water supplies available from run-of-river rights to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Somerset implement the following water supply plan (Table 4B.2.2-44).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 29 acft/yr by 2010, increasing to 177 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-44.
Recommended Water Supply Plan for the City of Somerset

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	29	70	110	131	152	177
Total New Supply	29	70	110	131	152	177

Estimated costs of the recommended plan to meet the City of Somerset's projected needs are shown in Table 4B.2.2-45.

Table 4B.2.2-45.
Recommended Plan Costs by Decade for the City of Somerset

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$14,849	$31,401	$46,780	$55,004	$63,112	$73,129
Unit Cost ($/acft)	$520	$447	$424	$419	$415	$414

4B.2.2.24 City of St. Hedwig

The City of St. Hedwig is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of St. Hedwig implement the following water supply plan (Table 4B.2.2-46).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 14 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-46.
Recommended Water Supply Plan for the City of St. Hedwig

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	14
Total New Supply	—	—	—	—	—	**14**

Estimated costs of the recommended plan to meet the City of St. Hedwig's projected needs are shown in Table 4B.2.2-47.

Table 4B.2.2-47.
Recommended Plan Costs by Decade for the City of St. Hedwig

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$8,219
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.2.25 City of Terrell Hills

The City of Terrell Hills is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Terrell Hills implement the following water supply plan (Table 4B.2.2-48).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 14 acft/yr by 2010, increasing to 65 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-48.
Recommended Water Supply Plan for the City of Terrell Hills

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	14	18	21	24	39	65
Total New Supply	**14**	**18**	**21**	**24**	**39**	**65**

Estimated costs of the recommended plan to meet the City of Terrell Hills' projected needs are shown in Table 4B.2.2-49.

Table 4B.2.2-49.
Recommended Plan Costs by Decade for the City of Terrell Hills

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$7,250	$9,258	$11,080	$12,587	$18,489	$28,943
Unit Cost ($/acft)	$520	$520	$520	$520	$472	$445

4B.2.2.26 City of Universal City

Current water supply for the City of Universal City is obtained from the Edwards and Carrizo Aquifers. Universal City is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Universal City implement the following water supply plan to meet the projected needs for the city (Table 4B.2.2-50).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 49 acft/yr by 2050, increasing to 148 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 141 acft/yr by 2010, increasing to 634 acft/yr of additional supply by 2060.

Table 4B.2.2-50.
Recommended Water Supply Plan for the City of Universal City

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	141	449	708	658	634	634
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	49	148
Edwards Transfers (L-15)	141	449	708	658	634	634
Total New Supply	**141**	**449**	**708**	**658**	**683**	**782**

Estimated costs of the recommended plan to meet the City of Universal City's projected needs are shown in Table 4B.2.2-51.

Table 4B.2.2-51.
Recommended Plan Costs by Decade for the City of Universal City

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$25,594	$70,876
Unit Cost ($/acft)	—	—	—	—	$520	$480
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$19,035	$60,615	$95,580	$88,830	$85,590	$85,590
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.27 Water Service Inc. (Apex)

Current water supply for Water Service Inc. is obtained from the Edwards Aquifer. Water Service Inc. is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Water Service Inc. implement the following water supply plan to meet the projected needs for the entity (Table 4B.2.2-52).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 18 acft/yr by 2040, increasing to 105 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional supply of 908 acft/yr by 2010, increasing to 2,015 acft/yr of additional supply by 2060

Table 4B.2.2-52.
Recommended Water Supply Plan for Water Service Inc.

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	908	1,145	1,381	1,596	1,798	2,015
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	18	50	105
Edwards Transfers (L-15)	908	1,145	1,381	1,596	1,798	2,015
Total New Supply	**908**	**1,145**	**1,381**	**1,614**	**1,848**	**2,120**

Estimated costs of the recommended plan to meet Water Service Inc.'s projected needs are shown in Table 4B.2.2-53.

Table 4B.2.2-53.
Recommended Plan Costs by Decade for Water Service Inc.

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$10,531	$29,384	$61,948
Unit Cost ($/acft)	—	—	—	$588	$588	$588
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$122,580	$154,575	$186,435	$215,460	$242,730	$272,025
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.2.28 City of Windcrest

The City of Windcrest is projected to have adequate water supplies available from the Edwards Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Windcrest implement the following water supply plan (Table 4B.2.2-54).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 99 acft/yr by 2010, increasing to 385 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.2-54.
Recommended Water Supply Plan for the City of Windcrest

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	99	189	270	343	362	385
Total New Supply	**99**	**189**	**270**	**343**	**362**	**385**

Estimated costs of the recommended plan to meet the City of Windcrest's projected needs are shown in Table 4B.2.2-55.

Table 4B.2.2-55.
Recommended Plan Costs by Decade for the City of Windcrest

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$50,168	$84,043	$114,288	$141,248	$147,588	$156,708
Unit Cost ($/acft)	$504	$444	$423	$412	$408	$407

4B.2.2.29 Rural Area Residential and Commercial

Current water supply for Rural Areas is obtained from the Edwards Aquifer, Trinity Aquifer, and Canyon Reservoir. Rural Areas are projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.2-56).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 49 acft/yr in 2010, increasing to 505 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (RWPBC) to be implemented prior to 2030. This strategy can provide an additional 200 acft/yr for years 2030 through 2060.

Table 4B.2.2-56.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	108	106	105	106
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	49	96	140	191	310	505
Purchase from WWP (RWPBC)	—	—	200	200	200	200
Total New Supply	**49**	**96**	**340**	**391**	**510**	**705**

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.2-57.

Table 4B.2.2-57.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$28,834	$56,217	$82,441	$112,410	$182,263	$297,122
Unit Cost ($/acft)	$588	$588	$588	$588	$588	$588
Purchase from WWP (RWPBC)						
Annual Cost ($/yr)	—	—	$127,544	$127,544	$119,486	$263,252
Unit Cost ($/acft)	—	—	$638	$638	$597	$1,316

4B.2.2.30 Industrial

Current water supply for industrial is obtained from the Edwards Aquifer, Trinity Aquifer, run-of-river rights, and direct reuse. Industrial is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected needs for industrial (Table 4B.2.2-58).

- Purchase from WWP (SAWS) to be implemented prior to 2010. This strategy can provide an additional 4,277 acft/yr of supply in 2010, increasing to 12,277 acft/yr of additional supply in 2060. See Section 4B.3.2 for an individual project list.

Table 4B.2.2-58.
Recommended Water Supply Plan for Industrial

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	3,258	6,804	10,082	13,375	16,272	19,419
Recommended Plan						
Purchase from WWP (SAWS)	4,277	8,277	10,277	14,277	22,277	22,277
Total New Supply	**4,277**	**8,277**	**10,277**	**14,277**	**22,277**	**22,277**

Estimated costs of the recommended plan to meet the industrial projected needs are shown in Table 4B.2.2-59.

Table 4B.2.2-59.
Recommended Plan Costs by Decade for Industrial

Plan Element	2010	2020	2030	2040	2050	2060
Purchase from WWP (SAWS)						
Annual Cost ($/yr)	$2,520,948	$4,745,060	$5,744,518	$2,925,594	$17,074,956	$16,975,005
Unit Cost ($/acft)	$589	$573	$559	$205	$766	$762

4B.2.2.31 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from Victor Braunig Lake and Calaveras Lake to meet the water user group's projected demand during the planning period.

4B.2.2.32 Mining

Current water supply for mining is obtained from the Carrizo Aquifer. Mining is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected needs for mining (Table 4B.2.2-60).

- Mining Water Conservation to be implemented prior to 2010. This strategy can provide an additional 25 acft/yr of supply.
- Purchase from WWP (RWPBC) to be implemented prior to 2030. This strategy can provide an additional 1,300 acft/yr by 2030.

Table 4B.2.2-60. Recommended Water Supply Plan for Mining

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	23	22	953	1,046	1,142	1,229
Recommended Plan						
Mining Water Conservation	25	25	25	25	25	25
Purchase from WWP (RWPBC)	—	—	1,300	1,300	1,300	1,300
Total New Supply	**25**	**25**	**1,325**	**1,325**	**1,325**	**1,325**

Estimated costs of the recommended plan to meet the mining projected needs are shown in Table 4B.2.2-61.

Table 4B.2.2-61. Recommended Plan Costs by Decade for Mining

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Mining Water Conservation						
Annual Cost ($/yr)	N/A	N/A	N/A	N/A	N/A	N/A
Unit Cost ($/acft)	N/A	N/A	N/A	N/A	N/A	N/A
Purchase from WWP (RWPBC)						
Annual Cost ($/yr)	—	—	$829,039	$829,039	$776,656	$1,711,137
Unit Cost ($/acft)	—	—	$638	$638	$597	$1,316

4B.2.2.33 Irrigation

Current water supply for irrigation is obtained from the Edwards Aquifer, Carrizo Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual irrigators implement the following water supply plan to meet the projected needs for irrigation (Table 4B.2.2-62).

- Irrigation Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 529 acft/yr of supply.

Table 4B.2.2-62.
Recommended Water Supply Plan for Irrigation

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	184	150	529	489	452	417
Recommended Plan						
Irrigation Water Conservation (L-10 Irr.)	529	529	529	529	529	529
Total New Supply	**529**	**529**	**529**	**529**	**529**	**529**

Estimated costs of the recommended plan to meet the irrigation projected needs are shown in Table 4B.2.2-63.

Table 4B.2.2-63.
Recommended Plan Costs by Decade for Irrigation

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Irrigation Water Conservation (L-10 Irr.)						
Annual Cost ($/yr)	$37,559	$37,559	$37,559	$37,559	$37,559	$37,559
Unit Cost ($/acft)	$71	$71	$71	$71	$71	$71

4B.2.2.34 Livestock

Current water supply for livestock is obtained from the Edwards, Carrizo, and Trinity Aquifers and local sources. Livestock is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual livestock operations implement the following water supply plan to meet the projected needs for livestock (Table 4B.2.2-64).

- Local Carrizo to be implemented prior to 2030. This strategy can provide an additional 91 acft/yr by 2030.

Table 4B.2.2-64.
Recommended Water Supply Plan for Livestock

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	80	84	88	91
Recommended Plan						
Local Carrizo	—	—	91	91	91	91
Total New Supply	—	—	**91**	**91**	**91**	**91**

No estimated costs of the recommended plan to meet the livestock projected needs are included as additional supplies will likely be produced from existing wells. It is not expected to be economically feasible to develop new sources of firm supply to meet these small unconcentrated needs.

4B.2.3 Caldwell County Water Supply Plan

Table 4B.2.3-1 lists each water user group in Caldwell County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.3-1.
Caldwell County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
Aqua WSC	-49	-362	Projected shortage (2010 through 2060)
County Line WSC			See Hays County
Creedmoor-Maha WSC	412	73	
Goforth WSC			See Hays County
Gonzales County WSC			See Gonzales County
City of Lockhart	-341	-3,175	Projected shortage (2010 through 2060)
City of Luling	-168	-695	Projected shortage (2010 through 2060)
City Martindale	33	0	
Martindale WSC	99	-41	Projected shortage (2040 through 2060)
Maxwell WSC	381	-692	Projected shortage (2030 through 2060)
City of Mustang Ridge	-19	-213	Projected shortage (2010 through 2060)
City of Niederwald			See Hays County
Polonia WSC	269	-719	Projected shortage (2030 through 2060)
Rural Area Residential and Commercial	690	711	
Industrial	15	1	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	19	165	
Livestock	0	0	

4B.2.3.1 Aqua WSC

Current water supply for Aqua WSC is obtained from the Carrizo Aquifer. Aqua WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Aqua WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.3-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 6 acft/yr by 2050, increasing to 19 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2010. This strategy can provide an additional 536 acft/yr by 2010.

Table 4B.2.3-2. Recommended Water Supply Plan for Aqua WSC

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	49	121	178	240	300	362
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	6	19
Local Carrizo	536	536	536	536	536	536
Total New Supply	**536**	**536**	**536**	**536**	**542**	**555**

Estimated costs of the recommended plan to meet Aqua WSC's projected needs are shown in Table 4B.2.3-3.

Table 4B.2.3-3. Recommended Plan Costs by Decade for Aqua WSC

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$3,555	$11,247
Unit Cost ($/acft)	—	—	—	—	$588	$588
Local Carrizo						
Annual Cost ($/yr)	$236,000	$236,000	$236,000	$131,000	$131,000	$131,000
Unit Cost ($/acft)	$440	$440	$440	$244	$244	$244

4B.2.3.2 Creedmoor-Maha WSC

Creedmoor-Maha WSC is projected to have adequate water supplies available from the Edwards (Barton Springs) Aquifer to meet the WSC's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Creedmoor-Maha WSC implement the following water supply plan (Table 4B.2.3-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 11 acft/yr by 2060 (Volume II, Section 4C.1.1).

Table 4B.2.3-4.
Recommended Water Supply Plan for Creedmoor-Maha WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	11
Total New Supply	—	—	—	—	—	**11**

Estimated costs of the recommended plan for Creedmoor-Maha WSC are shown in Table 4B.2.3-5.

Table 4B.2.3-5.
Recommended Plan Costs by Decade for Creedmoor-Maha WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$6,644
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.3.3 City of Lockhart

Current water supply for the City of Lockhart is obtained from the Carrizo Aquifer and Guadalupe-Blanco River Authority run-of-river rights. Lockhart is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Lockhart implement the following water supply plan to meet the projected needs for the city (Table 4B.2.3-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 28 acft/yr by 2030, increasing to 333 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2010. This strategy can provide an additional 363 acft/yr by 2010, increasing to 1,612 acft/yr by 2030.
- Hays/Caldwell Carrizo Project[1] to be implemented prior to 2040. This strategy can provide an additional 1,000 acft/yr by 2040, increasing to 2,000 acft/yr by 2060.

An alternative water management strategy identified by Lockhart is Lockhart Reservoir.

Table 4B.2.3-6. Recommended Water Supply Plan for the City of Lockhart

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	341	984	1,519	2,070	2,615	3,175
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	28	103	195	333
Local Carrizo	403	1,209	1,612	1,612	1,612	1,612
Hays/Caldwell Carrizo Project	—	—	—	1,000	1,500	2,000
Total New Supply	**403**	**1,209**	**1,640**	**2,715**	**3,307**	**3,945**

Estimated costs of the recommended plan to meet the City of Lockhart's projected needs are shown in Table 4B.2.3-7.

[1] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Table 4B.2.3-7.
Recommended Plan Costs by Decade for the City of Lockhart

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	$14,384	$53,459	$101,274	$168,109
Unit Cost ($/acft)	—	—	$520	$520	$520	$505
Local Carrizo						
Annual Cost ($/yr)	$155,000	$465,000	$620,000	$532,750	$358,250	$271,000
Unit Cost ($/acft)	$385	$385	$385	$330	$222	$168
Hays/Caldwell Carrizo Project						
Annual Cost ($/yr)	—	—	—	$694,467	$1,041,700	$1,388,933
Unit Cost ($/acft)	—	—	—	$694	$694	$694

4B.2.3.4 City of Luling

Current water supply for the City of Luling is obtained from the Carrizo Aquifer and Guadalupe-Blanco River Authority run-of-river rights. Luling is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Luling implement the following water supply plan to meet the projected needs for the city (Table 4B.2.3-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 70 acft/yr by 2010, increasing to 192 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2010. This strategy can provide an additional 403 acft/yr of supply in 2010, increasing to 807 acft/yr of additional supply in 2060.[2]

[2] In response to the Infrastructure Financing Survey, Luling explained that it does not plan to add a well in the Carrizo Aquifer. Upon further review of Luling's existing water supplies, it has been determined that the reliability of existing surface water supplies may have been underestimated, thereby eliminating the need for the Local Carrizo water management strategy recommended in the plan. However, if the need arises, the strategy is included and available for consideration by the City.

Table 4B.2.3-8.
Recommended Water Supply Plan for the City of Luling

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	168	311	400	485	587	695
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	70	90	108	117	148	192
Local Carrizo	403	403	403	807	807	807
Total New Supply	**473**	**493**	**511**	**924**	**955**	**999**

Estimated costs of the recommended plan to meet the City of Luling's projected needs are shown in Table 4B.2.3-9.

Table 4B.2.3-9.
Recommended Plan Costs by Decade for the City of Luling

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$41,206	$51,359	$54,793	$54,106	$64,951	$83,246
Unit Cost ($/acft)	$588	$571	$510	$463	$440	$433
Local Carrizo						
Annual Cost ($/yr)	$146,000	$146,000	$146,000	$223,000	$223,000	$223,000
Unit Cost ($/acft)	$362	$362	$362	$276	$276	$276

4B.2.3.5 City of Martindale

The City of Martindale is projected to have adequate water supplies available from run-of-river rights to meet the city's projected demand during the planning period.

4B.2.3.6 Martindale WSC

Current water supply for Martindale WSC is obtained from Canyon Reservoir and run-of-river rights through Canyon Regional Water Authority (CRWA). Martindale WSC is projected to need additional water supplies prior to 2040. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Martindale WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.3-10).

- Purchase from WWP (GBRA) to be implemented prior to 2040. This strategy can provide an additional 50 acft/yr by 2040.

Alternative water management strategies identified by Martindale WSC include Local Trinity, Hays/Caldwell Carrizo Project, and/or Purchase from WWP (CRWA).

Table 4B.2.3-10.
Recommended Water Supply Plan for Martindale WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	2	19	41
Recommended Plan						
Purchase from WWP (GBRA)	—	—	—	50	50	50
Total New Supply	—	—	—	**50**	**50**	**50**

Estimated costs of the recommended plan to meet Martindale WSC's projected needs are shown in Table 4B.2.3-11.

Table 4B.2.3-11.
Recommended Plan Costs by Decade for Martindale WSC

Plan Element	2010	2020	2030	2040	2050	2060
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	—	—	$61,278	$21,717	$21,717
Unit Cost ($/acft)	—	—	—	$1,226	$434	$434

4B.2.3.7 Maxwell WSC

Current water supply for Maxwell WSC is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights through Canyon Regional Water Authority (CRWA). Maxwell WSC is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Maxwell WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.3-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 11 acft/yr by 2050, increasing to 55 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2030. This strategy can provide an additional 100 acft/yr by 2030, increasing to 700 acft/yr in 2060.

Alternative water management strategies identified by Maxwell WSC include Local Trinity, Hays/Caldwell Carrizo Project, and/or Purchase from WWP (CRWA).

Table 4B.2.3-12.
Recommended Water Supply Plan for Maxwell WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	73	249	479	692
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	11	55
Purchase from WWP (GBRA)	—	—	100	400	500	700
Total New Supply	—	—	**100**	**400**	**511**	**755**

Estimated costs of the recommended plan to meet Maxwell WSC's projected needs are shown in Table 4B.2.3-13.

Table 4B.2.3-13.
Recommended Plan Costs by Decade for Maxwell WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$6,567	$32,475
Unit Cost ($/acft)	—	—	—	—	$588	$588
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	—	$122,555	$490,220	$217,165	$304,031
Unit Cost ($/acft)	—	—	$1,226	$1,226	$434	$434

4B.2.3.8 City of Mustang Ridge

Current water supply for the City of Mustang Ridge is obtained from the Carrizo Aquifer. Mustang Ridge is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Mustang Ridge implement the following water supply plan to meet the projected needs for the city (Table 4B.2.3-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 10 acft/yr by 2010, increasing to 116 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 19 acft/yr by 2010, increasing to 213 acft/yr in 2060.

Table 4B.2.3-14.
Recommended Water Supply Plan for the City of Mustang Ridge

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	19	62	99	137	175	213
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	10	26	48	74	98	116
Purchase from WWP (GBRA)	19	62	99	137	175	213
Total New Supply	**29**	**88**	**147**	**211**	**273**	**329**

Estimated costs of the recommended plan to meet the City of Mustang Ridge's projected needs are shown in Table 4B.2.3-15.

Table 4B.2.3-15.
Recommended Plan Costs by Decade for the City of Mustang Ridge

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$5,555	$11,918	$20,440	$31,032	$40,604	$47,978
Unit Cost ($/acft)	$551	$454	$428	$418	$413	$413
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$23,285	$75,984	$121,329	$167,900	$76,008	$92,512
Unit Cost ($/acft)	$1,226[1]	$1,226	$1,226	$1,226	$434	$434
1 2020 unit cost used for 2010, though actual unit cost would likely be less.						

4B.2.3.9 Polonia WSC

Current water supply for Polonia WSC is obtained from the Carrizo Aquifer. Polonia WSC is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Polonia WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.3-16).

- Local Carrizo to be implemented prior to 2030. This strategy can provide an additional 360 acft/yr by 2030, increasing to 800 acft/yr in 2060.

Table 4B.2.3-16.
Recommended Water Supply Plan for Polonia WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	137	331	520	719
Recommended Plan						
Local Carrizo	—	—	240	480	720	720
Total New Supply	—	—	**240**	**480**	**720**	**720**

Estimated costs of the recommended plan to meet Polonia WSC's projected needs are shown in Table 4B.2.3-17.

Table 4B.2.3-17.
Recommended Plan Costs by Decade for Polonia WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Local Carrizo						
Annual Cost ($/yr)	—	—	$103,920	$207,840	$311,760	$259,200
Unit Cost ($/acft)	—	—	$433	$433	$433	$360

4B.2.3.10 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer, Queen City Aquifer, and run-of-river rights to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the

TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.3-18).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 21 acft/yr by 2010, increasing to 29 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.3-18.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	21	37	36	31	28	29
Total New Supply	**21**	**37**	**36**	**31**	**28**	**29**

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.3-19.

Table 4B.2.3-19.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$12,581	$18,669	$17,070	$13,780	$12,118	$12,160
Unit Cost ($/acft)	$588	$499	$475	$446	$426	$423

4B.2.3.11 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demands during the planning period.

4B.2.3.12 Steam-Electric Power

There is no projected steam-electric power water demand in Caldwell County, therefore no water management strategies are recommended for this water user group.

4B.2.3.13 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demands during the planning period.

4B.2.3.14 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Queen City Aquifer, and run-of-river rights to meet the water user group's projected demands during the planning period.

4B.2.3.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demands during the planning period.

4B.2.4 Calhoun County Water Supply Plan

Table 4B.2.4-1 lists each water user group in Calhoun County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.4-1. Calhoun County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
Calhoun County WSC	204	8	
City of Point Comfort	-46	-489	Projected shortage (2010 through 2060)
City of Port Lavaca	671	95	
City of Seadrift	200	194	
Rural Area Residential and Commercial	69,324	69,322	
Industrial	40,904	18,450	
Steam-Electric Power	320	12	
Mining	32	38	
Irrigation	7,490	13,478	
Livestock	0	0	

4B.2.4.1 Calhoun County WSC

Calhoun County WSC is projected to have adequate water supplies available from Canyon Reservoir and run-of-river rights to meet the WSC's projected demands during the planning period.

4B.2.4.2 City of Point Comfort

Current water supply for the City of Point Comfort is obtained from Lake Texana. Point Comfort is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Point Comfort implement the following water supply plan to meet the projected needs for the city (Table 4B.2.4-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 18 acft/yr by 2010, increasing to 98 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (LNRA) to be implemented prior to 2010. This strategy can provide an additional 46 acft/yr by 2010, increasing to 499 acft/yr in 2040, and decreasing to 489 acft/yr in 2060.

Table 4B.2.4-2.
Recommended Water Supply Plan for the City of Point Comfort

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	46	145	322	499	489	489
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	18	34	55	78	84	98
Purchase from WWP (LNRA)	46	145	322	499	489	489
Total New Supply	**64**	**179**	**377**	**577**	**573**	**573**

Estimated costs of the recommended plan to meet the City of Point Comfort's projected needs are shown in Table 4B.2.4-3.

Table 4B.2.4-3.
Recommended Plan Costs by Decade for the City of Point Comfort

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$10,336	$18,411	$27,797	$36,343	$36,886	$42,658
Unit Cost ($/acft)	$588	$517	$483	$451	$436	$432
Purchase from WWP (LNRA)[1]						
Annual Cost ($/yr)	$41,262	$130,065	$288,834	$223,552	$219,072	$219,072
Unit Cost ($/acft)	$897	$897	$897	$448	$448	$448

4B.2.4.3 City of Port Lavaca

The City of Port Lavaca is projected to have adequate water supplies available from Canyon Reservoir and run-of-river rights of the Guadalupe-Blanco River Authority (GBRA) to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Port Lavaca implement the following water supply plan (Table 4B.2.4-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 30 acft/yr by 2050, increasing to 89 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.4-4.
Recommended Water Supply Plan for the City of Port Lavaca

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	30	89
Total New Supply	—	—	—	—	**30**	**89**

Estimated costs of the recommended plan for the City of Port Lavaca are shown in Table 4B.2.4-5.

Table 4B.2.4-5.
Recommended Plan Costs by Decade for the City of Port Lavaca

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$17,354	$52,051
Unit Cost ($/acft)	—	—	—	—	$588	$588

4B.2.4.4 City of Seadrift

The City of Seadrift is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Seadrift implement the following water supply plan (Table 4B.2.4-6).

- Municipal Water Conservation to be implemented or enhanced in the future. This strategy can provide an additional 20 acft/yr by 2010, increasing to 41 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.4-6.
Recommended Water Supply Plan for the City of Seadrift

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	20	29	30	32	36	41
Total New Supply	**20**	**29**	**30**	**32**	**36**	**41**

Estimated costs of the recommended plan for the City of Seadrift are shown in Table 4B.2.4-7.

Table 4B.2.4-7.
Recommended Plan Costs by Decade for the City of Seadrift

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$11,672	$14,947	$14,961	$14,211	$15,550	$17,827
Unit Cost ($/acft)	$588	$517	$483	$451	$436	$432

4B.2.4.5 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Gulf Coast Aquifer, Canyon Reservoir, and run-of-river rights to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan for rural areas (Table 4B.2.4-8).

- Municipal Water Conservation to be implemented or enhanced in the future. This strategy can provide an additional 4 acft/yr by 2050, increasing to 11 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.4-8.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	4	11
Total New Supply	—	—	—	—	**4**	**11**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.4-9.

Table 4B.2.4-9.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$2,351	$6,310
Unit Cost ($/acft)	—	—	—	—	$588	$588

4B.2.4.6 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer, Lake Texana, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demands during the planning period.

4B.2.4.7 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demands during the planning period.

4B.2.4.8 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demands during the planning period.

4B.2.4.9 Irrigation

Irrigation is projected to have adequate water supplies available from run-of-river rights to meet the water user group's projected demands during the planning period.

4B.2.4.10 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demands during the planning period.

4B.2.5 Comal County Water Supply Plan

Table 4B.2.5-1 lists each water user group in Comal County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.5-1.
Comal County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
Bexar Metropolitan Water District			See Bexar County
City of Bulverde	-653	-4,595	Projected shortage (2010 through 2060)
Canyon Lake WSC	1,072	-9,331	Projected shortage (2020 through 2060)
Crystal Clear WSC			See Guadalupe County
Fair Oaks Ranch			See Bexar County
City of Garden Ridge	-285	-1,080	Projected shortage (2010 through 2060)
Green Valley SUD			See Guadalupe County
City of New Braunfels	1,242	-14,475	Projected shortage (2020 through 2060)
City of Schertz			See Guadalupe County
City of Selma			See Bexar County
Water Service Inc.			See Bexar County
Rural Area Residential and Commercial	-1,752	-2,071	Projected shortage (2010 through 2060)
Industrial	1,894	-2,297	Projected shortage (2030 through 2060)
Steam-Electric Power	0	0	No projected demand
Mining	-1,905	-2,694	Projected shortage (2010 through 2060)
Irrigation	879	964	
Livestock	-109	-120	Projected shortage

4B.2.5.1 City of Bulverde

Current water supply for the City of Bulverde is obtained from Canyon Reservoir. City of Bulverde is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Bulverde implement the following water supply plan to meet the projected needs for the city (Table 4B.2.5-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 38 acft/yr by 2030, increasing to 430 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 653 acft/yr by 2010, increasing to 4,595 acft/yr in 2060.

Table 4B.2.5-2.
Recommended Water Supply Plan for the City of Bulverde

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	653	1,342	2,128	2,910	3,723	4,595
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	38	130	260	430
Purchase from WWP (GBRA)	653	1,342	2,128	2,910	3,723	4,595
Total New Supply	**653**	**1,342**	**2,166**	**3,040**	**3,983**	**5,025**

Estimated costs of the recommended plan to meet the City of Bulverde's projected needs are shown in Table 4B.2.5-3.

Table 4B.2.5-3.
Recommended Plan Costs by Decade for the City of Bulverde

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	$19,554	$67,539	$135,017	$223,786
Unit Cost ($/acft)	—	—	$520	$520	$520	$520
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$800,284	$1,644,688	$2,607,970	$3,566,351	$4,562,723	$5,631,402
Unit Cost ($/acft)	$1,226	$1,226	$1,226	$1,226	$1,226	$1,226

4B.2.5.2 Canyon Lake WSC

Current water supply for Canyon Lake WSC is obtained from Canyon Reservoir. Canyon Lake WSC is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Canyon Lake WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.5-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 96 acft/yr by 2020, increasing to 1,414 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2020. This strategy can provide an additional 769 acft/yr by 2020, increasing to 9,331 acft/yr in 2060.

Table 4B.2.5-4.
Recommended Water Supply Plan for Canyon Lake WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	769	2,838	4,898	7,034	9,331
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	96	254	543	929	1,414
Purchase from WWP (GBRA)	—	769	2,838	4,898	7,034	9,331
Total New Supply	—	**865**	**3,092**	**5,441**	**7,963**	**10,745**

Estimated costs of the recommended plan to meet Canyon Lake WSC's projected needs are shown in Table 4B.2.5-5.

Table 4B.2.5-5.
Recommended Plan Costs by Decade for Canyon Lake WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	$56,708	$149,583	$319,201	$546,430	$812,408
Unit Cost ($/acft)	—	$588	$588	$588	$588	$575
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	$336,822	$1,243,044	$2,145,324	$1,484,174	$1,968,841
Unit Cost ($/acft)	—	$438	$438	$438	$211	$211

4B.2.5.3 City of Garden Ridge

Current water supply for the City of Garden Ridge is obtained from the Edwards Aquifer. Garden Ridge is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Garden Ridge implement the following water supply plan to meet the projected needs for the city (Table 4B.2.5-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 42 acft/yr by 2010, increasing to 460 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 115 acft/yr by 2010, increasing to 436 acft/yr of additional supply in 2060.
- Purchase from WWP (SSLGC) to be implemented prior to 2010. This strategy can provide an additional 170 acft/yr by 2010, increasing to 644 acft/yr in 2060.

An alternative water management strategy, identified by the City of Garden Ridge, is Local Trinity, which the city may implement by increasing pumping capacity on an existing well in the Trinity Aquifer or drilling an additional well.

Table 4B.2.5-6.
Recommended Water Supply Plan for the City of Garden Ridge

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	285	423	580	738	901	1,080
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	42	103	187	294	379	460
Edwards Transfers (L-15)	115	171	234	298	364	436
Purchase from WWP (SSLGC)	170	252	346	440	537	644
Total New Supply	**327**	**526**	**767**	**1,032**	**1,280**	**1,540**

Estimated costs of the recommended plan to meet the City of Garden Ridge's projected needs are shown in Table 4B.2.5-7.

Table 4B.2.5-7.
Recommended Plan Costs by Decade for the City of Garden Ridge

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$20,953	$44,899	$77,624	$120,404	$154,491	$187,192
Unit Cost ($/acft)	$499	$435	$416	$410	$407	$407
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$15,525	$23,085	$31,590	$40,230	$49,140	$58,860
Unit Cost ($/acft)	$135	135	135	135	135	135
Purchase from WWP (SSLGC)						
Annual Cost ($/yr)	$69,899	$103,615	$142,265	$114,366	$139,578	$167,390
Unit Cost ($/acft)	$411	$411	$411	$260	$260	$260

4B.2.5.4 City of New Braunfels

Current water supply for the City of New Braunfels is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. New Braunfels is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that New Braunfels implement the following water supply plan to meet the projected needs for the city (Table 4B.2.5-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 815 acft/yr by 2010, increasing to 8,152 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 91 acft/yr by 2010, increasing to 14,475 acft/yr in 2060.

Table 4B.2.5-8.
Recommended Water Supply Plan for the City of New Braunfels

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	91	1,462	4,599	7,706	10,916	14,475
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	815	1,965	3,632	5,433	6,650	8,152
Purchase from WWP (GBRA)	91	1,462	4,599	7,706	10,916	14,475
Total New Supply	**906**	**3,427**	**8,231**	**13,139**	**17,566**	**22,627**

Estimated costs of the recommended plan to meet the City of New Braunfels' projected needs are shown in Table 4B.2.5-9.

Table 4B.2.5-9.
Recommended Plan Costs by Decade for the City of New Braunfels

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$414,181	$866,901	$1,533,907	$2,257,759	$2,744,832	$3,359,164
Unit Cost ($/acft)	$508	$441	$422	$416	$413	$412
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$8,327	$429,828	$1,352,106	$2,265,564	$1,975,796	$2,619,975
Unit Cost ($/acft)	$92	$294	$294	$294	$181	$181

4B.2.5.5 Rural Area Residential and Commercial

Current water supply for Rural Areas is obtained from the Edwards Aquifer, Trinity Aquifer, Canyon Reservoir, and run-of-river rights. Rural Areas are projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.5-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 85 acft/yr in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 1,752 acft/yr by 2010, increasing to 2,071 acft/yr in 2060.

Table 4B.2.5-10.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	1,752	1,492	1,211	1,405	1,770	2,071
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	85
Purchase from WWP (GBRA)	1,752	1,492	1,211	1,405	1,770	2,071
Total New Supply	**1,752**	**1,492**	**1,211**	**1,405**	**1,770**	**2,156**

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.5-11.

Table 4B.2.5-11.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$50,171
Unit Cost ($/acft)	—	—	—	—	—	$588
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$2,147,164	$1,828,521	$1,484,141	$1,721,898	$2,169,224	$2,538,114
Unit Cost ($/acft)	$1,226	$1,226	$1,226	$1,226	$1,226	$1,226

4B.2.5.6 Industrial

Current water supply for industrial is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Industrial is projected to need additional water supplies in the year 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected needs for industrial (Table 4B.2.5-12).

- Recycled water to be implemented prior to 2030. This strategy can provide an additional 59 acft/yr by 2030, increasing to 2,297 acft/yr in 2060.

Table 4B.2.5-12.
Recommended Water Supply Plan for Industrial

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	59	789	1,416	2,297
Recommended Plan						
Recycled Water	—	—	59	789	1,416	2,297
Total New Supply	—	—	**59**	**789**	**1,416**	**2,297**

Estimated costs of the recommended plan to meet the industrial projected needs are shown in Table 4B.2.5-13.

Table 4B.2.5-13.
Recommended Plan Costs by Decade for Industrial

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Recycled Water						
Annual Cost ($/yr)	—	—	$17,349	$232,006	$416,375	$368,600
Unit Cost ($/acft)	—	—	$294	$294	$294	$160

4B.2.5.7 Steam-Electric Power

There is no projected steam-electric power water demand in Comal County, therefore no water management strategies are recommended for this water user group.

4B.2.5.8 Mining

Current water supply for mining is obtained from the Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected needs for mining (Table 4B.2.5-14).

- Water conservation to be implemented prior to 2010. This strategy can provide an additional 1,400 acft/yr of supply by 2010.
- Recycled water to be implemented prior to 2010. This strategy can provide an additional 505 acft/yr by 2010, increasing to 1,294 acft/yr in 2060.

Table 4B.2.5-14.
Recommended Water Supply Plan for Mining

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	1,905	2,094	2,210	2,324	2,590	2,694
Recommended Plan						
Mining Water Conservation	1,400	1,400	1,400	1,400	1,400	1,400
Recycled Water	505	694	810	924	1,190	1,294
Total New Supply	**1,905**	**2,094**	**2,210**	**2,324**	**2,590**	**2,694**

Estimated costs of the recommended plan to meet the mining projected needs are shown in Table 4B.2.5-15.

Table 4B.2.5-15.
Recommended Plan Costs by Decade for Mining

Plan Element	2010	2020	2030	2040	2050	2060
Mining Water Conservation[1]						
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Recycled Water						
Annual Cost ($/yr)	$148,819	$204,515	$238,699	$148,866	$191,721	$208,476
Unit Cost ($/acft)	$295	$295	$295	$161	$161	$161

[1] Costs not available due to lack of relevant data.

4B.2.5.9 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.5.10 Livestock

Current water supply for livestock is obtained from the Trinity Aquifer and local sources. Livestock is projected to need additional water supplies in the planning year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual livestock operations implement the following water supply plan to meet the projected needs for livestock (Table 4B.2.5-16).

- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 120 acft/yr by 2010.

Table 4B.2.5-16.
Recommended Water Supply Plan for Livestock

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	109	111	111	112	120	120
Recommended Plan						
Local Trinity	120	120	120	120	120	120
Total New Supply	**120**	**120**	**120**	**120**	**120**	**120**

No estimated costs of the recommended plan to meet the livestock projected needs are included as additional supplies will likely be produced from existing wells. It is not expected to be economically feasible to develop new sources of firm supply to meet the small unconcentrated needs.

4B.2.6 DeWitt County Water Supply Plan

Table 4B.2.6-1 lists each water user group in DeWitt County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.6-1.
DeWitt County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Cuero	4,095	4,167	
Gonzales County WSC			See Gonzales County
City of Yoakum	674	698	
City of Yorktown	867	892	
Rural Area Residential and Commercial	263	364	
Industrial	76	6	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	187	262	
Livestock	0	0	

4B.2.6.1 City of Cuero

The City of Cuero is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Cuero implement the following water supply plan (Table 4B.2.6-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 99 acft/yr by 2010, increasing to 218 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.6-2.
Recommended Water Supply Plan for the City of Cuero

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	99	181	187	190	197	218
Total New Supply	**99**	**181**	**187**	**190**	**197**	**218**

Estimated costs of the recommended plan for the City of Cuero are shown in Table 4B.2.6-3.

Table 4B.2.6-3.
Recommended Plan Costs by Decade for the City of Cuero

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$58,228	$89,694	$87,918	$85,014	$84,796	$93,005
Unit Cost ($/acft)	$588	$496	$471	$446	$429	$426

4B.2.6.2 City of Yoakum

The City of Yoakum is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Yoakum implement the following water supply plan (Table 4B.2.6-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 14 acft/yr by 2010, increasing to 27 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.6-4.
Recommended Water Supply Plan for the City of Yoakum

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	14	16	17	18	20	27
Total New Supply	**14**	**16**	**17**	**18**	**20**	**27**

Estimated costs of the recommended plan for the City of Yoakum are shown in Table 4B.2.6-5.

Table 4B.2.6-5.
Recommended Plan Costs by Decade for the City of Yoakum

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$8,335	$9,155	$9,774	$10,027	$9,938	$12,725
Unit Cost ($/acft)	$588	$588	$588	$561	$494	$468

4B.2.6.3 City of Yorktown

The City of Yorktown is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Yorktown implement the following water supply plan (Table 4B.2.6-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 2 acft/yr by 2020, increasing to 13 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.6-6.
Recommended Water Supply Plan for the City of Yorktown

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	2	2	2	5	13
Total New Supply	—	**2**	**2**	**2**	**5**	**13**

Estimated costs of the recommended plan for the City of Yorktown are shown in Table 4B.2.6-7.

Table 4B.2.6-7.
Recommended Plan Costs by Decade for the City of Yorktown

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	$928	$1,217	$1,375	$2,956	$7,448
Unit Cost ($/acft)	—	$588	$588	$588	$588	$588

4B.2.6.4 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Gulf Coast Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan for rural areas (Table 4B.2.6-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 6 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.6-8.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	6
Total New Supply	—	—	—	—	—	**6**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.6-9.

Table 4B.2.6-9.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$3,789
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.6.5 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group’s projected demand during the planning period.

4B.2.6.6 Steam-Electric Power

There is no projected steam-electric power water demand in DeWitt County, therefore no water management strategies are recommended for this water user group.

4B.2.6.7 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.6.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.6.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.2.7 Dimmit County Water Supply Plan

Table 4B.2.7-1 lists each water user group in Dimmit County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.7-1.
Dimmit County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Asherton	359	366	
City of Big Wells	779	783	
City of Carrizo Springs	485	491	
Rural Area Residential and Commercial	59	80	
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	1	1	
Irrigation	175	776	
Livestock	0	0	

4B.2.7.1 City of Asherton

The City of Asherton is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city’s projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Asherton implement the following water supply plan (Table 4B.2.7-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 20 acft/yr by 2010, increasing to 64 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.7-2.
Recommended Water Supply Plan for the City of Asherton

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	20	43	58	59	62	64
Total New Supply	**20**	**43**	**58**	**59**	**62**	**64**

Estimated costs of the recommended plan for the City of Asherton are shown in Table 4B.2.7-3.

Table 4B.2.7-3.
Recommended Plan Costs by Decade for the City of Asherton

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$11,763	$20,537	$25,492	$24,883	$25,654	$26,569
Unit Cost ($/acft)	$588	$475	$441	$423	$416	$415

4B.2.7.2 City of Big Wells

The City of Big Wells is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city’s projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Big Wells implement the following water supply plan (Table 4B.2.7-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 11 acft/yr by 2010, increasing to 33 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.7-4.
Recommended Water Supply Plan for the City of Big Wells

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	11	23	30	30	32	33
Total New Supply	**11**	**23**	**30**	**30**	**32**	**33**

Estimated costs of the recommended plan for the City of Big Wells are shown in Table 4B.2.7-5.

Table 4B.2.7-5.
Recommended Plan Costs by Decade for the City of Big Wells

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$6,570	$11,176	$13,313	$12,987	$13,395	$13,883
Unit Cost ($/acft)	$588	$480	$447	$429	$422	$420

4B.2.7.3 City of Carrizo Springs

The City of Carrizo Springs is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Carrizo Springs implement the following water supply plan (Table 4B.2.7-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 152 acft/yr by 2010, increasing to 777 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.7-6.
Recommended Water Supply Plan for the City of Carrizo Springs

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	152	312	464	590	700	777
Total New Supply	**152**	**312**	**464**	**590**	**700**	**777**

Estimated costs of the recommended plan for the City of Carrizo Springs are shown in Table 4B.2.7-7.

Table 4B.2.7-7.
Recommended Plan Costs by Decade for the City of Carrizo Springs

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$78,506	$139,947	$196,889	$243,145	$285,507	$316,254
Unit Cost ($/acft)	$518	$448	$424	$412	$408	$407

4B.2.7.4 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer to meet their projected demands during the planning period.

4B.2.7.5 Industrial

There is no projected industrial water demand in Dimmit County, therefore no water management strategies are recommended for this water user group.

4B.2.7.6 Steam-Electric Power

There is no projected steam-electric power water demand in Dimmit County, therefore no water management strategies are recommended for this water user group.

4B.2.7.7 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.7.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.7.9 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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4B.2.8 Frio County Water Supply Plan

Table 4B.2.8-1 lists each water user group in Frio County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.8-1.
Frio County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage		Comment
	2010 (acft/yr)	2060 (acft/yr)	
Benton City WSC			See Atascosa County
City of Dilley	1,151	555	
City of Pearsall	1,437	1,431	
Rural Area Residential and Commercial	293	13	
Industrial	0	0	No projected demand
Steam-Electric Power	61	3	
Mining	0	0	
Irrigation	28	41	
Livestock	0	0	

4B.2.8.1 City of Dilley

The City of Dilley is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Dilley implement the following water supply plan (Table 4B.2.8-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 104 acft/yr by 2010, increasing to 772 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.8-2.
Recommended Water Supply Plan for the City of Dilley

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	104	229	362	511	652	772
Total New Supply	**104**	**229**	**362**	**511**	**652**	**772**

Estimated costs of the recommended plan for the City of Dilley are shown in Table 4B.2.8-3.

Table 4B.2.8-3.
Recommended Plan Costs by Decade for the City of Dilley

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$55,537	$104,266	$155,680	$214,764	$270,407	$318,725
Unit Cost ($/acft)	$533	$456	$430	$420	$415	$413

4B.2.8.2 City of Pearsall

The City of Pearsall is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Pearsall implement the following water supply plan (Table 4B.2.8-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 116 acft/yr by 2010, increasing to 324 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.8-4.
Recommended Water Supply Plan for the City of Pearsall

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	116	223	272	271	294	324
Total New Supply	**116**	**223**	**272**	**271**	**294**	**324**

Estimated costs of the recommended plan for the City of Pearsall are shown in Table 4B.2.8-5.

Table 4B.2.8-5.
Recommended Plan Costs by Decade for the City of Pearsall

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$60,160	$101,115	$118,051	$113,594	$121,876	$133,939
Unit Cost ($/acft)	$520	$454	$434	$419	$414	$413

4B.2.8.3 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan for rural areas (Table 4B.2.8-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 18 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.8-6.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	18
Total New Supply	—	—	—	—	—	**18**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.8-7.

Table 4B.2.8-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$10,572
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.8.4 Industrial

There is no projected industrial water demand in Frio County, therefore no water management strategies are recommended for this water user group.

4B.2.8.5 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group’s projected demand during the planning period.

4B.2.8.6 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group’s projected demand during the planning period.

4B.2.8.7 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Queen City Aquifer, Sparta Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.8.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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4B.2.9 Goliad County Water Supply Plan

Table 4B.2.9-1 lists each water user group in Goliad County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.9-1.
Goliad County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Goliad	592	414	
Rural Area Residential and Commercial	292	52	
Industrial	20	0	
Steam-Electric Power	3,892	-4,842	Projected shortage (2050 and 2060)
Mining	0	0	
Irrigation	2,793	2,909	
Livestock	0	0	

4B.2.9.1 City of Goliad

The City of Goliad is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Goliad implement the following water supply plan (Table 4B.2.9-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 30 acft/yr by 2010, increasing to 100 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.9-2.
Recommended Water Supply Plan for the City of Goliad

	2010 (acft/yr)	**_2020 (acft/yr)_**	**_2030 (acft/yr)_**	**_2040 (acft/yr)_**	**_2050 (acft/yr)_**	**_2060 (acft/yr)_**
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	30	59	67	73	85	100
Total New Supply	**30**	**59**	**67**	**73**	**85**	**100**

Estimated costs of the recommended plan for the City of Goliad are shown in Table 4B.2.9-3.

Table 4B.2.9-3.
Recommended Plan Costs by Decade for the City of Goliad

Plan Element	**_2010_**	**_2020_**	**_2030_**	**_2040_**	**_2050_**	**_2060_**
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$17,887	$29,681	$31,907	$32,596	$36,970	$43,095
Unit Cost ($/acft)	$588	$507	$476	$447	$434	$430

4B.2.9.2 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Gulf Coast Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan for rural areas (Table 4B.2.9-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 16 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.9-4.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	16
Total New Supply	—	—	—	—	—	**16**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.9-5.

Table 4B.2.9-5.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$9,670
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.9.3 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.9.4 Steam-Electric Power

Current water supply for steam-electric power is obtained from the Gulf Coast Aquifer and Coleto Creek Reservoir. Steam-electric power is projected to need additional water supplies prior to year 2050. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual steam-electric power operations implement the following water supply plan to meet the projected needs for mining (Table 4B.2.9-6).

- Purchase from WWP (GBRA) to be implemented prior to 2050. This strategy can provide an additional 2,010 acft/yr by 2050, increasing to 4,842 acft/yr in 2060.

Table 4B.2.9-6.
Recommended Water Supply Plan for Steam-Electric Power

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	2,010	4,842
Recommended Plan						
Purchase from WWP (GBRA)	—	—	—	—	2,010	4,842
Total New Supply	—	—	—	—	**2,010**	**4,842**

Estimated costs of the recommended plan to meet the steam-electric power projected needs are shown in Table 4B.2.9-7.

Table 4B.2.9-7.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	—	—	—	$108,540	$242,028
Unit Cost ($/acft)	—	—	—	—	**$54**	**$54**

4B.2.9.5 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.9.6 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.9.7 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.2.10 Gonzales County Water Supply Plan

Table 4B.2.10-1 lists each water user group in Gonzales County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.10-1.
Gonzales County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Gonzales	1,098	884	
Gonzales County WSC	404	-255	Projected shortage (2020 through 2060)
City of Nixon	162	112	
City of Waelder	511	462	
Rural Area Residential and Commercial	179	368	
Industrial	1,018	16	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	1,077	1,589	
Livestock	0	0	

4B.2.10.1 City of Gonzales

The City of Gonzales is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Gonzales implement the following water supply plan (Table 4B.2.10-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 116 acft/yr by 2010, increasing to 414 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.10-2.
Recommended Water Supply Plan for the City of Gonzales

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	116	245	325	353	381	414
Total New Supply	**116**	**245**	**325**	**353**	**381**	**414**

Estimated costs of the recommended plan for the City of Gonzales are shown in Table 4B.2.10-3.

Table 4B.2.10-3.
Recommended Plan Costs by Decade for the City of Gonzales

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$68,293	$117,647	$145,194	$152,927	$162,458	$175,538
Unit Cost ($/acft)	$588	$480	$446	$433	$426	$424

4B.2.10.2 Gonzales County WSC

Current water supply for Gonzales County WSC is obtained from the Carrizo Aquifer and Canyon Reservoir. Gonzales County WSC is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Gonzales County WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.10-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 143 acft/yr by 2010, increasing to 1,002 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo Aquifer to be implemented prior to 2020. This strategy can provide an additional 645 acft/yr by 2020.[3]

[3] In response to Infrastructure Financing Survey, Gonzales County WSC's ngineer explained that the WSC has wells capable of producing enough water to meet projected needs to 2060, but plans to add one more well in 2006, with capacity of 660 acft/yr to assist in supplying a high use area. This, in effect, is implementation of the water management strategy of the plan for service convenience, as opposed to meeting a projected need (shortage).

Table 4B.2.10-4.
Recommended Water Supply Plan for Gonzales County WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	14	75	208	254	255
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	143	312	505	693	858	1,002
Local Carrizo	—	645	645	645	645	645
Total New Supply	**143**	**957**	**1,150**	**1,338**	**1,503**	**1,647**

Estimated costs of the recommended plan to meet Gonzales County WSC's projected needs are shown in Table 4B.2.10-5.

Table 4B.2.10-5.
Recommended Plan Costs by Decade for Gonzales County WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$74,798	$139,402	$214,856	$287,705	$352,220	$409,672
Unit Cost ($/acft)	$524	$447	$426	$415	$410	$409
Local Carrizo						
Annual Cost ($/yr)	—	$278,000	$278,000	$278,000	$153,000	$153,000
Unit Cost ($/acft)	—	$431	$431	$431	$237	$237

4B.2.10.3 City of Nixon

The City of Nixon is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Nixon implement the following water supply plan (Table 4B.2.10-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 35 acft/yr by 2010, increasing to 93 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.10-6.
Recommended Water Supply Plan for the City of Nixon

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	35	64	72	75	83	93
Total New Supply	**35**	**64**	**72**	**75**	**83**	**93**

Estimated costs of the recommended plan for the City of Nixon are shown in Table 4B.2.10-7.

Table 4B.2.10-7.
Recommended Plan Costs by Decade for the City of Nixon

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$20,394	$31,365	$33,695	$33,656	$36,283	$40,173
Unit Cost ($/acft)	$588	$492	$471	$446	$435	$432

4B.2.10.4 City of Waelder

The City of Waelder is projected to have adequate water supplies available from the Queen City Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Waelder implement the following water supply plan (Table 4B.2.10-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 3 acft/yr by 2040, increasing to 11 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.10-8.
Recommended Water Supply Plan for the City of Waelder

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	3	7	11
Total New Supply	—	—	—	**3**	**7**	**11**

Estimated costs of the recommended plan for the City of Waelder are shown in Table 4B.2.10-9.

Table 4B.2.10-9.
Recommended Plan Costs by Decade for the City of Waelder

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$1,972	$3,902	$6,731
Unit Cost ($/acft)	—	—	—	$588	$588	$588

4B.2.10.5 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan for rural areas (Table 4B.2.10-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 6 acft/yr by 2010, decreasing to 3 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.10-10.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	6	7	5	—	—	3
Total New Supply	**6**	**7**	**5**	—	—	**3**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.10-11.

Table 4B.2.10-11.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$3,659	$4,216	$2,986	—	—	$1,831
Unit Cost ($/acft)	$588	$588	$588	—	—	$588

4B.2.10.6 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer and Sparta Aquifer to meet the water user group's projected demand during the planning period.

4B.2.10.7 Steam-Electric Power

There is no projected steam-electric power water demand in Gonzales County, therefore no water management strategies are recommended for this water user group.

4B.2.10.8 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

4B.2.10.9 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, Gulf Coast Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.10.10 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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4B.2.11 Guadalupe County Water Supply Plan

Table 4B.2.11-1 lists each water user group in Guadalupe County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.11-1. Guadalupe County Management Supply/Shortage by Water User Group

Water User Group	*Management Supply/Shortage*		*Comment*
	2010 (acft/yr)	*2060 (acft/yr)*	
City of Cibolo	-66	70	Projected shortage (2010)
Crystal Clear WSC	809	-2,701	Projected shortage (2030 through 2060)
East Central SUD			See Bexar County
Green Valley SUD	-229	-1,816	Projected shortage (2010 and 2060)
City of Marion	17	-70	Projected shortage (2030 through 2060)
Martindale WSC			See Caldwell County
City of New Braunfels			See Comal County
Santa Clara	-76	-810	Projected shortage
City of Schertz	2,287	-5,621	Projected shortage (2030 through 2060)
City of Seguin	9,402	5,373	
City of Selma			See Bexar County
Springs Hill WSC	2,956	975	
Water Service Inc.			See Bexar County
Rural Area Residential and Commercial	201	474	Projected shortage (San Antonio Basin)
Industrial	1,459	0	
Steam-Electric Power	-3,225	-21,008	Projected shortage (2010 through 2060)
Mining	0	0	
Irrigation	727	1,011	
Livestock	0	0	

4B.2.11.1 City of Cibolo

Current water supply for the City of Cibolo is obtained from Canyon Reservoir. Cibolo is projected to need additional water supplies prior in 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Cibolo implement the following water supply plan to meet the projected needs for the city (Table 4B.2.11-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 65 acft/yr by 2010, increasing to 645 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (CRWA) to be implemented prior to 2010. This strategy can provide an additional 66 acft/yr in 2010.

Table 4B.2.11-2. Recommended Water Supply Plan for the City of Cibolo

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	66	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	65	176	281	374	499	645
Purchase from WWP (CRWA)	66	—	—	—	—	—
Total New Supply	**131**	**176**	**281**	**374**	**499**	**645**

Estimated costs of the recommended plan to meet the City of Cibolo's projected needs are shown in Table 4B.2.11-3.

Table 4B.2.11-3. Recommended Plan Costs by Decade for the City of Cibolo

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$33,604	$79,818	$123,362	$161,882	$214,291	$275,647
Unit Cost ($/acft)	$520	$453	$439	$433	$430	$427
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	$62,042	—	—	—	—	—
Unit Cost ($/acft)	$940	—	—	—	—	—

4B.2.11.2 Crystal Clear WSC

Current water supply for Crystal Clear WSC is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Crystal Clear WSC is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Crystal Clear WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.11-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 41 acft/yr by 2050, increasing to 184 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo Aquifer to be implemented prior to 2020. This strategy can provide an additional 200 acft/yr by 2020, increasing to 1,000 acft/yr of supply in 2040.
- Edwards Transfers to be implemented prior to 2010. This strategy can provide an additional 1000 acft/yr by 2010.
- Purchase from WWP (GBRA) to be implemented prior to 2030. This strategy can provide an additional 500 acft/yr by 2030, increasing to 1,000 acft/yr of supply in 2040.
- Purchase from WWP (CRWA) to be implemented prior to 2050. This strategy can provide an additional 500 acft/yr by 2050.
- Purchase from WWP (SSLGC) to be implemented prior to 2020. This strategy can provide an additional 300 acft/yr by 2020, increasing to 900 acft/yr of supply in 2040.

Alternative water management strategies identified by Crystal Clear WSC include Local Trinity, Hays/Caldwell Carrizo Project, Recycled Water, and/or Purchase from WWP (SHWSC).

Table 4B.2.11-4.
Recommended Water Supply Plan for Crystal Clear WSC

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	2	494	1,123	1,911	2,701
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	41	184
Local Carrizo	—	200	600	1,000	1,000	1,000
Edwards Transfers	1,000	1,000	1,000	1,000	1,000	1,000
Purchase from WWP (GBRA)	—	—	500	1,000	1,000	1,000
Purchase from WWP (CRWA)	—	—	—	—	500	500
Purchase from WWP (SSLGC)	—	300	600	900	900	900
Total New Supply	**1,000**	**1,500**	**2,700**	**3,900**	**4,441**	**4,584**

Estimated costs of the recommended plan to meet Crystal Clear WSC's projected needs are shown in Table 4B.2.11-5.

Table 4B.2.11-5.
Recommended Plan Costs by Decade for Crystal Clear WSC

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$24,036	$108,003
Unit Cost ($/acft)	—	—	—	—	$588	$588
Local Carrizo						
Annual Cost ($/yr)	—	$71,000	$213,000	$355,000	$314,600	$233,800
Unit Cost ($/acft)	—	$355	$355	$355	$315	$234
Edwards Transfers						
Annual Cost ($/yr)	$135,000	$135,000	$135,000	$135,000	$135,000	$135,000
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	—	$612,775	$1,225,550	$434,330	$434,330
Unit Cost ($/acft)	—	—	$1,226	$1,226	$434	$434
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	—	—	—	$204,882	$212,592
Unit Cost ($/acft)	—	—	—	—	$410	$425
Purchase from WWP (SSLGC)						
Annual Cost ($/yr)	—	$123,352	$246,703	$233,930	$233,930	$233,930
Unit Cost ($/acft)	—	$411	$411	$260	$260	$260

4B.2.11.3 Green Valley SUD

Current water supply for Green Valley SUD is obtained from the Edwards Aquifer and Canyon Reservoir. Green Valley SUD is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Green Valley SUD implement the following water supply plan to meet the projected needs for the SUD (Table 4B.2.11-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 20 acft/yr in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers to be implemented prior to 2010. This strategy can provide an additional 200 acft/yr by 2010, increasing to 400 acft/yr of supply in 2020.
- Purchase from WWP (GBRA) to be implemented prior to 2020. This strategy can provide an additional 100 acft/yr by 2020, increasing to 500 acft/yr of supply in 2040.
- Purchase from WWP (CRWA) to be implemented prior to 2020. This strategy can provide an additional 700 acft/yr by 2020, increasing to 3,100 acft/yr of supply in 2060.
- Purchase from WWP (SSLGC) to be implemented prior to 2010. This strategy can provide an additional 200 acft/yr by 2010, increasing to 500 acft/yr of supply in 2020.

Alternative water management strategies identified by Green Valley SUD include Local Trinity and/or Wells Ranch Carrizo Project.

Table 4B.2.11-6.
Recommended Water Supply Plan for Green Valley SUD

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	229	443	710	842	1,069	1,816
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	20
Edwards Transfers	200	400	400	400	400	400
Purchase from WWP (GBRA)	—	100	100	500	500	500
Purchase from WWP (CRWA)	—	700	1,100	1,500	2,300	3,100
Purchase from WWP (SSLGC)	200	500	500	500	500	500
Total New Supply	**400**	**1,700**	**2,100**	**2,900**	**3,700**	**4,520**

Estimated costs of the recommended plan to meet Green Valley SUD's projected needs are shown in Table 4B.2.11-7.

Table 4B.2.11-7.
Recommended Plan Costs by Decade for Green Valley SUD

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$11,992
Unit Cost ($/acft)	—	—	—	—	—	$588
Edwards Transfers						
Annual Cost ($/yr)	$27,000	$54,000	$54,000	$54,000	$54,000	$54,000
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	$122,555	$122,555	$612,775	$217,165	$217,165
Unit Cost ($/acft)	—	$1,226	$1,226	$1,226	$434	$434
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	$634,683	$997,360	$588,705	$942,456	$1,318,069
Unit Cost ($/acft)	—	$907	$907	$392	$410	$425
Purchase from WWP (SSLGC)						
Annual Cost ($/yr)	$82,234	$205,586	$205,586	$129,961	$129,961	$129,961
Unit Cost ($/acft)	$411	$411	$411	$260	$260	$260

4B.2.11.4 City of Marion

Current water supply for the City of Marion is obtained from the Edwards Aquifer and Canyon Reservoir. Marion is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Marion implement the following water supply plan to meet the projected needs for the city (Table 4B.2.11-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 3 acft/yr by 2050, increasing to 10 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (CRWA) to be implemented prior to 2030. This strategy can provide an additional 13 acft/yr by 2030, increasing to 70 acft/yr of supply in 2060.

Table 4B.2.11-8.
Recommended Water Supply Plan for the City of Marion

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	13	28	48	70
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	3	10
Purchase from WWP (CRWA)	—	—	13	28	48	70
Total New Supply	—	—	**13**	**28**	**51**	**80**

Estimated costs of the recommended plan to meet the City of Marion's projected needs are shown in Table 4B.2.11-9.

Table 4B.2.11-9.
Recommended Plan Costs by Decade for the City of Marion

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$2,046	$5,844
Unit Cost ($/acft)	—	—	—	—	$588	$588
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	—	$11,787	$10,989	$19,669	$29,763
Unit Cost ($/acft)	—	—	$907	$392	$410	$425

4B.2.11.5 City of Santa Clara

Current water supply for the City of Santa Clara is obtained from the Carrizo Aquifer. Santa Clara is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Santa Clara implement the following water supply plan to meet the projected needs for the city (Table 4B.2.11-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 10 acft/yr by 2030, increasing to 79 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (CRWA) to be implemented prior to 2010. This strategy can provide an additional 100 acft/yr by 2010, increasing to 900 acft/yr of supply in 2060.

Table 4B.2.11-10.
Recommended Water Supply Plan for the City of Santa Clara

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	76	205	348	485	642	810
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	10	23	47	79
Purchase from WWP (CRWA)	100	300	400	500	700	900
Total New Supply	**100**	**300**	**410**	**523**	**747**	**979**

Estimated costs of the recommended plan to meet the City of Santa Clara's projected needs are shown in Table 4B.2.11-11.

Table 4B.2.11-11.
Recommended Plan Costs by Decade for the City of Santa Clara

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	$6,015	$13,335	$27,662	$46,643
Unit Cost ($/acft)	—	—	$588	$588	$588	$588
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	$94,004	$272,007	$362,676	$196,235	$286,834	$382,665
Unit Cost ($/acft)	$940	$907	$907	$392	$410	$425

4B.2.11.6 City of Schertz

Current water supply for the City of Schertz is obtained from the Edwards Aquifer and Carrizo Aquifer. Schertz is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Schertz implement the following water supply plan to meet the projected needs for the city (Table 4B.2.11-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 22 acft/yr by 2010, increasing to 1,088 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (SSLGC) to be implemented prior to 2020. This strategy can provide an additional 24 acft/yr by 2020, increasing to 5,621 acft/yr of supply in 2060.

Table 4B.2.11-12.
Recommended Water Supply Plan for the City of Schertz

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	24	635	2,122	3,813	5,621
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	22	87	182	365	694	1,088
Purchase from WWP (SSLGC)	—	24	635	2,122	3,813	5,621
Total New Supply	**22**	**111**	**817**	**2,487**	**4,507**	**6,709**

Estimated costs of the recommended plan to meet the City of Schertz's projected needs are shown in Table 4B.2.11-13.

Table 4B.2.11-13.
Recommended Plan Costs by Decade for the City of Schertz

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$11,544	$45,489	$94,418	$189,693	$351,446	$522,253
Unit Cost ($/acft)	$520	$520	$520	$520	$507	$480
Purchase from WWP (SSLGC)						
Annual Cost ($/yr)	—	$9,868	$261,094	$551,554	$991,082	$1,461,021
Unit Cost ($/acft)	—	$411	$411	$260	$206	$260

4B.2.11.7 City of Seguin

The City of Seguin is projected to have adequate water supplies available from the Carrizo Aquifer, Canyon Reservoir, and run-of-river rights to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Seguin implement the following water supply plan (Table 4B.2.11-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 377 acft/yr by 2010, increasing to 2,131 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.11-14.
Recommended Water Supply Plan for the City of Seguin

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	377	853	1,229	1,448	1,744	2,131
Total New Supply	**377**	**853**	**1,299**	**1,448**	**1,744**	**2,131**

Estimated costs of the recommended plan for the City of Seguin are shown in Table 4B.2.11-15.

Table 4B.2.11-15.
Recommended Plan Costs by Decade for the City of Seguin

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$196,168	$384,624	$527,643	$609,814	$726,363	$884,582
Unit Cost ($/acft)	$520	$451	$429	$421	$417	$415

4B.2.11.8 Springs Hill WSC

Springs Hill WSC is projected to have adequate water supplies available from the Carrizo Aquifer and Canyon Reservoir to meet the WSC's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Springs Hill WSC implement the following water supply plan (Table 4B.2.11-16).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 174 acft/yr by 2010, increasing to 877 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.11-16.
Recommended Water Supply Plan for Springs Hill WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	174	381	477	571	701	877
Total New Supply	**174**	**381**	**477**	**571**	**701**	**877**

Estimated costs of the recommended plan for Springs Hill WSC are shown in Table 4B.2.11-17.

Table 4B.2.11-17.
Recommended Plan Costs by Decade for Springs Hill WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$102,348	$183,033	$219,262	$252,458	$303,283	$376,203
Unit Cost ($/acft)	$588	$481	$459	$442	$432	$429

4B.2.11.9 Rural Area Residential and Commercial

Current water supply for Rural Areas is obtained from the Edwards Aquifer, Carrizo Aquifer, Queen City Aquifer, Canyon Reservoir, and run-of-river rights. Rural Areas are projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.11-18).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 2 acft/yr in 2010 (Volume II, Section 4C.1.1).
- Purchase from WWP (CRWA) to be implemented prior to 2010. This strategy can provide an additional 48 acft/yr by 2010, decreasing to 0 acft/yr in 2060.

Table 4B.2.11-18.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	48	37	25	15	7	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	2	—	—	—	—	—
Purchase from WWP (CRWA)	48	37	25	15	7	—
Total New Supply	**50**	**37**	**25**	**15**	**7**	—

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.11-19.

Table 4B.2.11-19.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$1,107	—	—	—	—	—
Unit Cost ($/acft)	$588	—	—	—	—	—
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	$45,122	$33,548	$22,667	$5,887	$2,868	—
Unit Cost ($/acft)	$940	$907	$907	$392	$410	—

4B.2.11.10 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.1.11 Steam-Electric Power

Current water supply for steam-electric power is obtained from Canyon Reservoir and reuse water. Steam-electric power is projected to need additional water supplies prior to year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual steam-electric power operations implement the following water supply plan to meet the projected needs for steam-electric (Table 4B.2.11-20).

- Steam-Electric Water Conservation (Air cooling) to be implemented prior to 2020. This strategy can provide an additional 3,225 acft/yr of supply by 2010, increasing to 20,108 acft/yr by 2060.
- Recycled Water to be implemented prior to 2020. This strategy can provide an additional 300 acft/yr of supply by 2020, increasing to 900 acft/yr of additional supply by 2060.

Limited available proximate water sources and somewhat arbitrary assignment of steam-electric water demands to Guadalupe County necessitate that the SCTRWPG recommend installation of air, rather than water, cooling systems for any power generation facility expansions in Guadalupe County. It is further recognized that it may not be economically feasible to satisfy all projected water needs for steam-electric power generation assigned to Guadalupe County.

Table 4B.2.11-20.
Recommended Water Supply Plan for Steam-Electric Power

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	3,225	7,567	10,004	12,974	16,595	21,008
Recommended Plan						
Steam-Electric Water Conservation	3,225	7,267	9,404	12,174	15,695	20,108
Recycled Water	—	300	600	800	900	900
Total New Supply	**3,225**	**7,567**	**10,004**	**12,974**	**16,595**	**21,008**

Estimated costs of the recommended plan to meet the steam-electric power projected needs are shown in Table 4B.2.11-21.

Table 4B.2.11-21.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Steam-Electric Water Conservation[1]						
Annual Cost ($/yr)						
Unit Cost ($/acft)						
Recycled Water						
Annual Cost ($/yr)	—	$32,255	$64,510	$86,013	$96,764	$96,764
Unit Cost ($/acft)	—	$108	$108	$108	$108	$108

[1] Costs not available due to lack of relevant data.

4B.2.11.12 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.11.13 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.11.14 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.2.12 Hays County Water Supply Plan

Table 4B.2.12-1 lists each water user group in Hays County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.12-1.
Hays County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
County Line WSC	-44	-2,365	Projected shortage (2010 through 2060)
Creedmoor-Maha WSC			See Caldwell County
Crystal Clear WSC			See Guadalupe County
Goforth WSC	-79	-2,408	Projected shortage (2010 through 2060)
City of Kyle	-1,388	-3,851	Projected shortage (2010 through 2060)
Maxwell WSC			See Caldwell County
City of Mountain City	88	-50	Projected shortage (2050 and 2060)
City of Niederwald	-35	-354	Projected shortage (2010 through 2060)
Plum Creek Water Company	123	-941	Projected shortage (2020 through 2060)
City of San Marcos	526	-15,875	Projected shortage (2020 through 2060)
Wimberley WSC	-177	-1,479	Projected shortage (2010 through 2060)
City of Woodcreek	-118	-506	Projected shortage (2010 through 2060)
Woodcreek Utilities, Inc.	-475	-2,651	Projected shortage (2010 through 2060)
Rural Area Residential and Commercial	-1,033	-2,201	Projected shortage (2010 through 2060)
Industrial	2,111	1,937	
Steam-Electric Power	1,069	-8,351	Projected shortage (2020 through 2060)
Mining	-82	-107	Projected shortage (2010 through 2060)
Irrigation	491	506	
Livestock	-82	-82	Projected shortage (2010 through 2060)

4B.2.12.1 County Line WSC

Current water supply for County Line WSC is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. County Line WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that County Line WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.12-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 43 acft/yr by 2010, increasing to 473 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 404 acft/yr by 2010, increasing to 808 acft/yr of supply in 2060.
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 1,000 acft/yr by 2010.
- Purchase from WWP (GBRA) to be implemented prior to 2020. This strategy can provide an additional 500 acft/yr by 2020, increasing to 1,000 acft/yr of supply in 2060.
- Purchase from WWP (CRWA) to be implemented prior to 2020. This strategy can provide an additional 500 acft/yr by 2020, increasing to 1,000 acft/yr of supply in 2040.

Alternative water management strategies identified by County Line WSC include Recycled Water, Hays/Caldwell Carrizo Project, and/or LCRA-SAWS Water Project-Bastrop Diversion. Brackish Groundwater Desalination (Edwards) is a potential alternative water management strategy.

Table 4B.2.12.-2.
Recommended Water Supply Plan for County Line WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	44	1,096	1,416	1,582	1,900	2,365
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	43	110	176	227	344	473
Local Trinity	404	404	404	404	404	808
Edwards Transfers (L-15)	1,000	1,000	1,000	1,000	1,000	1,000
Purchase from WWP (GBRA)	—	500	1,000	1,000	1,000	1,000
Purchase from WWP (CRWA)	—	500	500	1,000	1,000	1,000
Total New Supply	**1,447**	**2,514**	**3,080**	**3,631**	**3,748**	**4,281**

Estimated costs of the recommended plan to meet County Line WSC's projected needs are shown in Table 4B.2.12-3.

Table 4B.2.12-3.
Recommended Plan Costs by Decade for County Line WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$25,017	$64,541	$103,352	$125,908	$176,450	$233,550
Unit Cost ($/acft)	$588	$588	$588	$554	$513	$494
Local Trinity						
Annual Cost ($/yr)	$135,500	$135,500	$135,500	$37,500	$37,500	$173,000
Unit Cost ($/acft)	$335	$335	$335	$93	$93	$214
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$135,000	$135,000	$135,000	$135,000	$135,000	$135,000
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	$612,775	$1,225,550	$1,225,550	$434,330	$434,330
Unit Cost ($/acft)	—	$1,226	$1,226	$1,226	$434	$434
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	$453,345	$453,345	$392,470	$409,763	$425,184
Unit Cost ($/acft)	—	$907	$907	$392	$410	$425

4B.2.12.2 Goforth WSC

Current water supply for Goforth WSC is obtained from the Edwards (Barton Springs) Aquifer. Goforth WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Goforth WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.12-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 22 acft/yr by 2050, increasing to 111 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Trinity to be implemented prior to 2020. This strategy can provide an additional 400 acft/yr by 2010.
- Local Edwards (Barton Springs) to be implemented prior to 2010. This strategy can provide an additional 150 acft/yr by 2010.

- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 1,000 acft/yr by 2010, increasing to 3,000 acft/yr of supply in 2060.

Alternative water management strategies identified by Goforth WSC include Hays/Caldwell Carrizo Project and/or LCRA-SAWS Water Project-Bastrop Diversion. Brackish Groundwater Desalination (Edwards) is a potential alternative water management strategy.

Table 4B.2.12-4.
Recommended Water Supply Plan for Goforth WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	79	532	969	1,415	1,963	2,408
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	22	111
Local Trinity	400	400	400	400	400	400
Local Edwards (Barton Springs)	150	150	150	150	150	150
Purchase from WWP (GBRA)	1,000	1,000	1,500	2,000	2,500	3,000
Total New Supply	**1,650**	**1,550**	**2,050**	**2,550**	**3,050**	**3,550**

Estimated costs of the recommended plan to meet Goforth WSC's projected needs are shown in Table 4B.2.12-5.

Table 4B.2.12-5.
Recommended Plan Costs by Decade for Goforth WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$13,133	$65,352
Unit Cost ($/acft)	—	—	—	—	$588	$588
Local Trinity						
Annual Cost ($/yr)	$146,000	$146,000	$146,000	$46,000	$46,000	$46,000
Unit Cost ($/acft)	$365	$365	$365	$115	$115	$115
Local Edwards (Barton Springs)						
Annual Cost ($/yr)	$20,250	$20,250	$20,250	$20,250	$20,250	$20,250
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$1,280,416	$1,280,416	$1,920,624	$2,560,832	$3,201,040	$3,841,248
Unit Cost ($/acft)	$1,280	$1,280	$1,280	$1,280	$1,280	$1,280

4B.2.12.3 City of Kyle

Current water supply for the City of Kyle is obtained from the Edwards Aquifer, Edwards (Barton Springs) Aquifer, and Canyon Reservoir. Kyle is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Kyle implement the following water supply plan to meet the projected needs for the city (Table 4B.2.12-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 27 acft/yr by 2020, increasing to 443 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Hays/Caldwell Carrizo Project[4] to be implemented prior to 2060. This strategy can provide an additional supply of 1,000 acft/yr by 2060.
- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 2,368 acft/yr by 2010, increasing to 3,522 acft/yr of supply in 2060.

An alternative water management strategy identified by the City of Kyle is the LCRA-SAWS Water Project-Bastrop Diversion.

Table 4B.2.12-6.
Recommended Water Supply Plan for the City of Kyle

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	1,388	2,588	2,865	3,025	3,522	3,851
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	27	96	167	302	443
Hays/Caldwell Carrizo Project	—	—	—	—	—	1,000
Purchase from WWP (GBRA)	2,368	2,588	2,865	3,025	3,522	3,522
Total New Supply	**2,368**	**2,615**	**2,961**	**3,192**	**3,824**	**4,965**

[4] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Estimated costs of the recommended plan to meet the City of Kyle's projected needs are shown in Table 4B.2.12-7.

Table 4B.2.12-7.
Recommended Plan Costs by Decade for the City of Kyle

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	$13,814	$49,662	$86,993	$157,117	$230,493
Unit Cost ($/acft)	—	$520	$520	$520	$520	$520
Hays/Caldwell Carrizo Project						
Annual Cost ($/yr)	—	—	—	—	—	$694,467
Unit Cost ($/acft)	—	—	—	—	—	$694
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$3,032,025	$3,313,717	$3,668,392	$3,873,258	$4,509,625	$4,509,625
Unit Cost ($/acft)	$1,280	$1,280	$1,280	$1,280	$1,280	$1,280

4B.2.12.4 City of Mountain City

Current water supply for the City of Mountain City is obtained from the Edwards (Barton Springs) Aquifer. Mountain City is projected to need additional water supplies prior to 2050. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Mountain City implement the following water supply plan to meet the projected needs for the city (Table 4B.2.12-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 1 acft/yr by 2010, increasing to 22 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Edwards (Barton Springs) to be implemented prior to 2050. This strategy can provide an additional 50 acft/yr by 2050.

Table 4B.2.12-8.
Recommended Water Supply Plan for the City of Mountain City

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	24	50
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	1	3	6	10	16	22
Local Edwards (Barton Springs)	—	—	—	—	50	50
Total New Supply	**1**	**3**	**6**	**10**	**66**	**72**

Estimated costs of the recommended plan to meet the City of Mountain City's projected needs are shown in Table 4B.2.12-9.

Table 4B.2.12-9.
Recommended Plan Costs by Decade for the City of Mountain City

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$847	$1,773	$3,419	$5,452	$8,242	$11,167
Unit Cost ($/acft)	$588	$588	$588	$554	$521	$500
Local Edwards (Barton Springs)						
Annual Cost ($/yr)	—	—	—	—	$6,750	$6,750
Unit Cost ($/acft)	—	—	—	—	$135	$135

4B.2.12.5 City of Niederwald

Current water supply for the City of Niederwald is obtained from the Edwards (Barton Springs) Aquifer. Niederwald is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Niederwald implement the following water supply plan to meet the projected needs for the city (Table 4B.2.12-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 1 acft/yr by 2020, increasing to 42 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 35 acft/yr by 2010, increasing to 354 acft/yr of supply in 2060.

Table 4B.2.12-10.
Recommended Water Supply Plan for the City of Niederwald

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	35	95	160	221	294	354
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	1	8	15	27	42
Purchase from WWP (GBRA)	35	95	160	221	294	354
Total New Supply	**35**	**96**	**168**	**236**	**321**	**396**

Estimated costs of the recommended plan to meet the City of Niederwald's projected needs are shown in Table 4B.2.12-11.

Table 4B.2.12-11.
Recommended Plan Costs by Decade for the City of Niederwald

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	$669	$4,571	$8,532	$15,904	$24,465
Unit Cost ($/acft)	—	$588	$588	$588	$588	$588
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$44,815	$121,640	$204,867	$282,972	$376,442	$453,267
Unit Cost ($/acft)	$1,280	$1,280	$1,280	$1,280	$1,280	$1,280

4B.2.12.6 Plum Creek Water Company

Current water supply for Plum Creek Water Company is obtained from the Edwards (Barton Springs) Aquifer. Plum Creek Water Company is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Plum Creek Water Company implement the following water supply plan to meet the projected needs for the entity (Table 4B.2.12-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 12 acft/yr by 2050, increasing to 54 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2020. This strategy can provide an additional 73 acft/yr by 2020, increasing to 941 acft/yr of supply in 2060.

Table 4B.2.12-12.
Recommended Water Supply Plan for Plum Creek Water Company

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	73	274	479	738	941
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	12	54
Purchase from WWP (GBRA)	—	73	274	479	738	941
Total New Supply	—	**73**	**274**	**479**	**750**	**995**

Estimated costs of the recommended plan to meet Plum Creek Water Company's projected needs are shown in Table 4B.2.12-13.

Table 4B.2.12-13.
Recommended Plan Costs by Decade for Plum Creek Water Company

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$7,201	$31,722
Unit Cost ($/acft)	—	—	—	—	$588	$588
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	$89,465	$335,800	$587,038	$320,535	$408,704
Unit Cost ($/acft)	—	$1,226	$1,226	$1,226	$434	$434

4B.2.12.7 City of San Marcos

Current water supply for the City of San Marcos is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. San Marcos is projected to need additional water supplies prior to 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that San Marcos implement the following water supply plan to meet the projected needs for the city (Table 4B.2.12-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 417 acft/yr by 2010, increasing to 2,656 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2020. This strategy can provide an additional 5,000 acft/yr by 2020.
- Additional surface water rights to be implemented prior to 2030. This strategy can provide an additional 2,867 acft/yr by 2030.
- Recycled water to be implemented prior to 2040. This strategy can provide an additional 5,778 acft/yr by 2040.
- Hays/Caldwell Carrizo Project[5] to be implemented prior to 2060. This strategy can provide an additional 7,000 acft/yr by 2060.

Table 4B.2.12-14.
Recommended Water Supply Plan for the City of San Marcos

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	2,634	5,807	9,260	12,995	15,875
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	417	554	815	1,282	1,875	2,656
Purchase from WWP (GBRA)	—	5,000	5,000	5,000	5,000	5,000
Additional Surface Water Rights	—	—	2,867	2,867	2,867	2,867
Recycled Water	—	—	—	5,778	5,778	5,778
Hays/Caldwell Carrizo Project	—	—	—	—	—	7,000
Total New Supply	**417**	**5,554**	**8,682**	**14,927**	**15,520**	**23,301**

Estimated costs of the recommended plan to meet the City of San Marcos' projected needs are shown in Table 4B.2.12-15.

[5] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Table 4B.2.12-15.
Recommended Plan Costs by Decade for the City of San Marcos

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$217,098	$288,312	$411,764	$589,861	$824,852	$1,147,567
Unit Cost ($/acft)	$520	$520	$505	$460	$440	$432
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	$6,127,750	$6,127,750	$6,127,750	$2,171,650	$2,171,650
Unit Cost ($/acft)	—	$1,226	$1,226	$1,226	$434	$434
Additional Surface Water Rights						
Annual Cost ($/yr)	—	—	$8,006,063	$8,006,063	$8,006,063	$8,006,063
Unit Cost ($/acft)	—	—	$2,792	$2,792	$2,792	$2,792
Recycled Water						
Annual Cost ($/yr)	—	—	—	$4,834,650	$4,834,650	$4,834,650
Unit Cost ($/acft)	—	—	—	$837	$837	$837
Hays/Caldwell Carrizo Project						
Annual Cost ($/yr)	—	—	—	—	—	$4,861,267
Unit Cost ($/acft)	—	—	—	—	—	$694

4B.2.12.8 Wimberley WSC

Current water supply for Wimberley WSC is obtained from the Trinity Aquifer. Wimberley WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Wimberley implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.12-16).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 19 acft/yr by 2050, increasing to 70 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Wimberley and Woodcreek Water Supply from Canyon Reservoir to be implemented prior to 2010. This strategy can provide an additional 177 acft/yr by 2010, increasing to 1,479 acft/yr of supply in 2060.

Table 4B.2.12-16.
Recommended Water Supply Plan for Wimberley WSC

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	177	400	628	847	1,248	1,479
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	19	70
Wimberley and Woodcreek (Canyon)	177	400	628	847	1,248	1,479
Total New Supply	**177**	**400**	**628**	**847**	**1,267**	**1,549**

Estimated costs of the recommended plan to meet Wimberley WSC's projected needs are shown in Table 4B.2.12-17.

Table 4B.2.12-17.
Recommended Plan Costs by Decade for Wimberley WSC

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$11,207	$40,963
Unit Cost ($/acft)	—	—	—	—	$588	$588
Wimberley and Woodcreek (Canyon)						
Annual Cost ($/yr)	$174,976	$395,427	$620,821	$346,400	$510,399	$604,871
Unit Cost ($/acft)	$989	$989	$989	$409	$409	$409

4B.2.12.9 City of Woodcreek

Current water supply for the City of Woodcreek is obtained from the Trinity Aquifer. Woodcreek is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Woodcreek implement the following water supply plan to meet the projected needs for the city (Table 4B.2.12-18).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 2 acft/yr by 2030, increasing to 37 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

- Wimberley and Woodcreek Water Supply from Canyon Reservoir to be implemented prior to 2010. This strategy can provide an additional 118 acft/yr by 2010, increasing to 506 acft/yr of supply in 2060.

Table 4B.2.12-18.
Recommended Water Supply Plan for the City of Woodcreek

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	118	187	257	325	436	506
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	2	6	20	37
Wimberley and Woodcreek (Canyon)	118	187	257	325	436	506
Total New Supply	**118**	**187**	**259**	**331**	**456**	**543**

Estimated costs of the recommended plan to meet the City of Woodcreek's projected needs are shown in Table 4B.2.12-19.

Table 4B.2.12-19.
Recommended Plan Costs by Decade for the City of Woodcreek

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	$1,010	$3,463	$11,892	$21,956
Unit Cost ($/acft)	—	—	$588	$588	$588	$588
Wimberley and Woodcreek (Canyon)						
Annual Cost ($/yr)	$106,765	$184,862	$254,062	$132,916	$178,312	$206,980
Unit Cost ($/acft)	$989	$989	$989	$409	$409	$409

4B.2.12.10 Woodcreek Utilities, Inc.

Current water supply for the Woodcreek Utilities is obtained from the Trinity Aquifer. Woodcreek Utilities is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Woodcreek Utilities implement the following water supply plan to meet the projected needs for the utility (Table 4B.2.12-20).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 56 acft/yr by 2010, increasing to 771 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Wimberley and Woodcreek Water Supply from Canyon Reservoir to be implemented prior to 2010. This strategy can provide an additional 475 acft/yr by 2010, increasing to 2,651 acft/yr of supply in 2060.

Table 4B.2.12-20.
Recommended Water Supply Plan for Woodcreek Utilities

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	475	872	1,292	1,702	2,255	2,651
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	56	177	337	455	619	771
Wimberley and Woodcreek (Canyon)	475	872	1,292	1,702	2,255	2,651
Total New Supply	**531**	**1,049**	**1,629**	**2,157**	**2,874**	**3,422**

Estimated costs of the recommended plan to meet Woodcreek Utilities' projected needs are shown in Table 4B.2.12-21.

Table 4B.2.12-21.
Recommended Plan Costs by Decade Woodcreek Utilities

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$29,350	$80,000	$147,623	$196,938	$265,978	$329,778
Unit Cost ($/acft)	$520	$453	$438	$433	$430	$428
Wimberley and Woodcreek (Canyon)						
Annual Cost ($/yr)	$469,570	$862,031	$1,277,230	$696,072	$922,235	$1,084,188
Unit Cost ($/acft)	$989	$989	$989	$409	$409	$409

4B.2.12.11 Rural Area Residential and Commercial

Current water supply for Rural Areas is obtained from the Edwards Aquifer and Trinity Aquifer. Rural Areas are projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.12-22).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 12 acft/yr in 2030, increasing to 184 acft/yr in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 4,480 acft/yr by 2010.

Table 4B.2.12-22.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	1,033	1,233	1,444	1,667	1,978	2,201
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	12	49	112	184
Purchase from WWP (GBRA)	4,480	4,480	4,480	4,480	4,480	4,480
Total New Supply	**4,480**	**4,480**	**4,492**	**4,529**	**4,592**	**4,664**

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.12-23.

Table 4B.2.12-23.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	$7,204	$28,662	$66,090	$108,113
Unit Cost ($/acft)	—	—	$588	$588	$588	$588
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$5,736,264	$5,736,264	$5,736,264	$5,736,264	$5,736,264	$5,736,264
Unit Cost ($/acft)	$1,280	$1,280	$1,280	$1,280	$1,280	$1,280

4B.2.12.12 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.12.13 Steam-Electric Power

Current water supply for steam-electric power is obtained from Canyon Reservoir and reclaimed water. Steam-electric power is projected to need additional water supplies prior to year 2020. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual steam-electric power operations implement the following water supply plan to meet the projected needs for steam-electric mining (Table 4B.2.12-24).

- Steam-Electric Water Conservation (Air Cooling) to be implemented prior to 2020. This strategy can provide an additional 1,231 acft/yr of supply by 2020, increasing to 8,351 acft/yr by 2060.

Limited available proximate water sources and somewhat arbitrary assignment of steam-electric water demands to Hays County necessitate that the SCTRWPG recommend installation of air, rather than water, cooling systems for any power generation facility expansions in Guadalupe County. It is further recognized that it may not be economically feasible to satisfy all projected water needs for steam-electric power generation assigned to Hays County.

Table 4B.2.12-24.
Recommended Water Supply Plan for Steam-Electric Power

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	—	1,231	2,522	4,095	6,013	8,351
Recommended Plan						
Steam-Electric Water Conservation	—	1,231	2,522	4,095	6,013	8,351
Total New Supply	—	**1,231**	**2,522**	**4,095**	**6,013**	**8,351**

Estimated costs of the recommended plan to meet the steam-electric power projected needs are shown in Table 4B.2.12-25.

Table 4B.2.12-25.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	2010	2020	2030	2040	2050	2060
Steam-Electric Water Conservation[1]						
Annual Cost ($/yr)						
Unit Cost ($/acft)						

[1] Costs not available due to lack of relevant data.

4B.2.12.14 Mining

Current water supply for mining is obtained from the Trinity Aquifer. Mining is projected to need additional water supplies prior to year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual mining operations implement the following water supply plan to meet the projected needs for mining (Table 4B.2.12-26).

- Recycled water to be implemented prior to 2010. This strategy can provide an additional 82 acft/yr by 2010, increasing to 107 acft/yr in 2060.

Table 4B.2.12-26.
Recommended Water Supply Plan for Mining

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	82	87	91	94	106	107
Recommended Plan						
Recycled Water	82	87	91	94	106	107
Total New Supply	**82**	**87**	**91**	**94**	**106**	**107**

Estimated costs of the recommended plan to meet the mining projected needs are shown in Table 4B.2.12-27.

Table 4B.2.12-27.
Recommended Plan Costs by Decade for Mining

Plan Element	2010	2020	2030	2040	2050	2060
Recycled Water						
Annual Cost ($/yr)	$39,807	$42,234	$44,176	$33,076	$37,298	$37,650
Unit Cost ($/acft)	$485	$485	$485	$352	$352	$352

4B.2.12.15 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.12.16 Livestock

Current water supply for livestock is obtained from the Trinity Aquifer and local sources. Livestock is projected to need additional water supplies in the planning year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual livestock operations implement the following water supply plan to meet the projected needs for livestock (Table 4B.2.12-28).

- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 82 acft/yr by 2010.

Table 4B.2.12-28.
Recommended Water Supply Plan for Livestock

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	82	82	82	82	82	82
Recommended Plan						
Local Trinity	82	82	82	82	82	82
Total New Supply	**82**	**82**	**82**	**82**	**82**	**82**

No estimated costs of the recommended plan to meet the livestock projected needs are included as additional supplies will likely be produced from existing wells. It is not expected to be economically feasible to develop new sources of firm supply to meet these small unconcentrated needs.

4B.2.13 Karnes County Water Supply Plan

Table 4B.2.13-1 lists each water user group in Karnes County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.13-1.
Karnes County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
El Oso WSC	754	581	
City of Falls City	32	0	
City of Karnes City	80	0	
City of Kenedy	-187	-417	Projected shortage (2010 through 2060)
City of Runge	297	245	
Sunko WSC			See Wilson County
Rural Area Residential and Commercial	827	377	
Industrial	21	2	
Steam-Electric Power	0	0	No projected demand
Mining	5	4	
Irrigation	865	1,084	
Livestock	0	0	

4B.2.13.1 El Oso WSC

El Oso WSC is projected to have adequate water supplies available from the Carrizo Aquifer to meet the WSC's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that El Oso WSC implement the following water supply plan (Table 4B.2.13-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 41 acft/yr by 2010, increasing to 139 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.13-2.
Recommended Water Supply Plan for El Oso WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	41	83	92	105	120	139
Total New Supply	**41**	**83**	**92**	**105**	**120**	**139**

Estimated costs of the recommended plan for El Oso WSC are shown in Table 4B.2.13-3.

Table 4B.2.13-3.
Recommended Plan Costs by Decade for El Oso WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$24,042	$40,706	$42,945	$46,735	$52,217	$59,871
Unit Cost ($/acft)	$588	$492	$466	$446	$435	$432

4B.2.13.2 City of Falls City

The City of Falls City is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Falls City implement the following water supply plan (Table 4B.2.13-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 8 acft/yr by 2010, increasing to 23 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.13-4.
Recommended Water Supply Plan for the City of Falls City

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	8	13	14	16	19	23
Total New Supply	**8**	**13**	**14**	**16**	**19**	**23**

Estimated costs of the recommended plan for the City of Falls City are shown in Table 4B.2.13-5.

Table 4B.2.13-5.
Recommended Plan Costs by Decade for the City of Falls City

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$4,450	$6,518	$6,783	$7,393	$8,362	$9,779
Unit Cost ($/acft)	$588	$518	$481	$453	$438	$433

4B.2.13.3 City of Karnes City

The City of Karnes City is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Karnes City implement the following water supply plan (Table 4B.2.13-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 11 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.13-6.
Recommended Water Supply Plan for the City of Karnes City

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	11
Total New Supply	—	—	—	—	—	**11**

Estimated costs of the recommended plan for the City of Karnes City are shown in Table 4B.2.13-7.

Table 4B.2.13-7.
Recommended Plan Costs by Decade for the City of Karnes City

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$6,532
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.13.4 City of Kenedy

Current water supply for the City of Kenedy is obtained from the Gulf Coast Aquifer. Kenedy is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Kenedy implement the following water supply plan to meet the projected needs for the city (Table 4B.2.13-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 58 acft/yr by 2010, increasing to 268 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Gulf Coast Aquifer to be implemented prior to 2010. This strategy can provide an additional 390 acft/yr by 2010, increasing to 780 acft/yr of supply in 2060.

Alternative water management strategies identified by the City of Kenedy include development of shallow wells, contracting for supplies from El Oso WSC or the City of Karnes City, and/or obtaining surface water rights from the San Antonio River.

Table 4B.2.13-8.
Recommended Water Supply Plan for the City of Kenedy

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	187	250	298	336	385	417
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	58	121	189	216	242	268
Local Gulf Coast	390	390	390	390	390	780
Total New Supply	**448**	**511**	**579**	**606**	**632**	**1,048**

Estimated costs of the recommended plan to meet the City of Kenedy's projected needs are shown in Table 4B.2.13-9.

Table 4B.2.13-9.
Recommended Plan Costs by Decade for the City of Kenedy

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$33,941	$56,896	$81,786	$90,158	$99,698	$110,310
Unit Cost ($/acft)	$581	$469	$433	$418	$413	$412
Local Gulf Coast						
Annual Cost ($/yr)	$352,500	$352,500	$352,500	$177,500	$177,500	$530,000
Unit Cost ($/acft)	$904	$904	$904	$455	$455	$679

4B.2.13.5 City of Runge

The City of Runge is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Runge implement the following water supply plan (Table 4B.2.13-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 15 acft/yr by 2010, increasing to 37 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.13-10.
Recommended Water Supply Plan for the City of Runge

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	15	22	24	26	31	37
Total New Supply	**15**	**22**	**24**	**26**	**31**	**37**

Estimated costs of the recommended plan for the City of Runge are shown in Table 4B.2.13-11.

Table 4B.2.13-11.
Recommended Plan Costs by Decade for the City of Runge

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$8,972	$11,532	$11,763	$11,761	$13,580	$16,254
Unit Cost ($/acft)	$588	$528	$491	$456	$439	$434

4B.2.13.6 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer and the Gulf Coast Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.13-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 68 acft/yr by 2010, increasing to 258 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.13-12.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	68	121	157	193	227	258
Total New Supply	**68**	**121**	**157**	**193**	**227**	**258**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.13-13.

Table 4B.2.13-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$40,238	$64,955	$80,789	$95,300	$109,839	$122,460
Unit Cost ($/acft)	$588	$538	$514	$495	$483	$475

4B.2.13.7 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.13.8 Steam-Electric Power

There is no projected steam-electric power water demand in Karnes County, therefore no water management strategies are recommended for this water user group.

4B.2.13.9 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.13.10 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.13.11 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.2.14 Kendall County Water Supply Plan

Table 4B.2.14-1 lists each water user group in Kendall County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.14-1.
Kendall County Management Supply/Shortage by Water User Group

Water User Group	*Management Supply/Shortage*		*Comment*
	2010 (acft/yr)	*2060 (acft/yr)*	
City of Boerne	38	-1,542	Projected shortage (2030 through 2060)
City of Fair Oaks Ranch			See Bexar County
Water Service Inc.			See Bexar County
Rural Area Residential and Commercial	-221	-4,163	Projected shortage
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	-148	-140	Projected shortage (2010 through 2060)
Livestock	-25	-28	Projected shortage (2010 through 2060)

4B.2.14.1 City of Boerne

Current water supply for the City of Boerne is obtained from the Trinity Aquifer, Canyon Reservoir, and Boerne Lake. Boerne is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Boerne implement the following water supply plan to meet the projected needs for the city (Table 4B.2.14-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 98 acft/yr by 2010, increasing to 816 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from a WWP (GBRA) to be implemented prior to 2030. This strategy can provide an additional 23 acft/yr by 2010, increasing to 1,542 acft/yr of supply in 2060.

Table 4B.2.14-2.
Recommended Water Supply Plan for the City of Boerne

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	23	549	1,092	1,542
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	98	280	394	502	652	816
Purchase from WWP (GBRA)	—	—	23	549	1,092	1,542
Total New Supply	**98**	**280**	**417**	**1,051**	**1,744**	**2,358**

Estimated costs of the recommended plan to meet the City of Boerne's projected needs are shown in Table 4B.2.14-3.

Table 4B.2.14-3.
Recommended Plan Costs by Decade for the City of Boerne

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$57,546	$134,963	$181,274	$221,288	$283,804	$352,354
Unit Cost ($/acft)	$588	$483	$460	$440	$435	$432
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	—	$28,188	$672,827	$474,288	$669,737
Unit Cost ($/acft)	—	—	$1,226	$1,226	$434	$434

4B.2.14.2 Rural Area Residential and Commercial

Current water supply for Rural Areas is obtained from the Edwards-Trinity Aquifer, Trinity Aquifer, and Canyon Reservoir. Rural Areas are projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.14-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 73 acft/yr by 2050, increasing to 264 acft/yr in 2060 (Volume II, Section 4C.1.1).

- Purchase from WWP (GBRA) to be implemented prior to 2010. This strategy can provide an additional 221 acft/yr by 2010, increasing to 4,163 acft/yr in 2060.

Table 4B.2.14-4.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	221	865	1,612	2,527	3,385	4,163
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	73	264
Purchase from WWP (GBRA)	221	865	1,612	2,527	3,385	4,163
Total New Supply	**221**	**865**	**1,612**	**2,527**	**3,458**	**4,427**

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.14-5.

Table 4B.2.14-5.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$43,086	$155,415
Unit Cost ($/acft)	—	—	—	—	$588	$588
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	$270,731	$1,059,650	$1,974,747	$3,095,648	$4,146,723	$5,099,796
Unit Cost ($/acft)	$1,226	$1,226	$1,226	$1,226	$1,226	$1,226

4B.2.14.3 Industrial

There is no projected industrial water demand in Kendall County, therefore no water management strategies are recommended for this water user group.

4B.2.14.4 Steam-Electric Power

There is no projected steam-electric power water demand in Kendall County, therefore no water management strategies are recommended for this water user group.

4B.2.14.5 Mining

Mining is projected to have adequate water supplies available from the Trinity Aquifer to meet the water user group's projected demand during the planning period.

4B.2.1.6 Irrigation

Current water supply for irrigation is obtained from the Trinity Aquifer and run-of-river rights. Irrigation is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected needs for irrigation (Table 4B.2.14-6).

- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 148 acft/yr of supply.

Table 4B.2.14-6.
Recommended Water Supply Plan for Irrigation

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	148	145	141	138	143	140
Recommended Plan						
Local Trinity	148	148	148	148	148	148
Total New Supply	**148**	**148**	**148**	**148**	**148**	**148**

No estimated costs of the recommended plan to meet the irrigation projected needs are included as additional supplies will likely be produced from existing wells. Data indicate that there is insufficient irrigated acreage for the Irrigation Water Conservation water management strategy to meet projected needs by demand reduction. SCTRWPG has determined that it is not economically feasible for agricultural producers to pay for additional supplies to meet projected needs.

4B.2.14.7 Livestock

Current water supply for livestock is obtained from the Trinity Aquifer and local sources. Livestock is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual livestock operations implement the following water supply plan to meet a portion of the projected needs for livestock (Table 4B.2.14-7).

- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 28 acft/yr of supply.

Table 4B.2.14-7.
Recommended Water Supply Plan for Livestock

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	25	25	25	25	28	28
Recommended Plan						
Local Trinity	28	28	28	28	28	28
Total New Supply	**28**	**28**	**28**	**28**	**28**	**28**

No estimated costs of the recommended plan to meet the livestock projected needs are included as additional supplies will likely be produced from existing wells. It is not expected to be economically feasible to develop new sources of firm supply to meet these small unconcentrated needs.

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4B.2.15 LaSalle County Water Supply Plan

Table 4B.2.15-1 lists each water user group in LaSalle County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.15-1.
LaSalle County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Cotulla	1,080	744	
City of Encinal	172	175	
Rural Area Residential and Commercial	218	0	
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected demand
Irrigation	3,287	3,287	
Livestock	0	0	

4B.2.15.1 City of Cotulla

The City of Cotulla is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Cotulla implement the following water supply plan (Table 4B.2.15-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 118 acft/yr by 2010, increasing to 745 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.15-2.
Recommended Water Supply Plan for the City of Cotulla

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	118	248	369	488	615	745
Total New Supply	**118**	**248**	**369**	**488**	**615**	**745**

Estimated costs of the recommended plan for the City of Cotulla are shown in Table 4B.2.15-3.

Table 4B.2.15-3.
Recommended Plan Costs by Decade for the City of Cotulla

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$59,194	$109,313	$155,531	$200,225	$250,155	$302,357
Unit Cost ($/acft)	$501	$441	$421	$410	$407	$406

4B.2.15.2 City of Encinal

The City of Encinal is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Encinal implement the following water supply plan (Table 4B.2.15-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 9 acft/yr by 2010, increasing to 14 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.15-4.
Recommended Water Supply Plan for the City of Encinal

	2010 (acft/yr)	**_2020 (acft/yr)_**	**_2030 (acft/yr)_**	**_2040 (acft/yr)_**	**_2050 (acft/yr)_**	**_2060 (acft/yr)_**
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	9	9	10	10	11	14
Total New Supply	**9**	**9**	**10**	**10**	**11**	**14**

Estimated costs of the recommended plan for the City of Encinal are shown in Table 4B.2.15-5.

Table 4B.2.15-5.
Recommended Plan Costs by Decade for the City of Encinal

Plan Element	**_2010_**	**_2020_**	**_2030_**	**_2040_**	**_2050_**	**_2060_**
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$5,015	$5,412	$5,358	$4,567	$5,067	$6,012
Unit Cost ($/acft)	$588	$574	$521	$472	$450	$442

4B.2.15.3 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.15-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 3 acft/yr by 2010, increasing to 42 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.15-6.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	3	4	11	17	29	42
Total New Supply	**3**	**4**	**11**	**17**	**29**	**42**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.15-7.

Table 4B.2.15-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$1,649	$2,259	$6,511	$9,809	$17,330	$24,945
Unit Cost ($/acft)	$588	$588	$588	$588	$588	$588

4B.2.15.4 Industrial

There is no projected industrial water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

4B.2.15.5 Steam-Electric Power

There is no projected steam-electric power water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

4B.2.15.6 Mining

There is no projected mining water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

4B.2.15.7 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.15.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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4B.2.16 Medina County Water Supply Plan

Table 4B.2.16-1 lists each water user group in Medina County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.16-1. Medina County Management Supply/Shortage by Water User Group

Water User Group	*Management Supply/Shortage*		*Comment*
	2010 (acft/yr)	*2060 (acft/yr)*	
Benton City WSC			See Atascosa County
Bexar Metropolitan Water District			See Bexar County
City of Castroville	-274	-555	Projected shortage (2010 through 2060)
City of Devine	63	4	
East Medina SUD	132	-372	Projected shortage (2030 through 2060)
City of Hondo	-804	-1,737	Projected shortage (2010 through 2060)
City of La Coste	-96	-172	Projected shortage (2010 through 2060)
City of Lytle			See Atascosa County
City of Natalia	-198	-387	Projected shortage (2010 through 2060)
Yancey WSC	-577	-1,348	Projected shortage (2010 through 2060)
Rural Area Residential and Commercial	-180	-1,567	Projected shortage (2010 through 2060)
Industrial	678	642	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	-30	9,814	Projected shortage (2010)
Livestock	0	0	

4B.2.16.1 City of Castroville

Current water supply for the City of Castroville is obtained from the Edwards Aquifer. Castroville is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that

Castroville implement the following water supply plan to meet the projected needs for the city (Table 4B.2.16-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 53 acft/yr by 2010, increasing to 302 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 274 acft/yr by 2010, increasing to 555 acft/yr of supply in 2060.

Table 4B.2.16-2.
Recommended Water Supply Plan for the City of Castroville

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	274	337	396	448	502	555
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	53	111	176	242	270	302
Edwards Transfers (L-15)	274	337	396	448	502	555
Total New Supply	**327**	**448**	**572**	**690**	**772**	**857**

Estimated costs of the recommended plan to meet the City of Castroville's projected needs are shown in Table 4B.2.16-3.

Table 4B.2.16-3.
Recommended Plan Costs by Decade for the City of Castroville

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$29,940	$51,371	$75,645	$100,897	$111,528	$124,634
Unit Cost ($/acft)	$566	$463	$431	$417	$413	$412
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$36,990	$45,495	$53,460	$60,480	$67,770	$74,925
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.16.2 City of Devine

The City of Devine is projected to have adequate water supplies available from the Edwards Aquifer and the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Devine implement the following water supply plan (Table 4B.2.16-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 63 acft/yr by 2010, increasing to 196 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.16-4.
Recommended Water Supply Plan for the City of Devine

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	63	127	152	159	175	196
Total New Supply	**63**	**127**	**152**	**159**	**175**	**196**

Estimated costs of the recommended plan for the City of Devine are shown in Table 4B.2.16-5.

Table 4B.2.16-5.
Recommended Plan Costs by Decade for the City of Devine

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$36,887	$60,844	$67,697	$67,340	$72,950	$81,588
Unit Cost ($/acft)	$588	$481	$444	$425	$417	$416

4B.2.16.3 East Medina SUD

Current water supply for East Medina SUD is obtained from the Edwards Aquifer. East Medina SUD is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that East

Medina SUD implement the following water supply plan to meet the projected needs for the SUD (Table 4B.2.16-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 19 acft/yr by 2050, increasing to 54 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2030. This strategy can provide an additional 95 acft/yr by 2010, increasing to 372 acft/yr of supply in 2060.

Table 4B.2.16-6.
Recommended Water Supply Plan for East Medina SUD

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	95	184	278	372
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	19	54
Edwards Transfers (L-15)	—	—	95	184	278	372
Total New Supply	—	—	**95**	**184**	**297**	**426**

Estimated costs of the recommended plan to meet East Medina SUD's projected needs are shown in Table 4B.2.16-7.

Table 4B.2.16-7.
Recommended Plan Costs by Decade for East Medina SUD

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$11,266	$31,933
Unit Cost ($/acft)	—	—	—	—	$588	$588
Edwards Transfers (L-15)						
Annual Cost ($/yr)	—	—	$12,825	$24,840	$37,530	$50,220
Unit Cost ($/acft)	—	—	$135	$135	$135	$135

4B.2.16.4 City of Hondo

Current water supply for the City of Hondo is obtained from the Edwards Aquifer. Hondo is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Hondo implement the following water supply plan to meet the projected needs for the city (Table 4B.2.16-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 125 acft/yr by 2010, increasing to 640 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 804 acft/yr by 2010, increasing to 1,737 acft/yr of supply in 2060.

Table 4B.2.16-8.
Recommended Water Supply Plan for the City of Hondo

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	804	1,021	1,225	1,395	1,568	1,737
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	125	289	420	477	551	640
Edwards Transfers (L-15)	804	1,021	1,225	1,395	1,568	1,737
Total New Supply	**929**	**1,310**	**1,645**	**1,872**	**2,119**	**2,377**

Estimated costs of the recommended plan to meet the City of Hondo's projected needs are shown in Table 4B.2.16-9.

Table 4B.2.16-9.
Recommended Plan Costs by Decade for the City of Hondo

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$73,358	$137,194	$187,297	$206,732	$234,533	$271,129
Unit Cost ($/acft)	$588	$475	$446	$433	$426	$424
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$108,540	$137,835	$165,375	$188,325	$211,680	$234,495
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.16.5 City of La Coste

Current water supply for the City of La Coste is obtained from the Edwards Aquifer. La Coste is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that La Coste implement the following water supply plan to meet the projected needs for the city (Table 4B.2.16-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 4 acft/yr by 2050, increasing to 11 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 96 acft/yr by 2010, increasing to 172 acft/yr of supply in 2060.

Table 4B.2.16-10.
Recommended Water Supply Plan for the City of La Coste

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	96	113	130	142	156	172
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	4	11
Edwards Transfers (L-15)	96	113	130	142	156	172
Total New Supply	**96**	**113**	**130**	**142**	**160**	**183**

Estimated costs of the recommended plan to meet the City of La Coste's projected needs are shown in Table 4B.2.16-11.

Table 4B.2.16-11.
Recommended Plan Costs by Decade for the City of La Coste

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$2,427	$6,580
Unit Cost ($/acft)	—	—	—	—	$588	$588
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$12,960	$15,255	$17,550	$19,170	$21,060	$23,220
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.16.6 City of Natalia

Current water supply for the City of Natalia is obtained from the Edwards Aquifer. Natalia is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Natalia implement the following water supply plan to meet the projected needs for the city (Table 4B.2.16-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 24 acft/yr by 2010, increasing to 73 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 198 acft/yr by 2010, increasing to 387 acft/yr of supply in 2060.

Table 4B.2.16-12.
Recommended Water Supply Plan for the City of Natalia

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	198	242	283	318	353	387
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	24	31	38	46	58	73
Edwards Transfers (L-15)	198	242	283	318	353	387
Total New Supply	**222**	**273**	**321**	**364**	**411**	**460**

Estimated costs of the recommended plan to meet the City of Natalia's projected needs are shown in Table 4B.2.16-13.

Table 4B.2.16-13.
Recommended Plan Costs by Decade for the City of Natalia

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$13,927	$17,432	$20,134	$22,533	$26,823	$33,248
Unit Cost ($/acft)	$588	$570	$525	$488	$466	$456
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$26,730	$32,670	$38,205	$42,930	$47,655	$52,245
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.16.7 Yancey WSC

Current water supply for Yancey WSC is obtained from the Edwards Aquifer. Yancey WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Yancey WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.16-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 61 acft/yr by 2010, increasing to 316 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 577 acft/yr by 2010, increasing to 1,348 acft/yr of supply in 2060.

Table 4B.2.16-14.
Recommended Water Supply Plan for Yancey WSC

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	577	758	925	1,073	1,214	1,348
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	61	136	171	214	259	316
Edwards Transfers (L-15)	577	758	925	1,073	1,214	1,348
Total New Supply	**638**	**894**	**1,096**	**1,287**	**1,473**	**1,664**

Estimated costs of the recommended plan to meet Yancey WSC's projected needs are shown in Table 4B.2.16-15.

Table 4B.2.16-15.
Recommended Plan Costs by Decade for Yancey WSC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$36,002	$67,475	$81,135	$98,199	$116,086	$139,743
Unit Cost ($/acft)	$588	$496	$473	$459	$447	$443
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$77,895	$102,330	$124,875	$144,855	$163,890	$181,980
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.16.8 Rural Area Residential and Commercial

Current water supply for Rural Areas is obtained from the Edwards Aquifer, Trinity Aquifer, and the Carrizo Aquifer. Rural Areas are projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.16-16).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 20 acft/yr by 2020, increasing to 244 acft/yr in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 180 acft/yr by 2010, increasing to 1,567 acft/yr in 2060.

Table 4B.2.16-16.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	180	507	799	1,058	1,326	1,567
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	20	41	86	160	244
Edwards Transfers (L-15)	180	507	799	1,058	1,326	1,567
Total New Supply	**180**	**527**	**840**	**1,144**	**1,486**	**1,811**

Estimated costs of the recommended plan to meet the projected needs of rural areas are shown in Table 4B.2.16-17.

Table 4B.2.16-17.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	$11,470	$24,304	$50,613	$94,232	$143,184
Unit Cost ($/acft)	—	$588	$588	$588	$588	$588
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$24,300	$68,445	$107,865	$142,830	$179,010	$211,545
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.16.9 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer to meet the water user group's projected demand during the planning period.

4B.2.16.10 Steam-Electric Power

There is no projected steam-electric power water demand in Medina County, therefore no water management strategies are recommended for this water user group.

4B.2.16.11 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer and the Trinity Aquifer to meet the water user group's projected demand during the planning period.

4B.2.1.12 Irrigation

Current water supply for irrigation is obtained from the Edwards Aquifer, Carrizo Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected needs for irrigation (Table 4B.2.16-18).

- Irrigation water conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 4,651 acft/yr of supply.

Table 4B.2.16-18.
Recommended Water Supply Plan for Irrigation

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	4,651	2,887	1,200	0	0	0
Recommended Plan						
Irrigation Water Conservation (L-10 Irr.)	4,651	2,887	1,200	—	—	—
Total New Supply	**4,651**	**2,887**	**1,200**	—	—	—

Estimated costs of the recommended plan to meet the irrigation projected needs are shown in Table 4B.2.16-19.

Table 4B.2.16-19.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2010	2020	2030	2040	2050	2060
Irrigation Water Conservation (L-10 Irr.)						
Annual Cost ($/yr)	$525,563	$326,231	$135,600	—	—	—
Unit Cost ($/acft)	$113	$113	$113	—	—	—

4B.2.16.13 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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4B.2.17 Refugio County Water Supply Plan

Table 4B.2.17-1 lists each water user group in Refugio County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.17-1.
Refugio County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Refugio	867	735	
City of Woodsboro	427	417	
Rural Area Residential and Commercial	132	221	
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	0	0	
Livestock	0	0	

4B.2.17.1 City of Refugio

The City of Refugio is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Refugio implement the following water supply plan (Table 4B.2.17-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 44 acft/yr by 2010, increasing to 144 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.17-2.
Recommended Water Supply Plan for the City of Refugio

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	44	94	100	114	130	144
Total New Supply	**44**	**94**	**100**	**114**	**130**	**144**

Estimated costs of the recommended plan for the City of Refugio are shown in Table 4B.2.17-3.

Table 4B.2.17-3.
Recommended Plan Costs by Decade for the City of Refugio

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$25,806	$46,071	$46,094	$50,073	$55,703	$61,436
Unit Cost ($/acft)	$588	$488	$460	$440	$429	$426

4B.2.17.2 City of Woodsboro

The City of Woodsboro is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Woodsboro implement the following water supply plan (Table 4B.2.17-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 5 acft/yr by 2010, increasing to 20 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

It is noted that groundwater quality and a potential change in the arsenic standard may necessitate additional treatment or alternative supplies, such as Brackish Groundwater Desalination (Gulf Coast) or Purchase from WWP.

Table 4B.2.17-4.
Recommended Water Supply Plan for the City of Woodsboro

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	5	6	7	8	14	20
Total New Supply	**5**	**6**	**7**	**8**	**14**	**20**

Estimated costs of the recommended plan for the City of Woodsboro are shown in Table 4B.2.17-5.

Table 4B.2.17-5.
Recommended Plan Costs by Decade for the City of Woodsboro

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$2,973	$3,620	$4,081	$4,511	$7,143	$9,803
Unit Cost ($/acft)	$588	$588	$588	$588	$525	$484

4B.2.1.3 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Gulf Coast Aquifer to meet their projected demands during the planning period.

4B.2.17.4 Industrial

There is no projected industrial water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

4B.2.17.5 Steam-Electric Power

There is no projected steam-electric power water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

4B.2.17.6 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.17.7 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.17.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.2.18 Uvalde County Water Supply Plan

Table 4B.2.18-1 lists each water user group in Uvalde County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.18-1.
Uvalde County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage		Comment
	2010 (acft/yr)	2060 (acft/yr)	
City of Sabinal	-139	-121	Projected shortage (2010 through 2060)
City of Uvalde	-3,793	-3,884	Projected shortage (2010 through 2060)
Rural Area Residential and Commercial	960	0	
Industrial	728	622	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	24,256	34,344	
Livestock	0	0	

4B.2.18.1 City of Sabinal

Current water supply for the City of Sabinal is obtained from the Edwards Aquifer. Sabinal is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Sabinal implement the following water supply plan to meet the projected needs for the city (Table 4B.2.18-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 34 acft/yr by 2010, increasing to 145 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 139 acft/yr by 2010, decreasing to 121 acft/yr of supply in 2060.

Table 4B.2.18-2.
Recommended Water Supply Plan for the City of Sabinal

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	139	135	130	125	121	121
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	34	65	92	116	139	145
Edwards Transfers (L-15)	139	135	130	125	121	121
Total New Supply	**173**	**200**	**222**	**241**	**260**	**266**

Estimated costs of the recommended plan to meet the City of Sabinal's projected needs are shown in Table 4B.2.18-3.

Table 4B.2.18-3.
Recommended Plan Costs by Decade for the City of Sabinal

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$18,665	$29,840	$39,674	$48,263	$56,792	$59,497
Unit Cost ($/acft)	$547	$462	$433	$417	$410	$409
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$18,765	$18,225	$17,550	$16,875	$16,335	$16,335
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.18.2 City of Uvalde

Current water supply for the City of Uvalde is obtained from the Edwards Aquifer. Uvalde is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Uvalde implement the following water supply plan to meet the projected needs for the city (Table 4B.2.18-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 521 acft/yr by 2010, increasing to 2,652 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Edwards Transfers (L-15) to be implemented prior to 2010. This strategy can provide an additional 3,793 acft/yr by 2010, increasing to 3,884 acft/yr of supply in 2060.

Table 4B.2.18-4.
Recommended Water Supply Plan for the City of Uvalde

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	3,793	3,830	3,850	3,854	3,856	3,884
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	521	1,017	1,471	1,882	2,269	2,652
Edwards Transfers (L-15)	3,793	3,830	3,850	3,854	3,856	3,884
Total New Supply	**4,314**	**4,847**	**5,321**	**5,736**	**6,125**	**6,536**

Estimated costs of the recommended plan to meet the City of Uvalde's projected needs are shown in Table 4B.2.18-5.

Table 4B.2.18-5.
Recommended Plan Costs by Decade for the City of Uvalde

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$252,905	$442,200	$614,381	$769,439	$917,448	$1,070,747
Unit Cost ($/acft)	$486	$435	$418	$409	$404	$404
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$512,055	$517,050	$519,750	$520,290	$520,560	$524,340
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135

4B.2.18.3 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Edwards Aquifer and Carrizo Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.18-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 33 acft/yr by 2040, increasing to 137 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.18-6.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	33	73	137
Total New Supply	—	—	—	**33**	**73**	**137**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.18-7.

Table 4B.2.18-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$19,652	$43,068	$80,667
Unit Cost ($/acft)	—	—	—	$588	$588	$588

4B.2.18.4 Industrial

Industrial is projected to have adequate water supplies available from the Edwards Aquifer to meet the water user group's projected demand during the planning period.

4B.2.18.5 Steam-Electric Power

There is no projected steam-electric power water demand in Uvalde County, therefore no water management strategies are recommended for this water user group.

4B.2.18.6 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.18.7 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.18.8 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

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4B.2.19 Victoria County Water Supply Plan

Table 4B.2.19-1 lists each water user group in Victoria County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.19-1.
Victoria County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage 2010 (acft/yr)	Management Supply/Shortage 2060 (acft/yr)	Comment
City of Victoria	5,670	3,234	
Rural Area Residential and Commercial	1,008	0	
Industrial	8,228	-6,566	Projected shortage (2040 through 2060)
Steam-Electric Power	1,600	261	
Mining	0	0	
Irrigation	489	979	
Livestock	0	0	

4B.2.19.1 City of Victoria

The City of Victoria is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the city’s projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Victoria implement the following water supply plan (Table 4B.2.19-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 874 acft/yr by 2010, increasing to 2,485 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Surface Water Rights and Local Storage (existing gravel pits) have been identified as a potential sources of supply.

Table 4B.2.19-2.
Recommended Water Supply Plan for the City of Victoria

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	874	1,597	1,733	1,844	2,118	2,485
Total New Supply	**874**	**1,597**	**1,733**	**1,844**	**2,118**	**2,485**

Estimated costs of the recommended plan for the City of Victoria are shown in Table 4B.2.19-3.

Table 4B.2.19-3.
Recommended Plan Costs by Decade for the City of Victoria

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$454,409	$743,989	$774,163	$790,535	$891,364	$1,039,310
Unit Cost ($/acft)	$520	$466	$447	$429	$421	$418

4B.2.19.2 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Gulf Coast Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.19-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 32 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.19-4.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	—	32
Total New Supply	—	—	—	—	—	**32**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.19-5.

Table 4B.2.19-5.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	—	$18,878
Unit Cost ($/acft)	—	—	—	—	—	$588

4B.2.19.3 Industrial

Current water supply for industrial is obtained from the Gulf Coast Aquifer and run-of-river rights. Industrial is projected to need additional water supplies in the planning year 2040. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual industrial operations implement the following water supply plan to meet the projected needs for industrial (Table 4B.2.19-6).

- Purchase from WWP (GBRA) to be implemented in 2040. This strategy can provide an additional 1,008 acft/yr of supply in 2040 increasing to 6,566 acft/yr in 2060.

Local Storage (existing gravel pits) has been identified as a potential source of supply.

Table 4B.2.19-6.
Recommended Water Supply Plan for Industrial

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	1,008	3,624	6,566
Recommended Plan						
Purchase from WWP (GBRA)	—	—	—	1,008	3,624	6,566
Total New Supply	—	—	—	1,008	3,624	6,566

Estimated costs of the recommended plan to meet the industrial projected needs are shown in Table 4B.2.19-7.

Table 4B.2.19-7.
Recommended Plan Costs by Decade for Industrial

Plan Element	2010	2020	2030	2040	2050	2060
Purchase from WWP (GBRA)						
Annual Cost ($/yr)	—	—	—	$54,432	$195,696	$354,564
Unit Cost ($/acft)	—	—	—	$54	$54	$54

4B.2.19.4 Steam-Electric Power

Steam-electric power is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.19.5 Mining

Mining is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

4B.2.19.6 Irrigation

Irrigation is projected to have adequate water supplies available from the Gulf Coast Aquifer and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.19.7 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.2.20 Wilson County Water Supply Plan

Table 4B.2.20-1 lists each water user group in Wilson County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.20-1.
Wilson County Management Supply/Shortage by Water User Group

Water User Group	*Management Supply/Shortage* 2010 (acft/yr)	*Management Supply/Shortage* 2060 (acft/yr)	*Comment*
East Central SUD			See Bexar County
El Oso WSC			See Karnes County
City of Floresville	784	-411	Projected shortage (2050 and 2060)
City of La Vernia	372	-114	Projected shortage (2050 and 2060)
McCoy WSC			See Atascosa County
Oak Hills WSC	477	-990	Projected shortage (2030 through 2060)
City of Poth	1,265	1,028	
SS WSC	-223	-3,690	Projected shortage (2010 through 2060)
City of Stockdale	1,183	975	
Sunko WSC	321	-392	Projected shortage (2040 through 2060)
Rural Area Residential and Commercial	1,397	0	
Industrial	0	0	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	761	1,582	
Livestock	0	0	

4B.2.20.1 City of Floresville

Current water supply for the City of Floresville is obtained from the Carrizo Aquifer. Floresville is projected to need additional water supplies prior to 2050. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that

Floresville implement the following water supply plan to meet the projected needs for the city (Table 4B.2.20-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 136 acft/yr by 2010, increasing to 714 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2050. This strategy can provide an additional 806 acft/yr by 2050.

Table 4B.2.20-2.
Recommended Water Supply Plan for the City of Floresville

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	137	411
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	136	291	433	504	596	714
Local Carrizo	—	—	—	—	806	806
Total New Supply	**136**	**291**	**433**	**504**	**1,402**	**1,520**

Estimated costs of the recommended plan to meet the City of Floresville's projected needs are shown in Table 4B.2.20-3.

Table 4B.2.20-3.
Recommended Plan Costs by Decade for the City of Floresville

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$80,014	$138,031	$190,360	$215,214	$250,555	$298,854
Unit Cost ($/acft)	$588	$474	$440	$427	$420	$419
Local Carrizo						
Annual Cost ($/yr)	—	—	—	—	$318,000	$318,000
Unit Cost ($/acft)	—	—	—	—	$395	$395

4B.2.20.2 City of La Vernia

Current water supply for the City of La Vernia is obtained from the Carrizo Aquifer. La Vernia is projected to need additional water supplies prior to 2050. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that La Vernia implement the following water supply plan to meet the projected needs for the city (Table 4B.2.20-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 21 acft/yr by 2010, increasing to 227 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Purchase from WWP (CRWA) to be implemented prior to 2050. This strategy can provide an additional 8 acft/yr by 2050, increasing to 114 acft/yr of supply in 2060.

Table 4B.2.20-4.
Recommended Water Supply Plan for the City of La Vernia

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	8	114
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	21	56	105	146	184	227
Purchase from WWP (CRWA)	—	—	—	—	8	114
Total New Supply	**21**	**56**	**105**	**146**	**192**	**341**

Estimated costs of the recommended plan to meet the City of La Vernia's projected needs are shown in Table 4B.2.20-5.

Table 4B.2.20-5.
Recommended Plan Costs by Decade for the City of La Vernia

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$12,338	$26,299	$45,976	$62,200	$78,329	$96,276
Unit Cost ($/acft)	$576	$471	$440	$427	$425	$424
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	—	—	—	$3,278	$48,471
Unit Cost ($/acft)	—	—	—	—	$410	$425

4B.2.20.3 Oak Hills WSC

Current water supply for Oak Hills WSC is obtained from the Carrizo Aquifer. Oak Hills WSC is projected to need additional water supplies prior to 2030. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Oak Hills WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.20-6).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 26 acft/yr by 2040, increasing to 136 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2020. This strategy can provide an additional 726 acft/yr by 2030, increasing to 1,452 acft/yr of supply in 2060.

Table 4B.2.20-6.
Recommended Water Supply Plan for Oak Hills WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	81	366	673	990
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	26	76	136
Local Carrizo	—	—	726	726	726	1,452
Total New Supply	—	—	**726**	**752**	**802**	**1,588**

Estimated costs of the recommended plan to meet Oak Hills WSC's projected needs are shown in Table 4B.2.20-7.

Table 4B.2.20-7.
Recommended Plan Costs by Decade for Oak Hills WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$15,276	$44,658	$76,819
Unit Cost ($/acft)	—	—	—	$588	$588	$565
Local Carrizo						
Annual Cost ($/yr)	—	—	$224,000	$224,000	$224,000	$353,000
Unit Cost ($/acft)	—	—	$309	$309	$309	$243

4B.2.20.4 City of Poth

The City of Poth is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Poth implement the following water supply plan (Table 4B.2.20-8).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 20 acft/yr by 2010, increasing to 64 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.20-8.
Recommended Water Supply Plan for the City of Poth

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	20	22	25	28	46	64
Total New Supply	**20**	**22**	**25**	**28**	**46**	**64**

Estimated costs of the recommended plan for the City of Poth are shown in Table 4B.2.20-9.

Table 4B.2.20-9.
Recommended Plan Costs by Decade for the City of Poth

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$11,938	$12,821	$13,911	$14,288	$21,306	$28,612
Unit Cost ($/acft)	$588	$588	$565	$518	$463	$450

4B.2.20.5 SS WSC

Current water supply for SS WSC is obtained from the Carrizo Aquifer. SS WSC is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that SS WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.20-10).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 84 acft/yr by 2050, increasing to 221 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2010. This strategy can provide an additional 766 acft/yr by 2010, increasing to 4,595 acft/yr of supply in 2060.
- Purchase from WWP (CRWA) to be implemented prior to 2060. This strategy can provide an additional 690 acft/yr in 2060.

Table 4B.2.20-10.
Recommended Water Supply Plan for SS WSC

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	223	864	1,546	2,214	2,939	3,690
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	—	84	221
Local Carrizo	766	1,532	2,298	2,298	3,064	3,830
Purchase from WWP (CRWA)	—	—	—	—	—	690
Total New Supply	**766**	**1,532**	**2,298**	**2,298**	**3,148**	**4,741**

Estimated costs of the recommended plan to meet SS WSC's projected needs are shown in Table 4B.2.20-11.

Table 4B.2.20-11.
Recommended Plan Costs by Decade for SS WSC

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	—	$49,321	$129,665
Unit Cost ($/acft)	—	—	—	—	$588	$588
Local Carrizo						
Annual Cost ($/yr)	$209,600	$419,200	$628,800	$537,600	$656,000	$774,400
Unit Cost ($/acft)	$274	$274	$274	$234	$214	$202
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	—	—	—	—	—	$293,377
Unit Cost ($/acft)	—	—	—	—	—	$425

4B.2.20.6 City of Stockdale

The City of Stockdale is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Stockdale implement the following water supply plan (Table 4B.2.20-12).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 27 acft/yr by 2010, increasing to 171 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.20-12.
Recommended Water Supply Plan for the City of Stockdale

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	27	57	93	128	147	171
Total New Supply	**27**	**57**	**93**	**128**	**147**	**171**

Estimated costs of the recommended plan for the City of Stockdale are shown in Table 4B.2.20-13.

Table 4B.2.20-13.
Recommended Plan Costs by Decade for the City of Stockdale

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$15,435	$26,636	$40,091	$53,468	$60,904	$70,524
Unit Cost ($/acft)	$569	$464	$431	$418	$414	$413

4B.2.20.7 Sunko WSC

Current water supply for Sunko WSC is obtained from the Carrizo Aquifer. Sunko WSC is projected to need additional water supplies prior to 2040. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Sunko WSC implement the following water supply plan to meet the projected needs for the WSC (Table 4B.2.20-14).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 3 acft/yr by 2010, increasing to 92 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).
- Local Carrizo to be implemented prior to 2040. This strategy can provide an additional 807 acft/yr by 2040.

Table 4B.2.20-14.
Recommended Water Supply Plan for Sunko WSC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need (Shortage)	0	0	0	95	237	392
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	3	6	10	29	54	92
Local Carrizo	—	—	—	807	807	807
Total New Supply	**3**	**6**	**10**	**836**	**861**	**899**

Estimated costs of the recommended plan to meet Sunko WSC's projected needs are shown in Table 4B.2.20-15.

Table 4B.2.20-15.
Recommended Plan Costs by Decade for Sunko WSC

Plan Element	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$1,926	$3,666	$5,667	$16,885	$30,057	$46,323
Unit Cost ($/acft)	$588	$588	$588	$588	$557	$504
Local Carrizo						
Annual Cost ($/yr)	—	—	—	$317,000	$317,000	$317,000
Unit Cost ($/acft)	—	—	—	$393	$393	$393

4B.2.20.8 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.20-16).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 14 acft/yr by 2040, increasing to 116 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.20-16.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	—	—	—	14	58	116
Total New Supply	—	—	—	**14**	**58**	**116**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.20-17.

Table 4B.2.20-17.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	—	—	—	$8,050	$34,243	$68,476
Unit Cost ($/acft)	—	—	—	$588	$588	$588

4B.2.20.9 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.20.10 Steam-Electric Power

There is no projected steam-electric power water demand in Wilson County, therefore no water management strategies are recommended for this water user group.

4B.2.20.11 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.20.12 Irrigation

Irrigation is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

4B.2.20.13 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected needs during the planning period.

4B.2.21 Zavala County Water Supply Plan

Table 4B.2.21-1 lists each water user group in Zavala County and its corresponding management supply or shortage in years 2010 and 2060. For each water user group with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.2.21-1.
Zavala County Management Supply/Shortage by Water User Group

Water User Group	Management Supply/Shortage		Comment
	2010 (acft/yr)	2060 (acft/yr)	
City of Crystal City	1,410	1,294	
Rural Area Residential and Commercial	504	0	
Industrial	273	3	
Steam-Electric Power	0	0	No projected demand
Mining	0	0	
Irrigation	-48,165	-35,078	Projected shortage
Livestock	0	0	

4B.2.21.1 City of Crystal City

The City of Crystal City is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Crystal City implement the following water supply plan (Table 4B.2.21-2).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 192 acft/yr by 2010, increasing to 1,002 acft/yr of supply in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.21-2.
Recommended Water Supply Plan for the City of Crystal City

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	192	364	543	695	850	1,002
Total New Supply	**192**	**364**	**543**	**695**	**850**	**1,002**

Estimated costs of the recommended plan for the City of Crystal City are shown in Table 4B.2.21-3.

Table 4B.2.21-3.
Recommended Plan Costs by Decade for the City of Crystal City

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$100,553	$163,584	$230,872	$286,358	$346,965	$407,948
Unit Cost ($/acft)	$524	$449	$425	$412	$408	$407

4B.2.21.2 Rural Area Residential and Commercial

Rural Areas are projected to have adequate water supplies available from the Carrizo Aquifer to meet their projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water supply districts and authorities and individual households and/or businesses not served by public water supply systems implement the following water supply plan to meet the projected needs for rural areas (Table 4B.2.21-4).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 42 acft/yr by 2010, increasing to 149 acft/yr in 2060 (Volume II, Section 4C.1.1).

Table 4B.2.21-4.
Recommended Water Supply Plan for Rural Areas

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)	42	54	71	89	115	149
Total New Supply	**42**	**54**	**71**	**89**	**115**	**149**

Estimated costs of the recommended plan for rural areas are shown in Table 4B.2.21-5.

Table 4B.2.21-5.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation (L-10 Mun)						
Annual Cost ($/yr)	$24,681	$31,818	$41,987	$47,447	$56,986	$70,798
Unit Cost ($/acft)	$588	$588	$588	$532	$494	$475

4B.2.21.3 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.21.4 Steam-Electric Power

There is no projected steam-electric water demand in Zavala County, therefore no water management strategies are recommended for this water user group.

4B.2.21.5 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer to meet the water user group's projected demand during the planning period.

4B.2.21.6 Irrigation

Current water supply for irrigation is obtained from the Carrizo Aquifer. Irrigation is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected needs for irrigation (Table 4B.2.21-6).

- Irrigation Water Conservation to be implemented or enhanced in the immediate future. This strategy can provide an additional 6,948 acft/yr of supply. The SCTRWPG has determined that it is not economically feasible for agricultural producers to pay for additional supplies to meet projected needs.

Table 4B.2.21-6.
Recommended Water Supply Plan for Irrigation

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	48,165	45,344	42,621	40,005	37,492	35,078
Recommended Plan						
Irrigation Water Conservation (L-10 Irr.)	6,948	6,948	6,948	6,948	6,948	6,948
Total New Supply	**6,948**	**6,948**	**6,948**	**6,948**	**6,948**	**6,948**

Estimated costs of the recommended plan to meet the irrigation projected needs are shown in Table 4B.2.21-7.

Table 4B.2.21-7.
Recommended Plan Costs by Decade for Irrigation

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Irrigation Water Conservation (L-10 Irr.)						
Annual Cost ($/yr)	$729,540	$729,540	$729,540	$729,540	$729,540	$729,540
Unit Cost ($/acft)	$105	$105	$105	$105	$105	$105

4B.2.21.7 Livestock

Livestock is projected to have adequate water supplies available from local sources to meet the water user group's projected demand during the planning period.

4B.3 Water Supply Plans for Wholesale Water Providers

Table 4B.3-1 lists each Wholesale Water Provider identified by the SCTRWPG and their corresponding management supply or shortage in years 2010 and 2060. For each Wholesale Water Provider with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 4B.3-1.
Wholesale Water Provider Management Supply/Shortage

Major Water Provider	*Management Supply/Shortage*		*Comment*
	2010 (acft/yr)	*2060 (acft/yr)*	
Regional Water Provider for Bexar County (RWPBC)	0	-6,500	Projected shortage (2020 through 2060)
San Antonio Water System (SAWS)	-57,442	-175,859	Projected shortage (2010 through 2060)
Bexar Metropolitan Water District (BMWD)	-20,243	-39,016	Projected shortage (2010 through 2060)
Guadalupe-Blanco River Authority (GBRA)	83,231	24,186	
Canyon Regional Water Authority (CRWA)	-1,714	-14,816	Projected shortage (2010 through 2060)
Schertz-Seguin Local Government Corporation (SSLGC)	-1,870	-12,792	Projected shortage (2010 through 2060)
Springs Hill WSC (SHWSC)	3,206	1,225	

4B.3.1 Regional Water Provider for Bexar County

Bexar County represents the major municipal demand center of the South Central Texas Region and encompasses not only the City of San Antonio, but numerous suburban cities and communities (water user groups). It is apparent that the most economical development of additional water supplies to meet the present and future needs of Bexar County can best be accomplished on a regional, rather than a major provider or city by city, basis. Development of additional water supplies for Bexar County will most likely be accomplished strategy by strategy, with a single sponsor or varying groups of sponsors involved in the cooperative implementation of each major strategy. Hence, for the purposes of this regional water plan, the concept of Regional Water Provider for Bexar County is employed. Designation of Regional Water Provider for Bexar County accounts for the fact that water supplies may be developed by individual sponsors and/or coalitions of sponsors. Furthermore, it ensures the flexibility necessary to facilitate activities of identified wholesale water providers, water user groups, and others in their independent or collective efforts to develop additional water supplies for Bexar County.

Bexar County's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Victor Braunig Lake, Calaveras Lake, the Medina Lake System, Direct Reuse, and run-of-river rights. Bexar County is projected to need additional water supplies prior to 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Regional Water Provider for Bexar County implement the following water supply plan to meet the projected needs for portions of the county (Table 4B.3.1-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual Water User Group (WUG) based on the Municipal Conservation water management strategy recommended by the SCTRWPG.
- Edwards Aquifer Recharge – Type 2 Projections to be implemented prior to 2020. This strategy can provide an additional 13,451 acft/yr of supply by 2020, increasing to 21,577 acft/yr of additional supply in 2060.
- Seawater Desalination to be implemented prior to 2060. This strategy can provide an additional 84,012 acft of supply by 2060.

Table 4B.3.1-1.
Recommended Water Supply Plan for the Regional Water Provider for Bexar County

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need	0	5,000	6,500	6,500	6,500	6,500
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	—	—	—	—	—	—
Edwards Aquifer Recharge – Type 2 Projects	—	13,451	13,451	13,451	13,451	21,577
Seawater Desalination	—	—	—	—	—	84,012
Total New Supply	—	**13,451**	**13,451**	**13,451**	**13,451**	**105,589**

[1] Assigned by Water User Group based on Municipal Conservation water management strategy recommended by SCTRWPG.

Estimated costs of the recommended plan to meet the projected needs for the RWPBC are shown in Table 4B.3.1-2.

4B.3.1-2.
Recommended Plan Costs by Decade for the Regional Water Provider for Bexar County

Plan Element	2010	2020	2030	2040	2050	2060
Edwards Aquifer Recharge – Type 2 Projects						
Annual Cost ($/yr)	—	$8,578,000	$8,578,000	$8,578,000	$8,036,000	$22,218,000
Unit Cost ($/acft)	—	$638	$638	$638	$597	$1,030
Seawater Desalination						
Annual Cost ($/yr)	—	—	—	—	—	$116,764,505
Unit Cost ($/acft)	—	—	—	—	—	$1,390

4B.3.2 San Antonio Water System (SAWS)

Current water supply for SAWS is obtained from the Edwards Aquifer, Trinity Aquifer, Carrizo Aquifer, Canyon Reservoir, and Direct Reuse. SAWS is projected to need additional water supplies prior to the year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that SAWS implement the following water supply plan to meet the projected needs for SAWS (Table 4B.3.2-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual Water User Group (WUG) based on the Municipal Water Conservation water management strategy recommended by the SCTRWPG.
- Edwards Transfers to be implemented prior to 2010. This strategy can provide an additional 48,000 acft/yr of supply for the years 2010 through 2060.
- Recycled Water Program Expansion[6] to be implemented prior to 2010. This strategy can provide an additional 18,712 acft/yr of supply by the year 2010, increasing to 36,258 acft/yr of additional supply in 2060.
- Regional Carrizo for Bexar County[7] to be implemented prior to 2010. This strategy can provide an additional 56,188 acft/yr[8] of supply for the years 2010 through 2060.

[6] Based on SAWS goal of meeting 20 percent of SAWS Municipal and Bexar County Industrial demands with recycled water.
[7] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3. Recent changes in the rules of the Evergreen Underground Water Conservation District may affect estimated costs for this project.
[8] Total supply associated with water management strategy is 62,588 acft/yr, of which up to 6,400 acft/yr has been included as existing supply.

- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 5,000 acft/yr of supply for the years 2010 through 2060.
- Brackish Groundwater Desalination (Wilcox)[9] to be implemented prior to 2010. This strategy can provide an additional 5,662 acft/yr of supply for the years 2010 through 2060.
- LCRA/SAWS Water Project[10] to be implemented prior to 2050. This strategy can provide an additional 150,000 acft/yr of supply for the years 2050 through 2060.

Table 4B.3.2-1.
Recommended Water Supply Plan for SAWS

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need *	57,442	86,372	111,453	135,897	159,901	175,859
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	—	—	—	—	—	—
Edwards Transfers	48,000	48,000	48,000	48,000	48,000	48,000
Recycled Water Program Expansion	18,712	23,510	28,064	31,543	34,155	36,258
Regional Carrizo for Bexar County	56,188	56,188	56,188	56,188	56,188	56,188
Local Trinity	5,000	5,000	5,000	5,000	5,000	5,000
Brackish Groundwater Desalination (Wilcox)	5,662	5,662	5,662	5,662	5,662	5,662
LCRA/SAWS Water Project	—	—	—	—	150,000	150,000
Total New Supply	**133,562**	**138,360**	**142,914**	**146,393**	**299,005**	**301,108**

* Projected needs could be up to 5,000 acft/yr less than shown as they do not account for SAWS existing Trinity Aquifer supply. As indicated in Table 3-1, the Trinity-Glen Rose Groundwater Conservation District Management Plan was adopted after completion of the needs assessment for the 2006 regional plan.

1 Assigned by Water User Group based on Municipal Conservation water management strategy recommended by SCTRWPG.

Estimated costs of the recommended plan to meet the SAWS projected needs are shown in Table 4B.3.2-2.

9 Wilcox Aquifer in Bexar County with connection to W.W. White storage tank.

10 Point of diversion is the subject of ongoing studies; however, the Bay City diversion point used in the 2001 South Central Texas Regional Water Plan has been assumed for cost estimation purposes. Allocation of the full projected 150,000 acft/yr to this potential diversion location does not preclude development of an upstream alternative or additional diversion location.

Table 4B.3.2-2.
Recommended Plan Costs by Decade for SAWS

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation[1]						
Annual Cost ($/yr)						
Unit Cost ($/acft)						
Edwards Transfers (L-15)						
Annual Cost ($/yr)	$6,480,000	$6,480,000	$6,480,000	$6,480,000	$6,480,000	$6,480,000
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135
Recycled Water Program Expansion						
Annual Cost ($/yr)	$13,565,102	$14,160,410	$14,725,443	$3,913,671	$4,237,753	$4,498,681
Unit Cost ($/acft)	$725	$602	$525	$124	$124	$124
Regional Carrizo for Bexar County[2]						
Annual Cost ($/yr)	$48,449,447	$48,449,447	$48,449,447	$16,710,606	$16,710,606	$16,710,606
Unit Cost ($/acft)	$862	$862	$862	$297	$297	$297
Local Trinity						
Annual Cost ($/yr)	$1,724,522	$1,724,522	$1,724,522	$1,175,075	$1,175,075	$1,175,075
Unit Cost ($/acft)	$345	$345	$345	$235	$235	$235
Brackish Groundwater Desalination (Wilcox)						
Annual Cost ($/yr)	$8,505,000	$8,505,000	$8,505,000	$1,719,000	$1,719,000	$1,719,000
Unit Cost ($/acft)	$1,502	$1,502	$1,502	$304	$304	$304
LCRA/SAWS Water Project						
Annual Cost ($/yr)	—	—	—	—	$198,860,000	$198,860,000
Unit Cost ($/acft)	—	—	—	—	$1,326	$1,326

[1] These costs have been assigned to the individual Water User Groups.
[2] Total supply associated with water management strategy is 62,588 acft/yr, of which up to 6,400 act/yr has been included as existing supply.

4B.3.3 Bexar Metropolitan Water District (BMWD)

Current water supply for BMWD is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Medina Lake System, and run-of-river rights. BMWD is projected to need additional water supplies prior to the year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD implement the following water supply plan to meet the projected needs for BMWD (Table 4B.3.3-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual BMWD customer Water User Group (WUG) based on the Municipal Conservation water management strategy recommended by the SCTRWPG. Quantities shown in Table 4B.3.3-1 are approximate and for general reference only.
- Edwards Transfers to be implemented prior to 2010. This strategy can provide an additional 3,960 acft/yr of supply for the years 2010 through 2060.
- Local Trinity to be implemented prior to 2010. This strategy can provide an additional 15,000 acft/yr of supply for the years 2010 through 2060.
- Local Carrizo to be implemented prior to 2010. This strategy can provide an additional 4,000 acft/yr of supply for the years 2010 through 2060.
- Wells Ranch Project[11] to be implemented prior to 2010. This strategy can provide an additional 3,400 acft/yr of supply for the years 2010 through 2060.
- Purchase from WWP (CRWA) to be implemented prior to 2010. This strategy can provide an additional 1,500 acft/yr of supply in the year 2010, increasing to 7,500 acft/yr of additional supply in 2030, and continuing at 7,500 acft/yr to 2060.
- Purchase from WWP (RWPBC) to be implemented prior to 2020. This strategy can provide an additional 4,000 acft/yr of supply for the years 2010 through 2060.

Table 4B.3.3-1.
Recommended Water Supply Plan for BMWD

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need	20,243	27,744	31,263	33,753	36,346	39,016
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	1,037	1,667	2,310	2,838	3,778	5,083
Edwards Transfers	3,960	3,960	3,960	3,960	3,960	3,960
Local Trinity	15,000	15,000	15,000	15,000	15,000	15,000
Local Carrizo	4,000	4,000	4,000	4,000	4,000	4,000
Wells Ranch Project	3,400	3,400	3,400	3,400	3,400	3,400
Purchase from WWP (CRWA)	1,500	6,600	7,500	7,500	7,500	7,500
Purchase from WWP (RWPBC)	—	4,000	4,000	4,000	4,000	4,000
Total New Supply	**28,897**	**38,627**	**40,170**	**40,698**	**41,638**	**43,236**

1 Assigned by Water User Group based on Municipal Conservation water management strategy recommended by SCTRWPG.

[11] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Estimated costs of the recommended plan to meet the BMWD projected needs are shown in Table 4B.3.3-2.

Table 4B.3.3-2.
Recommended Plan Costs by Decade for BMWD

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation[1]						
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Edwards Transfers						
Annual Cost ($/yr)	$534,600	$534,600	$534,600	$534,600	$534,600	$534,600
Unit Cost ($/acft)	$135	$135	$135	$135	$135	$135
Local Trinity						
Annual Cost ($/yr)	$4,934,000	$4,934,000	$4,934,000	$3,453,000	$3,453,000	$3,453,000
Unit Cost ($/acft)	$329	$329	$329	$230	$230	$230
Local Carrizo						
Annual Cost ($/yr)	$700,000	$700,000	$700,000	$506,000	$506,000	$506,000
Unit Cost ($/acft)	$175	$175	$175	$127	$127	$127
Wells Ranch Project						
Annual Cost ($/yr)	$2,347,000	$2,347,000	$2,347,000	$884,000	$884,000	$884,000
Unit Cost ($/acft)	$690	$690	$690	$260	$260	$260
Purchase from WWP (CRWA)						
Annual Cost ($/yr)	$1,410,055	$5,984,157	$6,800,179	$2,943,525	$3,073,226	$3,188,878
Unit Cost ($/acft)	$940	$907	$907	$392	$410	$425
Purchase from WWP (RWPBC)						
Annual Cost ($/yr)	—	$2,550,888	$2,550,888	$2,550,888	$2,389,711	$5,265,037
Unit Cost ($/acft)	—	$638	$638	$638	$597	$1,316

[1] These costs have been assigned to the individual Water User Groups.

4B.3.4 Canyon Regional Water Authority (CRWA)

Current water supply for CRWA is obtained from Canyon Reservoir and various water right leases. CRWA is projected to need additional water supplies prior to the year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that CRWA implement the following water supply plan to meet the projected needs for CRWA (Table 4B.3.4-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual member Water User Group (WUG) based on the Municipal Conservation water management strategy recommended by the SCTRWPG, and quantities are not tabulated in the CRWA tables referenced here.
- Dunlap/Wells Ranch Project[12] to be implemented prior to 2010. This strategy can provide an additional 5,600 acft/yr of supply for the years 2010 through 2060.
- Siesta Project to be implemented prior to 2020. This strategy can provide an additional 5,042 acft/yr of supply for the years 2020 through 2060.
- Hays/Caldwell Carrizo Project[13] to be implemented prior to 2040. This strategy can provide an additional 1,000 acft/yr of supply in the year 2040, increasing to 5,000 acft/yr of additional supply in 2060.

[12] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

[13] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Table 4B.3.4-1.
Recommended Water Supply Plan for CRWA

	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)	2060 (acft/yr)
Projected Need	1,714	9,237	9,789	11,038	12,779	14,816
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	—	—	—	—	—	—
Dunlap/Wells Ranch Project	5,600	5,600	5,600	5,600	5,600	5,600
Siesta Project	1,000	5,042	5,042	5,042	5,042	5,042
Hays/Caldwell Carrizo Project	—	—	—	1,000	3,000	5,000
Total New Supply	**6,600**	**10,642**	**10,642**	**11,642**	**13,642**	**15,642**

[1] Assigned by Water User Group based on Municipal Conservation water management strategy recommended by SCTRWPG.

Estimated costs of the recommended plan to meet the CRWA projected needs are shown in Table 4B.3.4-2.

Table 4B.3.4-2.
Recommended Plan Costs by Decade for CRWA

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation[1]						
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Dunlap/Wells Ranch Project						
Annual Cost ($/yr)	$5,352,000	$5,352,000	$5,352,000	$2,289,000	$2,289,000	$2,289,000
Unit Cost ($/acft)	$956	$956	$956	$409	$409	$409
Siesta Project						
Annual Cost ($/yr)	$852,241	$4,297,000	$4,297,000	$1,787,000	$1,787,000	$1,787,000
Unit Cost ($/acft)	$852	$852	$852	$354	$354	$354
Hays/Caldwell Carrizo Project						
Annual Cost ($/yr)				$694,467	$2,083,400	$3,472,333
Unit Cost ($/acft)				$694	$694	$694

[1] These costs have been assigned to the individual Water User Groups.

4B.3.5 Guadalupe-Blanco River Authority (GBRA)

GBRA is projected to have adequate water supplies available from Canyon Reservoir and run-of-river rights to meet the Wholesale Water Provider's projected demands, however certain portions of the GBRA system are projected to have a shortage (need) during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that GBRA implement the following water supply plan to meet the projected needs for GBRA (Table 4B.3.5-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual Water User Group (WUG) based on the Municipal Conservation water management strategy recommended by the SCTRWPG.
- Lower Guadalupe Water Supply Project (LGWSP) for Upstream GBRA Needs to be implemented prior to 2020. This strategy can provide an additional 60,000 acft/yr of supply for the years 2020 through 2060.

Table 4B.3.5-1.
Recommended Water Supply Plan for GBRA

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need*	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	—	—	—	—	—	—
Lower Guadalupe Water Supply Project for Upstream GBRA Needs	—	60,000	60,000	60,000	60,000	60,000
Total New Supply	—	**60,000**	**60,000**	**60,000**	**60,000**	**60,000**

* Projected needs in upper portion of GBRA district are offset by management supplies in the lower portion of the GBRA district.
1 Assigned by Water User Group based on Municipal Conservation water management strategy recommended by SCTRWPG.

Estimated costs of the recommended plan to meet the GBRA upstream projected needs are shown in Table 4B.3.5-2.

Table 4B.3.5-2.
Recommended Plan Costs by Decade for GBRA

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation[1]						
Annual Cost ($/yr)	—	—	—	—	—	—
Unit Cost ($/acft)	—	—	—	—	—	—
Lower Guadalupe Water Supply Project for GBRA Needs						
Annual Cost ($/yr)	—	$73,533,000	$73,533,000	$73,533,000	$26,059,800	$26,059,800
Unit Cost ($/acft)	—	$1,226	$1,226	$1,226	$434	$434

[1] These costs have been assigned to the individual Water User Groups.

4B.3.6 Schertz-Seguin Local Government Corporation (SSLGC)

Current water supply for SSLGC is obtained from the Carrizo Aquifer. SSLGC is projected to need additional water supplies prior to the year 2010. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that SSLGC implement the following water supply plan to meet the projected needs for SSLGC (Table 4B.3.6-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual Water User Group (WUG) based on the Municipal Conservation water management strategy recommended by the SCTRWPG.
- Regional Carrizo for SSLGC Project Expansion[14] to be implemented prior to 2010. This strategy can provide an additional 12,800 acft/yr of supply in the year 2010.

Table 4B.3.6-1.
Recommended Water Supply Plan for SSLGC

	2010 (acft/yr)	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*	*2060 (acft/yr)*
Projected Need	1,870	2,874	4,615	7,245	9,899	12,792
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	—	—	—	—	—	—
Regional Carrizo for SSLGC Project Expansion	12,800	12,800	12,800	12,800	12,800	12,800
Total New Supply	**12,800**	**12,800**	**12,800**	**12,800**	**12,800**	**12,800**

[1] Assigned by Water User Group based on Municipal Conservation water management strategy recommended by SCTRWPG.

Estimated costs of the recommended plan to meet the SSLGC projected needs are shown in Table 4B.3.6-2.

[14] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD. This project does not cause the Gonzales County UWCD management plan to be in conflict with the South Central Texas Regional Water Plan. For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.

Table 4B.3.6-2.
Recommended Plan Costs by Decade for SSLGC

Plan Element	2010	2020	2030	2040	2050	2060
Municipal Water Conservation [1]						
Annual Cost ($/yr)						
Unit Cost ($/acft)						
Regional Carrizo for SSLGC Project Expansion						
Annual Cost ($/yr)	$5,263,000	$5,263,000	$5,263,000	$3,327,000	$3,327,000	$3,327,000
Unit Cost ($/acft)	$411	$411	$411	$260	$260	$260

[1] These costs have been assigned to the individual Water User Groups.

4B.3.7 Springs Hill WSC (SHWSC)

Springs Hill WSC is projected to have adequate water supplies available from the Carrizo Aquifer and Canyon Reservoir to meet the WSC's projected demands during the planning period. Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Springs Hill WSC implement the following water supply plan (Table 4B.3.7-1).

- Municipal Water Conservation to be implemented or enhanced in the immediate future. This strategy has been assigned to each individual Water User Group (WUG) based on the Municipal Conservation water management strategy recommended by the SCTRWPG.

Table 4B.3.7-1.
Recommended Water Supply Plan for Springs Hill WSC

	2010 (acft/yr)	***2020 (acft/yr)***	***2030 (acft/yr)***	***2040 (acft/yr)***	***2050 (acft/yr)***	***2060 (acft/yr)***
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Municipal Water Conservation (L-10 Mun)[1]	—	—	—	—	—	—
Total New Supply	—	—	—	—	—	—

[1] Assigned by Water User Group (WUG) based on Municipal Conservation water management strategy recommended by SCTRWPG.

Estimated costs of the recommended plan for Springs Hill WSC are shown in Table 4B.3.7-2.

Table 4B.3.7-2.
Recommended Plan Costs by Decade for Springs Hill WSC

Plan Element	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Municipal Water Conservation[1]						
Annual Cost ($/yr)						
Unit Cost ($/acft)						

[1] These costs have been assigned to the individual Water User Groups.

Section 5
Impacts of Water Management Strategies on Key Parameters of Water Quality [31 TAC §357.7(a)(12)] and Moving Water from Rural and Agricultural Areas [31 TAC §357.7(a)(8)]

5.1 Impacts of Water Management Strategies on Key Parameters of Water Quality

In accordance with 31 TAC §357.7(a)(12), Regional Water Planning Guidelines, the South Central Texas Regional Planning Group (SCTRWPG) must consider the impacts of water management strategies on key parameters of water quality.

Regional Water Planning Guidelines 357.7(a)(12)

> *Regional water plan development shall include a description of the major impacts of recommended water management strategies on key parameters of water quality identified by the regional water planning group as important to the use of the water resource and comparing conditions with the recommended water management strategies to current conditions using best available data.*

The SCTRWPG has selected the following water quality constituents to be considered in a qualitative analysis:

- Chlorides,
- Sulfates,
- Total Dissolved Solids (TDS),
- Dissolved Oxygen (DO),
- pH Range,
- Indicator Bacteria,
- Temperature, and
- Nitrates.

Table 5-1 contains median values for these eight water quality parameters for each of the water supply sources of the water management strategies recommended in the 2006 Regional Water Plan. In addition, the SCTRWPG has considered the impacts of implementation of the Regional Water Plan on recreation, aquatic life, domestic water supply, and agriculture.

Table 5-1.
Median Values of Key Parameters of Water Quality

Water Source	Chlorides (mg/L)	Sulfates (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)	pH	Indicator Bacteria (#/100 ml)	Temperature (Degrees C)	Nitrates (mg/L)
Edwards Groundwater	20	18	321	6.2	7.4	0	21	0.9
Gonzales-Carrizo Aquifer	23	39	248	0.0	7.5	0	35	<0.1
Bexar-Carrizo Aquifer	37	27	190	0.0	6.1	0	26	<0.1
Lee/Milam-Carrizo Aquifer	23	54	121	0.0	7.3	0	24	<0.1
Lee/Milam-Simsboro Aquifer	69	24	215	0.0	6.3	0	24	0.4
Bexar-Wilcox Aquifer	145	258	1200	1.0	7.6	0	21	0.6
Trinity Aquifer	23	37	294	1.0	7.5	0	23	1.0
Gulf Coast Groundwater	253	90	877	2.0	7.8	0	29	0.5
Gulf Coast - Brackish Groundwater	350	90	1200	2.0	7.8	0	29	0.5
San Antonio River	120	110	610	7.9	7.9	194	23	3.9
Guadalupe River	31	36	380	7.6	7.9	100	23	1.1
Canyon Reservoir	23	37	300	7.1	7.9	100	23	1.1
Colorado River	70	44	406	7.0	8.0	43	22	0.2

Potential water quality impacts considered herein are associated with source and receiving water characteristics, treatment requirements, blending compatibility, and treated effluent quality and quantity. For the purposes of this general assessment, it is assumed that wastewater treatment standards and plant performance will continue to improve over time. Other applicable assumptions regarding baseline conditions and conditions with implementation of the recommended water management strategies are consistent with those described in Section 7 regarding consistency of the Regional Water Plan with long-term protection of the State's water, agricultural, and natural resources.

Table 5-2 summarizes a general qualitative assessment of the potential impacts of the implementation of recommended water management strategies on the key parameters of water quality listed above. Each water quality parameter was assigned an impact level associated with the implementation of each recommended water management strategy. A value of '0' is used to indicate that no impacts are expected; a value of '1' indicates minimal impacts are expected; a value of '2' indicates moderate impacts are expected; and a value of '3' indicates severe impacts are expected from the implementation of the water management strategy.

For example, the LCRA/SAWS Water Project scores a '0' (no impact) in the dissolved oxygen, pH, temperature, and nitrates parameters. The LCRA/SAWS Water Project scores a '1' (minimal potential impacts) in the chlorides, sulfates, indicator bacteria, and total dissolved solids (TDS) parameters. These associated concentrations are somewhat higher in the surface water obtained from the Colorado River than the existing supply (Edwards Aquifer) for the City of San Antonio. Therefore, a '1' score was given for these parameters to indicate the minimal, yet possible, impact of the strategy.

Table 5-2.
Impacts of Recommended Water Management Strategies on Key Parameters of Water Quality

Water Management Strategy	Water Quality Parameter							
	Chlorides	Sulfates	Total Dissolved Solids (TDS)	Dissolved Oxygen (DO)	pH	Indicator Bacteria	Temperature	Nitrates
Canyon Reservoir	0	0	0	0	0	0	0	0
Edwards Transfers	0	0	0	0	0	0	0	0
Recycled Water	0	0	0	0	0	0	0	0
SAWS Recycled Water Program – Phased Expansion	0	0	0	0	0	0	0	0
Surface Water Rights	0	0	0	0	0	0	0	0
Wimberley and Woodcreek Water Supply from Canyon Reservoir	0	0	0	0	0	1	0	0
Edwards Aquifer Recharge – Type 2 Projects (Program 2A)	1	1	0	0	0	1	0	0
LCRA/SAWS Water Project - Bay City to Bexar County	1	1	1	0	0	1	0	0
Lower Guadalupe Water Supply Project for Upstream GBRA Needs	0	0	0	0	0	1	0	1
Mining Water Conservation	0	0	0	0	0	0	0	0
Municipal Water Conservation	0	0	0	0	0	0	0	0
Irrigation Water Conservation	0	0	0	0	0	0	0	0
Brackish Groundwater Desalination - Wilcox Aquifer (WW White Tank Delivery)	1	2	1	0	0	0	0	0
Hays/Caldwell Carrizo Project	0	0	0	1	0	0	1	0
Local Barton Springs Edwards	0	0	0	0	0	0	0	0
Local Carrizo	0	0	0	0	0	0	0	0
Local Gulf Coast	0	0	0	0	0	0	0	0
Local Trinity	0	0	0	0	0	0	0	0
Regional Carrizo for Bexar County Supply	0	0	0	1	0	0	1	0
Regional Carrizo for SSLGC Project Expansion	0	0	0	1	0	0	1	0
Seawater Desalination	2	1	1	0	0	0	0	0
CRWA Dunlap Project	0	0	0	1	0	0	0	0
CRWA Siesta Project	0	0	0	1	0	0	0	0
Wells Ranch Carrizo Project	0	0	0	1	0	0	0	0

Key:
0 = No impacts are expected
1 = Minimal impacts are expected
2 = Moderate impacts are expected
3 = Severe impacts are expected

In general, the water management strategies recommended for implementation are expected to have little, if any, measurable impacts on water quality. Only two of the recommended water management strategies score a '2' or higher for any water quality parameter. These two strategies are Brackish Groundwater Desalination – Wilcox Aquifer and Seawater Desalination. Only the LCRA-SAWS Water Project (LSWP) received scores (though none greater than '1') in four or more of the key water quality parameters. This is not surprising as this project is the largest recommended water management strategy in the 2006 Regional Water Plan. Twelve of the recommended water management strategies received a score of zero (no impacts expected) and eleven received a score greater than zero in three or less of the key water quality parameters.

Six strategies could potentially impact domestic water use and agricultural water use: Regional Carrizo for Bexar County, Regional Carrizo for SSLGC Project Expansion, Hays-Caldwell Carrizo Project, CRWA Dunlap Project, Wells Ranch Carrizo Project, and Edwards Transfers. Three other strategies may provide benefits to domestic and/or agricultural water use: Edwards Aquifer Recharge – Type 2 Projects, LSWP, and Irrigation Water Conservation. In addition, the Irrigation Water Conservation strategy could have beneficial effects on water quality through decreased runoff carrying pesticides and fertilizers from cultivated areas to receiving streams. It is anticipated that none of the recommended water management strategies will have associated effects on water quality sufficient to impact recreation or instream aquatic life uses to a significant degree.

5.2 Impacts of Voluntary Redistribution of Water from Rural and Agricultural Areas

Similar to third-party impacts of voluntary redistribution, the Regional Water Plan shall include a quantitative reporting of socioeconomic impacts on agricultural resources including analysis of third-party gross business activity and employment impacts of moving water from rural and agricultural areas.1 In this case, voluntary redistribution is the acquisition of water by willing buyers from willing sellers, subject to conditions of existing groundwater management plans and rules of Groundwater Conservation Districts, in the case of groundwater supplies, and subject to existing surface water permits and water available from such permits (See Sections 3.1.1 and 3.1.2 for descriptions of methods used in determining quantities of groundwater and surface water available to meet projected water demands in the South Central Texas Water Planning Region).

In the development of the South Central Texas Regional Water Plan, the following principles have been followed: (1) water conservation has been the first water management strategy recommended to meet projected needs (shortages) of water user groups (WUGs), and (2) all other recommended water management strategies consider only quantities of water that are surplus to the year 2060 projected needs of local areas and/or water uses of the areas from which such supplies are proposed to be obtained, with the exception of voluntary transfers of Edwards Permits from irrigation to municipal and industrial uses, as will be further explained below. That is to say, that the water management strategies of the 2006 South Central Texas Regional Water Plan were carefully selected so as to have minimal impacts upon the supplies of water projected to be needed for use in rural and agricultural areas. In addition, the costing of each water management strategy includes estimated payments to landowners from which groundwater would be obtained and to holders of surface water rights to reflect that implementation of these water management strategies would compensate the owners of the water by the water users who would obtain and use the water (e.g., the willing seller willing buyer condition underlying the voluntary transfer concept).

Recommended water management strategies of the South Central Texas Regional Water Plan that may involve voluntary redistribution of water from rural and agricultural areas within

[1] It is important to note that the only places from which water can be obtained to meet the needs of municipalities and other water users of the South Central Texas Region are rural areas, many of which are also agricultural areas.

Region L are listed as follows, along with the portion of the firm new supply potentially considered a voluntary redistribution:[2]

- Edwards Transfers .... 71,335 acft/yr;
- Regional Carrizo for Bexar County .... 62,588 acft/yr;
- Regional Carrizo for SSLGC Project Expansion .... 12,800 acft/yr;
- Brackish Groundwater Desalination (Wilcox)............................ 5,662 acft/yr; and
- Hays/Caldwell Carrizo Project ....15,000 acft/yr.

  Total ....167,385 acft/yr

Discussion Related to Rural and Agricultural Areas: The recommended Edwards Transfers would result in the transfer of irrigation water supply projected to be needed for irrigation use in the amount of 19,223 acft/yr in 2010, declining to 14,450 acft/yr in 2020, 10,219 acft/yr in 2030, 5,589 acft/yr in 2040, to 2,407 acft/yr on 2050, and zero thereafter (Section 4C.2). None of the other recommended water management strategies of the South Central Texas Regional Water Plan would transfer water from rural and agricultural areas that is projected to be needed in those areas during the planning period. Thus, the only lost production and third party economic impacts of transfers are expected from the Edwards Transfers listed above. However, implementation of the recommended water management strategies would result in: (1) drawdown of the water table, increasing local area pump lifts in the aquifer areas from which groundwater would be obtained, and would (2) provide payments to landowners for groundwater and to holders of surface water permits for use of surface water at rates established by the surface water permit holders. In addition, implementation of recommended water management strategies can be expected to result in construction and associated expenditures in local areas where such projects are constructed, but neither the economic benefits of such expenditures, nor the subsequent economic development that might result from such expenditures are estimated due to lack of information pertaining to such activities. Water level drawdown and estimated effects upon pumping costs in areas from which groundwater is proposed to be obtained, and value of lost production in irrigation areas from which Edwards Transfers would occur, are presented below.

[2] The LCRA-SAWS Water Project of 150,000 acft/yr scheduled as a source of supply in 2050 in the Region L plan is not included here, since it includes new supplies to meet needs in Region K as a part of the strategy to make supplies available to Region L

The lowering of water levels in the Carrizo Aquifer areas from water management strategy implementation is estimated to occur at a rate of between 2.0 and 2.5 feet per year, and ultimately may reach between 100 and 170 feet by 2060. Water level drawdown in the Gulf Coast Aquifer areas is expected to vary highly from year to year, depending upon the year-to-year availability of surface water and may average between 25 and 30 feet through 2060. Water levels in the Edwards Aquifer areas are not expected to be affected by the water management strategies of the recommended plan, since aquifer recharge strategies will raise water levels in the aquifer, offsetting any lowering of water levels that might occur due to irrigation transfers to municipal and industrial uses.

Although it is not possible to estimate total costs of any additional pump lifts resulting or deepening of wells from implementation of recommended water management strategies in the Region L Plan due to lack of information about location and numbers of wells that might be affected, estimates are presented on a unit cost basis, and range from $1.08 per year for a single family home where additional lift might be 25 feet to $6.45 per year if lift is increased by 150 feet (Table 5-3). In the case of a municipal supplier with pumpage of 0.15 million gallons per day, increased lift of 25 feet would cost $322.73 per year, and increased lift of 150 feet would cost $1,936.38 per year (Table 5-3).

As stated above, the Edwards Transfers of water from rural and agricultural areas to municipal areas, would result in reduced water use and reduced economic activity from water use in the rural and agricultural areas. Estimates of direct (production) and indirect (third party) economic effects of use of an acft/yr of water in irrigated agriculture in rural areas in the South Central Texas Region are presented below. These estimates are developed from the "Socioeconomic Impacts of Unmet Water Needs," as computed for the irrigation water user group of the South Central Texas Region, since these estimates are for a case in which the business value, personal income, tax, and employment effects of not having water for use in irrigated agriculture have been calculated (see Section 4A.3 and Appendix E).[3] In the South Central Texas Region in 2010, the total economic impact of a shortage of water in irrigated agriculture is estimated to be $350/acft in business losses, of which $228/acft is direct farm value of production, and $123/acft is indirect (third party) farm support and marketing business and

[3] In the case of business, personal income, and taxes, these are pecuniary values, and do not include other values associated with rural and agricultural areas, such as, rural lifestyle.

Table 5-3.
Estimates of Annual Pumping Costs for Additional Lift
South Central Texas Region

Water User Group	Quantities	Additional Lift (feet) 25	50	75	100	125	150	175	200
		dollars annually							
Single Family Home	15,000 gal/mo	1.08	2.15	3.23	4.30	5.38	6.45	7.53	8.61
Livestock (cows)	50 per pasture/well, 20 g/d/h	2.15	4.30	6.45	8.61	10.76	12.91	15.06	17.21
Poultry (chickens)	50,000 per farm, 0.09 g/d/h	9.68	19.36	29.05	38.73	48.41	58.09	67.77	77.46
Municipal	(0.15 million gallons per day)	322.73	645.46	968.19	1,290.92	1,613.65	1,936.38	2,259.11	2,581.84

service losses (Table 5-4). In 2030, direct business effects are $259/acft, indirect effects are $139/acft, with total business effects of $398/acft annually (Table 5-4). In 2060, direct business effects from a shortage of water for irrigated agriculture are $301/acft, indirect effects (third party) are $162/acft, and total business effects are $462/acft (Table 5-4).

Personal income associated with water for irrigated agriculture is estimated at $193/acft in 2010, with $121/acft being the direct effect, and $71/acft the third party or indirect incomes from businesses that service direct agricultural water users (Table 5-4). In 2060, the total income effects are $255/acft with direct effects being $160/acft, and indirect effects being $94/acft (Table 5-4). The tax effects in 2010 from irrigation water shortages are $14/acft, of which $9/acft are from direct water users, and $4/acft are indirect, or third party, from business and service industries that support direct water users. In 2060, the direct tax effects are $12/acft of water for irrigated agriculture, and $6/acft are tax effects via the indirect (third party) business relationships (Table 5-4). The employment effects of irrigation water shortages in the South Central Texas Region in 2010 are 0.0085 jobs/acft, of which 0.0067/acft are jobs on irrigation farms, in and 0.0018/acft are in support sectors (Table 5-4). In 2060, the direct job effects are 0.0091/acft, with the indirect effects at 0.0024/acft, for a total of 0.0115/acft (Table 5-4).

If one assumes that the unit values for business, personal income, and taxes apply to the entire 167,385 acft of water proposed to be transferred, the total annual business effect in 2010 is estimated at $60.64 million, of which $39.40 million is direct, and $21.24 million is indirect, or third party effect (Table 5-4). Total direct annual personal income effect in 2010 is estimated at $21.00 million, and indirect, or third party personal income effect is $12.34 million (Table 5-4). Tax effects in 2010 are $2.39 million, of which $1.60 million are direct and $0.79 million are third party (Table 5-4).

Estimated total employment effects of transfers of water from rural to urban areas are 1,477 jobs in 2010 (1,167 direct and 310 third party) (Table 5-4). The values of business, personal income, taxes, and employment for years 2020 through 2060 can be seen in Table 5-4.

Table 5-4. Economic Impacts of Voluntary Redistribution of Water from Rural and Agricultural Areas South Central Texas Region

Business, Income, Taxes and Jobs	***Units***	***Years***					
		2010	***2020***	***2030***	***2040***	***2050***	***2060***
Economic Impacts		**Values Per Acre-Foot.**					
Business Value							
Direct	$/acft	228	238	259	277	289	301
Secondary	$/acft	123	128	139	149	155	162
Gross Business Value	$/acft	350	366	398	427	444	462
Personal Income							
Direct	$/acft	121	127	138	148	154	160
Secondary	$/acft	71	75	81	87	90	94
Total Income	$/acft	193	201	219	235	244	255
Taxes							
Direct	$/acft	9	10	11	11	12	12
Secondary	$/acft	5	5	5	6	6	6
Total	$/acft	14	15	16	17	18	18
Jobs							
Direct	No./acft	0.0067	0.0071	0.0078	0.0084	0.0087	0.0091
Secondary	No./acft	0.0018	0.0019	0.0021	0.0022	0.0023	0.0024
Jobs	No./acft	0.0085	0.0090	0.0099	0.0106	0.0110	0.0115
Economic Impacts		**Region Totals for 167,385 acft.**					
Business Value							
Direct	Million $s	39.40	41.17	44.76	48.03	49.97	52.04
Secondary	Million $s	21.24	22.12	24.07	25.83	26.87	27.99
Gross Business Value	Million $s	60.64	63.29	68.83	73.85	76.83	80.03
Personal Income							
Direct	Million $s	21.00	21.97	23.87	25.61	26.67	27.77
Secondary	Million $s	12.34	12.90	14.02	15.04	15.66	16.31
Total Income	Million $s	33.34	34.88	37.89	40.66	42.33	44.07
Taxes							
Direct	Million $s	1.60	1.69	1.82	1.97	2.04	2.12
Secondary	Million $s	0.79	0.83	0.90	0.97	1.01	1.04
Total	Million $s	2.39	2.52	2.72	2.94	3.05	3.16
Jobs							
Direct	Number	1,167	1,229	1,349	1,447	1,508	1,572
Secondary	Number	310	327	359	385	401	418
Jobs	Number	1,477	1,555	1,707	1,832	1,908	1,991

Of the total transfers of water from rural areas and agricultural areas recommended by the SCTRWPG, the quantities that are transfers from irrigated agriculture that are not surplus to projected irrigation needs in the areas from which the transfers would be made are 19,223 acft/yr in 2010, 10,219 acft/yr in 2030, and 2,407 acft/yr in 2050 (see listing below).

Items *	Units	Years					
		2010	2020	2030	2040	2050	2060
Irrig. Transfers	acft/yr	19,223	14,450	10,219	5,589	2,407	0
Gross Business	Million $s	6.73	5.29	4.07	2.39	1.07	0
Personal Income	Million $s	3.71	2.90	2.24	1.31	0.59	0
Jobs	Number	164	130	101	59	27	0
* See Table 5-4 for values of gross business, personal income, and jobs per acre-foot of water.							

The estimated gross business impacts of moving this water from rural and agricultural areas is $6.73 million per year in 2010, $4.07 million per year in 2030, and $1.07 million per year in 2050. The personal income effect from these transfers is estimated at $3.71 million per year in 2010, $2.24 million per year in 2030, and $590 thousand per year in 2050. Jobs lost in agriculture and the agriculture support industries are estimated at 164 per year in 2010, 101 per year in 2030, and 27 per year in 2050. Since payments would be made to local landowners for the water transferred, the effects would be positive to the extent that they are spent and/or invested locally. There is no information, however, with which to estimate these potential positive economic and employment effects.

Discussion Related to Urban Areas to which Water Management Strategies Provide Water for Industrial and Commercial Uses: The importance of a dependable water supply for industry and commercial activities of the South Central Texas Water Planning Region is illustrated by the value of business, personal income, taxes, and employment per unit of water being considered in the water management strategies. Estimates of these direct and indirect values of water for industrial and commercial uses in Region L are presented on an acre-foot basis and totals are calculated for the region in Tables 5-5 and 5-6, respectively. For example, the value of production by industry in the South Central Texas Water Planning Region is computed at $92,268 per acre-foot of water use in 2010, of which $58,975 is direct business, and $33,293 is

Table 5-5.
Economic Impacts of Water for Industrial and Commercial Users
(Values per Acre-Foot)[1]
South Central Texas Region

Business, Income, Taxes and Jobs	*Units*	*Years*					
		2010	*2020*	*2030*	*2040*	*2050*	*2060*
Industrial Users		**Values Per Acre-Foot.**					
Business Value							
Direct	$/acft	58,975	118,157	235,062	208,735	182,588	165,256
Secondary	$/acft	33,293	66,705	132,704	117,865	103,721	94,223
Gross Business Value	$/acft	92,268	184,862	367,766	326,600	286,310	259,479
Personal Income							
Direct	$/acft	13,207	26,461	52,643	46,930	41,186	37,384
Secondary	$/acft	17,655	35,373	70,373	62,576	55,826	51,145
Total Income	$/acft	30,862	61,834	123,015	109,506	97,012	88,529
Taxes							
Direct	$/acft	780	1,559	3,103	2,760	2,410	2,179
Secondary	$/acft	976	1,956	3,891	3,456	3,026	2,740
Total	$/acft	1,756	3,516	6,994	6,217	5,436	4,919
Jobs							
Direct	No./acft	0.18	0.35	0.70	0.63	0.55	0.50
Secondary	No./acft	0.35	0.70	1.39	1.24	1.09	0.99
Jobs	No./acft	0.53	1.05	2.10	1.87	1.64	1.48
Commercial Users		**Values Per Acre-Foot.**					
Business Value							
Direct	$/acft	7,405	5,656	5,115	5,228	17,428	21,494
Secondary	$/acft	3,414	2,618	2,385	2,468	7,935	9,784
Gross Business Value	$/acft	10,819	8,274	7,500	7,696	25,363	31,278
Personal Income							
Direct	$/acft	4,425	3,375	3,070	3,206	10,351	12,786
Secondary	$/acft	1,833	1,400	1,272	1,316	4,285	5,288
Total Income	$/acft	6,258	4,775	4,342	4,522	14,636	18,074
Taxes							
Direct	$/acft	422	323	292	299	992	1,223
Secondary	$/acft	217	166	150	154	508	626
Total	$/acft	639	488	442	453	1,500	1,849
Jobs							
Direct	No./acft	0.17	0.13	0.12	0.12	0.39	0.49
Secondary	No./acft	0.04	0.03	0.03	0.03	0.10	0.12
Jobs	No./acft	0.21	0.16	0.15	0.15	0.49	0.60

[1] In regional water planning, commercial users are included in the municipal water user group. For purposes of this analysis, economic impacts are computed for “water intensive” commercial business, which are estimated to use 25 percent of municipal water quantities.

Table 5-6.
Economic Impacts of Water for Industrial and Commercial Users (Total Value)[1]
South Central Texas Region

Business, Income, Taxes and Jobs	Units	Years					
		2010	2020	2030	2040	2050	2060
Industrial Users		Values for 21,000 acft					
Business Value							
Direct	Million $s	1,238	2,481	4,936	4,383	3,834	3,470
Secondary	Million $s	699	1,401	2,787	2,475	2,178	1,979
Gross Business Value	Million $s	1,938	3,882	7,723	6,859	6,013	5,449
Personal Income							
Direct	Million $s	277	556	1,105	986	865	785
Secondary	Million $s	371	743	1,478	1,314	1,172	1,074
Total Income	Million $s	648	1,299	2,583	2,300	2,037	1,859
Taxes							
Direct	Million $s	16	33	65	58	51	46
Secondary	Million $s	20	41	82	73	64	58
Total	Million $s	37	74	147	131	114	103
Jobs							
Direct	Number	3,706	7,426	14,775	13,212	11,560	10,481
Secondary	Number	7,335	14,691	29,229	25,986	22,813	20,699
Jobs	Number	11,041	22,117	44,005	39,197	34,373	31,181
Commercial Users		Values for 58,000 acft					
Business Value							
Direct	Million $s	430	328	297	303	1,011	1,247
Secondary	Million $s	198	152	138	143	460	567
Gross Business Value	Million $s	628	480	435	446	1,471	1,814
Personal Income							
Direct	Million $s	257	196	178	186	600	742
Secondary	Million $s	106	81	74	76	249	307
Total Income	Million $s	363	277	252	262	849	1,048
Taxes							
Direct	Million $s	24	19	17	17	58	71
Secondary	Million $s	13	10	9	9	29	36
Total	Million $s	37	28	26	26	87	107
Jobs							
Direct	Number	9,802	7,485	6,820	7,135	22,838	28,208
Secondary	Number	2,373	1,814	1,646	1,708	5,549	6,849
Jobs	Number	12,175	9,299	8,466	8,842	28,387	35,057

[1] In regional water planning, commercial users are included in the municipal water user group. For purposes of this analysis, economic impacts are computed for “water intensive” commercial business, which are estimated to use 25 percent of municipal water quantities.

indirect, or third party business (Table 5-5). Total personal income effects of industrial production, per acre-foot of water use in industrial pursuits in 2010 are $30,862, of which $13,207 is direct income, and $17,655 is indirect, or third party income (Table 5-5). The direct tax effect per acre-foot of water use in industry in 2010 is $780, the indirect effect is $976, with the total per acre-foot of $1,756 (Table 5-5). The number of direct jobs per acft of water use in industry in 2010 is 0.18, with indirect jobs at 0.35, and total jobs per acft in 2010 at 0.53 (Table 5-5). The projected values for 2020, 2030, 2040, 2050, and 2060 can be seen in Table 5-5.

The economic value of water in the South Central Texas Water Planning Region in commercial activity is computed at $10,819 per acft/yr in 2010, of which $7,402 is direct business, and $3,414 is indirect, or third party business (Table 5-5). Total personal income effects of commercial activity, per acre-foot of water use in water intensive commercial pursuits in 2010 are $6,258, of which $4,425 is direct income, and $1,833 is indirect, or third party income (Table 5-4). The direct tax effect per acre-foot of water use in commercial uses in 2010 is $422, the indirect effect is $217, with the total per acre-foot of $639 (Table 5-5). The number of direct jobs per acft of water use in commercial activity in 2010 is 0.17, with indirect jobs at 0.04, and total jobs per acft in 2010 at 0.21 (Table 5-6). As is the case for industrial activity, the projected values for 2020, 2030, 2040, 2050, and 2060 can be seen in Table 5-5. Of the total 167,385 acft/yr of water included in the water management strategies that would bring water from rural areas to urban areas, 21,000 acft/yr would be for industrial uses, and 58,000 acft/yr would be for commercial uses to which the acre-feet unit values of Table 5-5 described above would apply. The total value of production by industry in the South Central Texas Water Planning Region using the 21,000 acft/yr of water is computed at $1.938 billion in 2010, of which $1.238 billion is direct business, and $699 million is indirect, or third party business (Table 5-6). Total personal income effects of industrial production in 2010 are $648 million, of which $277 million is direct income, and $371 million is indirect, or third party income (Table 5-6). The direct tax effect of water use in industry in 2010 is $16 million, the indirect effect is $20 million, with the of $37 million (Table5-6). The number of direct jobs from water use in industry in 2010 is 3,706 with indirect jobs at 7,334, and total jobs in2010 of 11,041 (Table 5-6). The projected values for 2020, 2030, 2040, 2050, and 2060 can be seen in Table 5-6.

The economic value of water in the South Central Texas Water Planning Region in commercial activity using 58,000 acft/yr of water is computed at $628 million in 2010, of which $430 million is direct business, and $198 million is indirect, or third party business (Table 5-6). Total personal income effect from commercial activity for water use in water intensive commercial pursuits in 2010 are $363 million, of which $257 million are direct income, and $106 million indirect, or third party income (Table 5-6). The direct tax effect of 58,000 acft/yr of water use in water intensive commercial activity in 2010 is $24 million, the indirect effect is $13 million, with the total effect of $37 million (Table 5-6). The number of direct jobs associated with water use in commercial activity in 2010 is 9,802, with 2,373 indirect jobs, and 12,175 total jobs in 2010 (Table 5-6). As is the case for industrial activity, the projected values for 2020, 2030, 2040, 2050, and 2060 can be seen in Table 5-6.

In 2010, the total annual business, personal income and tax values for 21,000 acft of water in industrial use plus the value of 58,000 acft for commercial water use is the sum of the industrial and commercial values shown in Table 5-6 above. For example, business value in 2010 is $2.565 billion, of which $1.668 billion is direct effect, and $897 million is indirect effect (Table 5-7). The direct business value in 2060 is $4.717 billion, the indirect effect is $2.546 billion, and the total is $7.263 billion (Table 5-7).

Although a dependable supply of irrigation water is vitally important to rural and agricultural economies, the direct and indirect, or third party business values, taxes that can be paid, and employment effects of water use in irrigated agriculture in comparison to similar values in industrial (manufacturing) and commercial activities are much lower; (i.e., in 2010, industry is projected to generate business valued at $92,268/acft of water use and commercial water users are projected to generate $10,819/acft of water use, while irrigated agriculture is projected to generate $350/acft) (Tables 5-4 and 5-5). The employment effects have similar comparisons. For example, in industry, in 2010, employment is computed at 0.53 jobs/acft and commercial activities are projected to generate 0.21 jobs/acft of water use, while irrigated agriculture is computed at 0.0085 jobs/acft (Tables 5-4 and 5-5).

Table 5-7.
Economic Impacts of Water for Industrial and Commercial Users — Combined (Total Value)
South Central Texas Region

Business, Income, Taxes and Jobs	Units	Years 2010	2020	2030	2040	2050	2060
Industrial[1] plus Commercial[2]							
Business Value							
Direct	Million $s	1,668	2,809	5,233	4,687	4,845	4,717
Secondary	Million $s	897	1,553	2,925	2,618	2,638	2,546
Gross Business Value	Million $s	2,565	4,362	8,158	7,305	7,484	7,263
Personal Income							
Direct	Million $s	534	751	1,284	1,171	1,465	1,527
Secondary	Million $s	477	824	1,552	1,390	1,421	1,381
Total Income	Million $s	1,011	1,575	2,835	2,562	2,886	2,907
Taxes							
Direct	Million $s	41	51	82	75	108	117
Secondary	Million $s	33	51	90	82	93	94
Total	Million $s	74	102	173	157	201	211
Jobs							
Direct	Number	13,509	14,910	21,595	20,346	34,398	38,690
Secondary	Number	9,708	16,506	30,876	27,693	28,362	27,548
Jobs	Number	23,217	31,416	52,470	48,039	62,760	66,238

[1] Estimated quantity of industrial water is 21,000 of the total 167,037 acft of water transferred.
[2] Estimated quantity of commercial water is 58,000 of the total 167,037 acft of water transferred.

The comparison and discussion above is expressed in terms of business pecuniary values per unit of water use (acft), as opposed to other non-pecuniary values. It is important to note that quantities of use in the industrial, commercial, and irrigated agriculture water user groups have a significant bearing upon the relative importance of water to the regional economy. For example, value of production in industry is high per unit of water use, but the quantity of water use in industry is much lower than in irrigated agriculture uses. In 2010, projected industrial water demands (water use) for Region L are 119,310 acft/yr, commercial sector projected water demands are 98,999 acft/yr, and irrigation projected water demands are 379,026 acft/yr. The comparative quantities for 2060 are 179,715 acft/yr for industry, 159,309 acft/yr for commercial activities, and 301,679 acft/yr for irrigated agriculture. In summary, although the values per unit of water use vary widely among uses, there is an important need for each of the uses in the region.

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Section 6
Water Conservation and Drought Management Recommendations
[31 TAC § 357.7(a)(11)]

6.1 Water Conservation

The South Central Texas Regional Water Planning Group (SCTRWPG) strongly supports water conservation, and for the 2006 Regional Water Plan has recommended municipal, irrigation, industrial, steam-electric power generation, and mining water conservation water management strategies, each of which is described briefly below.

Municipal Water Conservation: The South Central Texas Regional Water Planning Group established municipal water conservation goals, as follows:

- For municipal water user groups (WUGs) with water use of 140 gpcd and greater, reduction of per capita water use by 1 percent per year until the level of 140 gpcd is reached, after which, the rate of reduction of per capita water use is one-fourth percent (0.25 percent) per year for the remainder of the planning period; and
- For municipal WUGs having year 2000 water use of less than 140 gpcd, reduction of per capita water use by one-fourth percent per year.

The municipal water conservation water management strategy included in the 2006 Regional Water Plan is based upon water conservation Best Management Practices (BMPs) for municipal water users, as included in the Water Conservation Implementation Task Force November 2004 Report to the 79th Texas Legislature. The list of Municipal Water Conservation BMPs is as follows:

1. System Water Audit and Water Loss;
2. Water Conservation Pricing;
3. Prohibition on Wasting Water;
4. Showerhead, Aerator, and Toilet Flapper Retrofit;
5. Residential Ultra-Low Flow Toilet Replacement Programs;
6. Residential Clothes Washer Incentive Program;
7. School Education;
8. Water Survey for Single-Family and Multi-Family Customers;
9. Landscape Irrigation Conservation and Incentives;
10. Water-Wise Landscape Design and Conversion Programs;
11. Athletic Field Conservation;
12. Golf Course Conservation;
13. Metering of all New Connections and Retrofitting of Existing Connections;
14. Wholesale Agency Assistance Programs;

15. Conservation Coordinator;
16. Reuse of Reclaimed Water;
17. Public Information;
18. Rainwater Harvesting and Condensate Reuse;
19. New Construction Graywater;
20. Park Conservation; and
21. Conservation Programs for Industrial, Commercial, and Institutional Accounts.

The Municipal Water Conservation water management strategy includes retrofit of plumbing fixtures, adoption and use of efficient clothes washers, and significant reduction of lawn and landscape watering. The combined plumbing fixtures, clothes washers, and lawn watering water conservation practices would reduce municipal water demand by 13,231 acft/yr in 2010, 31,616 acft/yr in 2030, and 72,570 acft/yr in 2060 (Section 4C.1). Of these totals, in 2010, 91 percent would be from plumbing fixtures and clothes washers, and 9 percent would be from lawn watering. In 2030, of the 31,616 acft/yr of municipal water conservation, 48 percent would be from plumbing fixture and clothes washer retrofit, and 52 percent would be from lawn irrigation, while in 2060, the 72,570 acft/yr of municipal water conservation would be 26 percent would be from plumbing fixtures and clothes washers, and 74 percent would be from lawn irrigation.

In 2010, total cost for implementation and administration of the municipal water conservation water management strategy to meet the Region L goals, as described in the municipal water conservation water management strategy (Section 4C.1), is $6.54 million ($494/acft/yr), increasing to $14.10 million ($446/acft/yr) in 2030, and to $31.34 in 2060 ($432/acft/yr). As the quantity of water conservation (demand reduction) increases, the unit cost decreases from $494 per acft in 2010, to $446 per acft in 2030, and to $432 per acft in 2060.

Irrigation Water Conservation: The irrigation water conservation water management strategy is based upon water conservation Best Management Practices for agricultural water, as included in the Water Conservation Implementation Task Force November 2004 Report to the 79th Texas Legislature. The list of Irrigation BMPs is as follows:

1. Irrigation Scheduling;
2. Volumetric Measurement of Irrigation Water Use;
3. Crop Residue Management and Conservation Tillage;
4. On-farm Irrigation audit;
5. Furrow Dikes;
6. Land Leveling;

7. Contour Farming;
8. Conservation of Supplemental Irrigated Farmland to Dry-Land Farmland;
9. Brush Control/Management;
10. Lining of On-Farm Irrigation Ditches;
11. Replacement of On-/farm Irrigation Ditches with Pipelines;
12. Low Pressure Center Pivot Sprinkler Irrigation Systems;
13. Drip/Micro-Irrigation System;
14. Gated and Flexible Pipe for Field Water Distribution Systems;
15. Surge Flow Irrigation for Field Water Distribution Systems;
16. Linear Move Sprinkler Irrigation Systems;
17. Lining of District Irrigation Canals;
18. Replacement of District Irrigation Canals and Lateral Canals with Pipelines;
19. Tailwater Recovery and Use System; and
20. Nursery Production Systems.

Best Management Practices of Low Energy Precision Application (LEPA) techniques are estimated to reduce water needed per acre by 20 percent of the rates estimated to have been used in Region L in year 2000. Based upon estimates that irrigation water conservation practices of LEPA, with furrow dikes, can be applied to 75 percent of the acreages that were irrigated in year 2000 in the counties of the region for which water needs have been projected, it is estimated that 23,074 acft/yr of irrigation water conservation can be accomplished at an average cost of $113/acft/yr (Section 4C.1).

Industrial, Steam-Electric Power, and Mining Water Conservation: Best Management Practices for industrial, steam-electric power, and mining water conservation, as included in the Water Conservation Implementation Task Force November 2004 Report to the 79th Texas Legislature are as follows:

1. Industrial Water Audit;
2. Industrial Water Waste Reduction;
3. Industrial Submetering;
4. Cooling Towers;
5. Cooling Systems Other than Cooling Towers;
6. Industrial Alternative Sources and Reuse of Process Water;
7. Rinsing/Cleaning;
8. Water Treatment;
9. Boiler and Steam Systems;
10. Refrigeration (including Chilled Water);
11. Once-through Cooling;
12. Management and Employee Programs;

13. Industrial Landscape; and
14. Industrial Site Specific Conservation.

BMPs of air cooling, reuse of treated wastewater, and onsite collection and use of precipitation runoff for mining are recommended. Potential quantities and costs, however, could not be estimated due to lack of data (Section 4C.1).

Model Municipal Water Conservation Plan: The model municipal water conservation plan required for the South Central Texas Regional Water Plan is included in Appendix F, and has the following components:

A. Utility Profile
   I. Population and Service Area Data
   II. Active Connections (number)
   III. Water Use Data for Service Area
   IV. Water supply System Data, and
   V. Wastewater System Data.
B. Requirements for Water Conservation Plans for Municipal Water Use by Public Water Suppliers
   1. Specific, Quantified 5 and 10 year water conservation targets and goals for municipal water use, in gallons per capita per day
   2. Metering Devices – Description Required
   3 Universal Metering-- Program Required
   4. Unaccounted-For Water Use-- Measures to Determine and Control
   5. Continuing Public Education & Information—Program Description Required
   6. Non-Promotional Water Rate Structure—Required, and included in Water Conservation Plan
   7. Reservoir Systems Operation Plan – Required, if Applicable
   8. Enforcement Procedure & Plan Adoption—Means of Implementation and Enforcement Requires
   9. Coordination with the Regional Water Planning Group(s)—Documentation for consistency with Regional Water Plans
   10. Additional Requirements
      a. Program for Leak Detection, Repair, and Water Loss Accounting
      b. Record Management System, and
      c. Plan Review and Update every 5 years.

Water conservation information and guidance in the development of municipal water conservation plans can be found at the following web sites:

- www.tceq.state.tx.us/waterconservation/waterconservationplanforms
- www.twdb.state.tx.us/assistance/conservation/Municipal/Plans/CPlans.asp
- www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf

Model Irrigation Water Conservation Plan: There is no model irrigation water conservation plan available for the South Central Texas Regional Water Plan. A form is provided by TCEQ to assist in conservation plan development for individually operated irrigation systems at the following web site:

- www.tceq.state.tx.us/permitting/water_supply/water_rights/conserve.html.

Model Industrial/Mining Water Conservation Plan: There is no model industrial/mining water conservation plan available for the South Central Texas Regional Water Plan. A form is provided by TCEQ to assist in conservation plan development for industrial/mining water use at the following web site:

- www.tceq.state.tx.us/permitting/water_supply/water_rights/conserve.html.

Recommendation: The South Central Texas Regional Water Planning Group strongly recommends the implementation of the Municipal, Industrial, Irrigation, Steam-Electric Power Generation, and the Mining Water Conservation water management strategies of the 2006 Regional Water Plan, and that each water user develop, implement, and maintain a Water Conservation Plan that meets or exceeds the requirements of applicable law.

6.2 Drought Management

31 TAC §357.7(a)(11) requires that the regional water plan identify: (A) factors specific to each source of water supply to be considered in determining whether to initiate a drought response; and (B) actions to be taken as part of the response. The general recommendations of the SCTRWPG regarding identification and initiation of drought responses for current water supply sources in the South Central Texas Region are listed in Table 6-1. As the SCTRWPG is a planning body only, with no implementation authority, it is emphasized that these drought responses are recommendations only. Local public and private water suppliers and water districts have been required by TCEQ to adopt a Drought Contingency Plan that contains drought triggers and responses unique to each specific entity. Furthermore, these entities have the authority and responsibility to manage their particular water supply within the bounds created by applicable law. Therefore, the SCTRWPG encourages these entities to implement their respective plans with due consideration of the recommendations summarized in Table 6-1 (See Section 8.6 for SCTRWPG recommendations regarding further studies of Drought Management as a water management strategy).

Table 6-1.
Identification and Initiation of Drought Responses

Source of Water Supply	***Factors to be Considered in Initiating Drought Response(s)***	***Potential Drought Responses***
Edwards Aquifer	• Local/regional well levels • Springflow maintenance • Water needs for health & safety • Availability of alternative sources	• Reductions in allowable withdrawals • Implementation of Drought Contingency Plans • Increase reliance on alternative sources
Carrizo & Other Aquifers	• Local/regional well levels • Water stored in formation vs. use • Acceptable long-term drawdown • Production facility constraints	• Implementation of Drought Contingency Plans • Groundwater district rules • Increase production facility capacity
Surface Water	• Streamflow/reservoir storage • Water right priority and special conditions • Dependable supply vs. use • Availability of alternative sources	• Implementation of Drought Contingency Plans • Coordination with TCEQ Watermaster • Increase reliance on alternative sources

Model Drought Contingency Plan for Retail Public Water Suppliers: The model municipal drought contingency plan required for the South Central Texas Regional Water Plan is included in Appendix G, and has the following components:

Section	Contents
I	Declaration of Policy, Purpose, and Intent
II	Public Involvement
III	Public Education
IV	Coordination with Regional Water Planning Groups
V	Authorization
VI	Application
VII	Definitions
VIII	Criteria for Initiation and Termination of Drought Response Stages • Stage 1 Triggers—Mild Water Shortage Condition • Stage 2 Triggers—Moderate Water Shortage Conditions • Stage 3 Triggers—Severe Water shortage Conditions • Stage 4 Triggers—Critical Water shortage Conditions • Stage 5 Triggers—Water Allocation
IX	Drought Response Stages • Notification • Response(s) (See Appendix G for list of potentials) o Stage 1 o Stage 2 o Stage 3 o Stage 4 o Stage 5 o Stage 6

Information and guidance in the development of drought contingency plans can be found at the following web site:

- www.tnrcc.state.tx.us/permitting/waterperm/wrpa/contingency.html

Recommendation: The South Central Texas Regional Water Planning Group recommends that each municipal water supplier develop, implement, and maintain a Drought Contingency Plan that meets or exceeds the requirements of applicable law.

6.2.1 Groundwater

The Edwards Aquifer Authority (EAA) has adopted Demand Management and Critical Period rules that establish trigger conditions for recognition of drought and specify reductions in withdrawals from the Edwards Aquifer when these trigger conditions are met. Subject to permitted withdrawals totaling 400,000 acft/yr, these rules reflect staged reductions in permitted municipal withdrawals ranging from five to 15 percent during periods in which water levels in representative monitoring wells in Bexar and Uvalde Counties or discharges at Comal or San Marcos Springs have fallen below specified trigger levels. Table 6-2 summarizes the factors specific to the Edwards Aquifer in determining whether to initiate a drought response and the reductions in withdrawal expected as part of the response pursuant to rules current as of February 28, 2005.

The EAA has developed and submitted a Habitat Conservation Plan to the U.S. Fish & Wildlife Service. It is expected that the Habitat Conservation Plan will form the basis for identification of appropriate springflow levels or other measures for protection of threatened and endangered species. Until these springflow levels and/or other measures are identified and approved, appropriate timing for initiation of drought responses is uncertain. The SCTRWPG encourages the timely implementation of this Regional Water Plan as a preemptive drought response so that alternative sources of supply and/or enhanced supplies from the Edwards Aquifer will be available to satisfy regional water needs, maintain springflow, and protect endangered species to the extent required by State and Federal law.

Table 6-2.
Summary of Edwards Aquifer Authority
Demand Management and Critical Period Rules[1]

Reduction Stage	Triggers Initiating Drought Response				Drought Response Maximum Allowable Withdrawal [5,6]
	J-17[2] (ft-msl)	Springflows (cfs)[2,3] San Marcos	Springflows (cfs)[2,3] Comal	J-27[4] (ft-msl)	
I	650	110	220	N/A	95 % of permitted (monthly) withdrawal
II	640	96	154	N/A	90 % of permitted (monthly) withdrawal
III	630	80	86	845	85 % of permitted (monthly) withdrawal

1 Information from EAA Rules as of February 28, 2005 for total permitted withdrawals less than or equal to 400,000 acft/yr.
2 Applicable to San Antonio Pool (Medina, Bexar, Comal, and Hays Counties).
3 Five-day running average.
4 Applicable to Uvalde Pool (Uvalde County).
5 Alternative responses related to base withdrawal multipliers and conservation plans available from EAA.
6 Reductions in maximum allowable withdrawal applicable to permitted municipal use (including irrigation transfers) only until Stage III is triggered.

Water supplies available from the Carrizo Aquifer and other aquifers in Region L are less subject to transient hydrologic drought conditions than the Edwards Aquifer and are more dependent upon water stored in the formation and the acceptability of long-term depletion or drawdown. If depletion of storage in these aquifers is occurring at an unacceptable pace (typically measured over many years, rather than a few months), there is likely to be sufficient time to amend groundwater district rules and/or develop alternative sources of supply. As with any source of water supply, production facility constraints may necessitate expedited increases in production capacity or implementation of drought contingency measures during dry periods when peak water demands are greatest.

6.2.2 Surface Water

Supplies from surface water sources such as run-of-river water rights and reservoirs are determined on the basis of minimum year availability and firm yield, respectively. Hence, the current surface water supplies presented herein are, by TWDB definition, dependable during drought. Factors that are typically considered in initiating drought response for surface water sources are low streamflow and/or low reservoir storage, since these factors can be conveniently measured and monitored. In contrast to groundwater sources, water right priority with respect to other rights and special permit conditions regarding minimum instream flows can also be important factors in determining whether to initiate drought responses for surface water sources. In the Guadalupe-San Antonio and Nueces River Basins, coordination with the TCEQ South Texas Watermaster is an essential drought response for all entities dependent upon surface water supply sources.

6.2.2.1 Potential for Emergency Transfers of Surface Water

In accordance with [31 TAC §357.5 (i)], the SCTRWPG is to consider emergency transfers of surface water including a determination of the portion of each right for non-municipal use that may be transferred without causing unreasonable damage to the property of the non-municipal water right holder. The Executive Director of TCEQ, after notice to the Governor, may issue emergency permits or temporarily suspend or amend permit conditions without notice or hearing to address emergency conditions for a limited period of not more than 120 days if an imminent threat to public health and safety exists. A person desiring to obtain an emergency authorization is required to justify the request to TCEQ. If TCEQ determines the request is justified, it may issue an emergency authorization without notice and hearing, or with notice and hearing, if practicable. Applicants for emergency authorizations are required to pay fair market value for the water they are allowed to divert, as well as any damages caused by the transfer. In transferring the quantity of water pursuant to an emergency authorization request, the Executive Director, or the TCEQ, shall allocate the requested quantity among two or more water rights held for purposes other than domestic or municipal purposes.

Surface water availability models have been developed for the streams of the South Central Texas Region (Region L) in which the locations, quantities, and reliabilities of the surface water rights of the region have been quantified as described in Section 3, entitled Water Supply Analyses. The Regional Water Plan incorporates Appendix B as a source of information to water user groups and the TCEQ for use in cases of emergencies that result in a threat to public health and safety. Water user groups located in proximity to one or more existing surface water diversion permits for non-municipal use can readily estimate quantities of water that might be available for emergency use applications. With regard to the determination of amounts "that may be transferred without causing unreasonable damage to the property of the non-municipal water rights holder," the SCTRWPG defers to the judgment of the TCEQ inasmuch as the TCEQ is charged with consideration of sworn applications for emergency transfer authorizations. The SCTRWPG recommends that water user groups of the region develop emergency water supply plans to be activated in the event that public health and safety are threatened.

Section 7
Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources [31 TAC §357.7(a)(13) and §357.14(2)(C)]

The 2006 South Central Texas Regional Water Plan (2006 Plan) is consistent with long-term protection of the state's water resources, agricultural resources, and natural resources and is based on principles outlined in the Texas Administrative Code Chapter 358–State Water Planning Guidelines. The 2006 Plan was formulated and developed with an understanding of the importance of orderly development, management, and conservation of water resources to meet the Region's near and long-term water needs during drought. The plan recognizes and honors all laws and existing permits applicable to water use for the state and regional water planning areas and, in the case of groundwater, recognizes and takes into account the programs and rules of groundwater conservation districts within the South Central Texas Water Planning Region (Section 3).

The 2006 Plan identifies actions and policies necessary to meet the Region's projected municipal, industrial, steam-electric power, mining, livestock, and most of irrigation needs, by developing and recommending water management strategies to meet these needs at a reasonable cost (Section 4B). It was not possible, however, to develop economically feasible strategies to meet all of the projected needs of irrigated agriculture. A socioeconomic impact analysis was performed to estimate the economic loss associated with not meeting these needs (Appendix E).

The 2006 Plan considered environmental information resulting from site-specific studies and ongoing water development projects when evaluating water management strategies. A list of endangered and threatened species for each county of the region was obtained from the U.S. Fish and Wildlife Service and the possible habitats for these species were considered for each water management strategy (Appendix H). In addition, a comprehensive environmental assessment, potential environmental effects analysis, and cumulative effects analyses were made of the recommended water management strategies of the plan (Sections 7.1 and 7.2). Section 7.3 summarizes the environmental benefits and concerns associated with implementation of the 2006 South Central Texas Regional Water Plan.

The 2006 Plan includes water conservation water management strategies based upon municipal water conservation best management practices (BMPS), and initiatives to respond to drought conditions by the municipal water user groups, and the use of water conservation BMPs in the irrigation water use group.

The water management strategies included in the plan are phased into a schedule that meets projected needs at the least capital, operating, and environmental costs, and thereby the plan meets the condition of "feasible strategies at reasonable costs," as specified in the guidelines (Section 4B). The Plan is based upon the condition of voluntary transfers of water resources to meet projected needs, including the underlying principles that local area projected needs to 2060 are met before any consideration is given to movement of water from rural and agricultural areas to meet projected needs at more distant locations, that compensation will be made to water owners for water to meet projected needs of others than the owners, and an evaluation was made of the social and economic impacts of voluntary transfers of water from rural and agricultural areas (Section 5.2).

The South Central Texas Regional Water Planning Group (SCTRWPG) conducted numerous public meetings during the 2006 planning cycle and based its decisions upon the best available information. The SCTRWPG coordinated water planning and management activities with local, regional, state, and federal agencies and cooperated and coordinated with Regions N and K (Coastal Bend and Lower Colorado) to identify common needs and cooperative opportunities.

The SCTRWPG considered recommendations of stream segments with significant ecological value by Texas Parks and Wildlife Department. At this time, the SCTRWPG recommends that no stream segments or reservoir sites within Region L be designated as having unique value. The SCTRWPG developed policy recommendations for the 2006 Plan including improved water demand and water supply data, continued support for the rule of capture as modified by the rules and regulations of existing groundwater conservation districts, continued funding for regional water planning, and especially that the Legislature provide adequate funding for the implementation of water management strategies of the plan (Section 8).

7.1 Cumulative Effects of Regional Water Plan Implementation

Sophisticated hydrologic models have been employed to quantify the cumulative effects of implementation of the South Central Texas Regional Water Plan through the year 2060. Such models include the GWSIM-IV Edwards Aquifer model (GWSIM-IV),[1,2] South-Central Carrizo System model (SCCS),[3] Gulf Coast Groundwater Availability Models (Gulf Coast GAMs),[4,5] Guadalupe-San Antonio River Basin Water Availability Model (GSAWAM),[6] Nueces River Basin Water Availability Model (Nueces WAM),[7] and Lower Nueces River Basin and Estuary Model (NUBAY).[8]

The cumulative effects are quantified through long-term simulation of natural hydrologic processes including precipitation, streamflow, aquifer recharge, springflow, and evaporation as they are affected by human influences such as aquifer pumpage, reservoirs, diversions, and the discharge of treated effluent. Figure 7.1-1 illustrates the connectivity of the various groundwater and surface water models, as well as the water management strategies of the 2006 Regional Water Plan.

7.1.1 Groundwater and Springs

Cumulative effects of plan implementation on the Edwards Aquifer are measured against this baseline representative of full utilization of Initial Regular Permits prorated to a total of 400,000 acft/yr subject to Critical Period Management rules without any additional recharge enhancement projects. Edwards Aquifer simulations with implementation of the Plan do not reflect the use of available System Management Supplies as may be necessary to offset Edwards

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[1] Texas Department of Water Resources, "Groundwater Resources and Model Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region," Report 239, October 1979.
[2] Texas Water Development Board, "Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Report 340, July 1992.
[3] HDR Engineering, Inc., "South Central Carrizo System Groundwater Model, SAWS Gonzales-Carrizo Project," San Antonio Water System, November 2004.
[4] Texas Water Development Board, Groundwater Availability Model for the Central Gulf Coast Aquifer System: Final Report and Numerical Simulations Through 1999," Texas Water Development Board, 2004.
[5] Waterstone Environmental Hydrology and Engineering. Inc., "Groundwater Availability of the Central Gulf Coast Aquifer – Numerical Simulations to 2050, Central Gulf Coast, Texas," Contract Draft Report, 2003.
[6] HDR Engineering, Inc., "Water Availability in the Guadalupe-San Antonio River Basin," Texas Natural Resource Conservation Commission (TNRCC), December 1999.
[7] HDR Engineering, Inc., "Water Availability in the Nueces River Basin," TNRCC, October 1999.
[8] HDR Engineering, Inc., "Water Supply Update for City of Corpus Christi Service Area," City of Corpus Christi, January 1999.

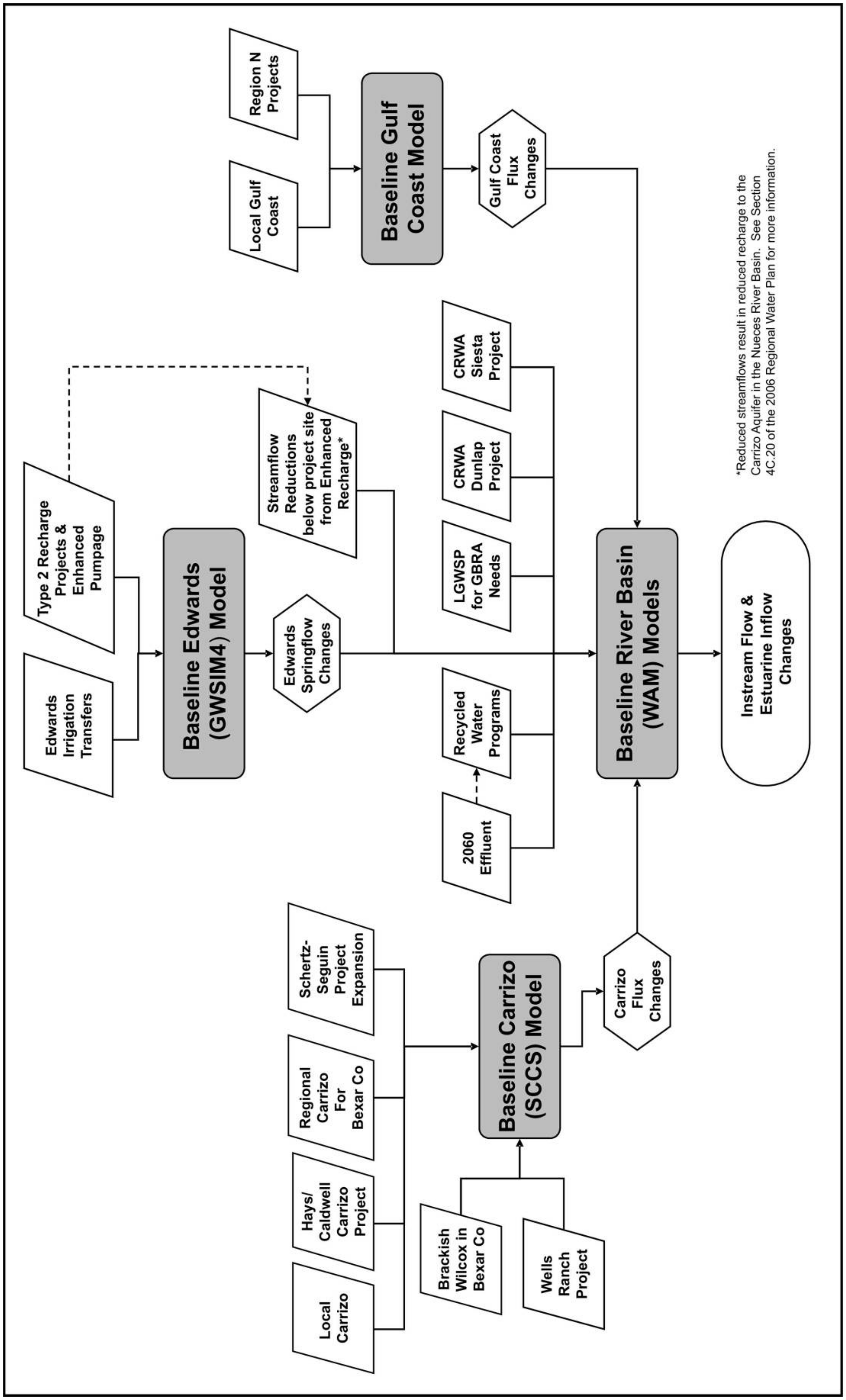


Figure 7.1-1. Flowchart for Assessment of Cumulative Effects of Regional Water Plan Implementation on Surface Water Resources

Aquifer pumpage reductions to maintain springflow. Cumulative effects of plan implementation on Carrizo, Simsboro, and Gulf Coast Aquifer levels are measured against a baseline of projected local pumpage.

The potential cumulative effects of plan implementation on Comal Springs discharge from the Edwards Aquifer are shown in Figure 7.1-2 for a 56-year historical simulation period. Springflows would increase by a net average of about 13 cfs (6.2 percent) considering the effects of Edwards Recharge – Type 2 Projects (Figure 7.1-3) and increased pumpage closer to the springs associated with Edwards Transfers. Additional information regarding Edwards Transfers and Recharge – Type 2 Projects can be found in Sections 4C.2 and 4C.20 (Volume II) respectively. As shown in Figures 7.1-4 and 7.1-5, simulated San Marcos Springs and Leona Springs discharges would increase substantially because the Edwards Recharge – Type 2 Projects, particularly the Lower Blanco Project and the Indian Creek Project, respectively. Overall pumpage from the Edwards Aquifer could increase (Figure 7.1-6) due to potential Edwards Aquifer Authority permits for recharge recovery and decreased frequency of withdrawal restrictions pursuant to development of the Edwards Recharge – Type 2 Projects. Figure 7.1-7 shows simulated water levels at key monitoring wells in Uvalde and Bexar Counties with implementation of the Plan.

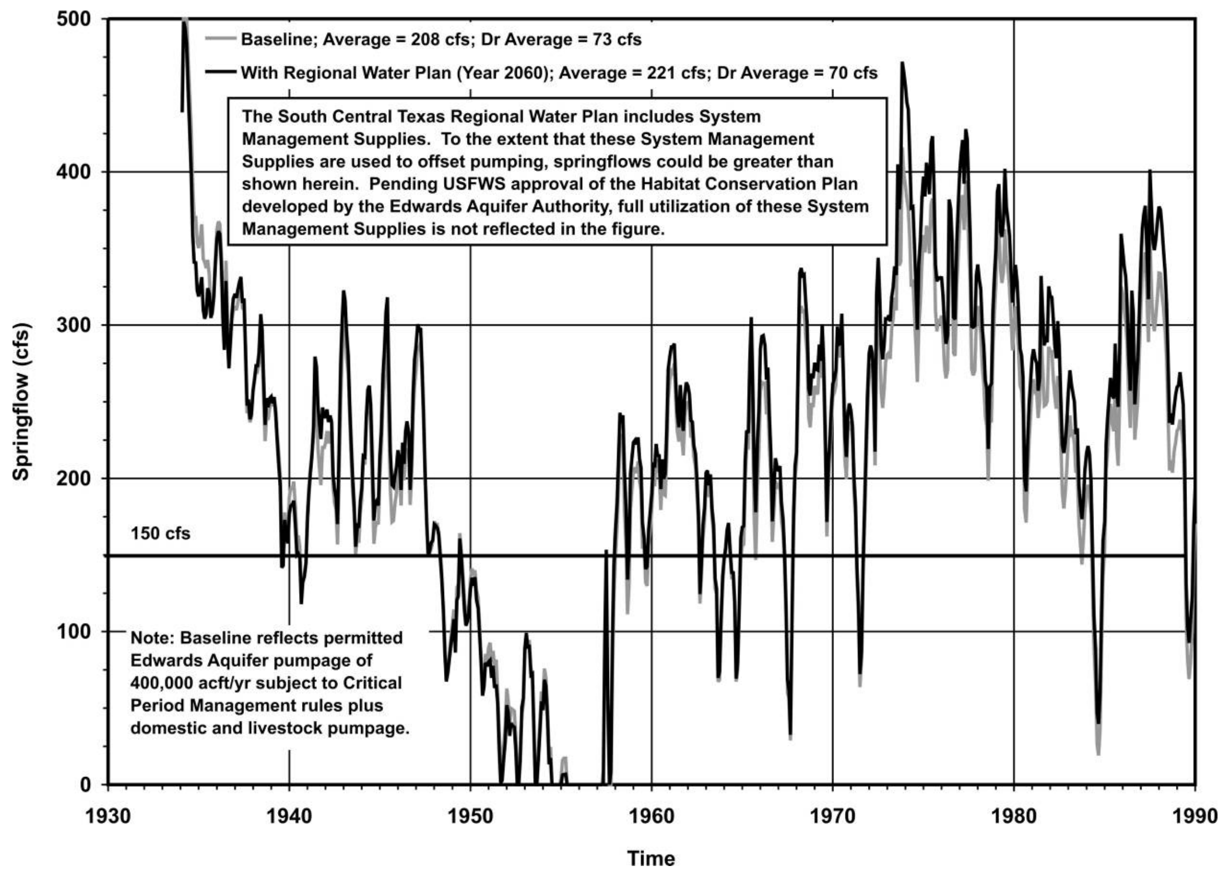


Figure 7.1-2. Simulated Comal Springflow

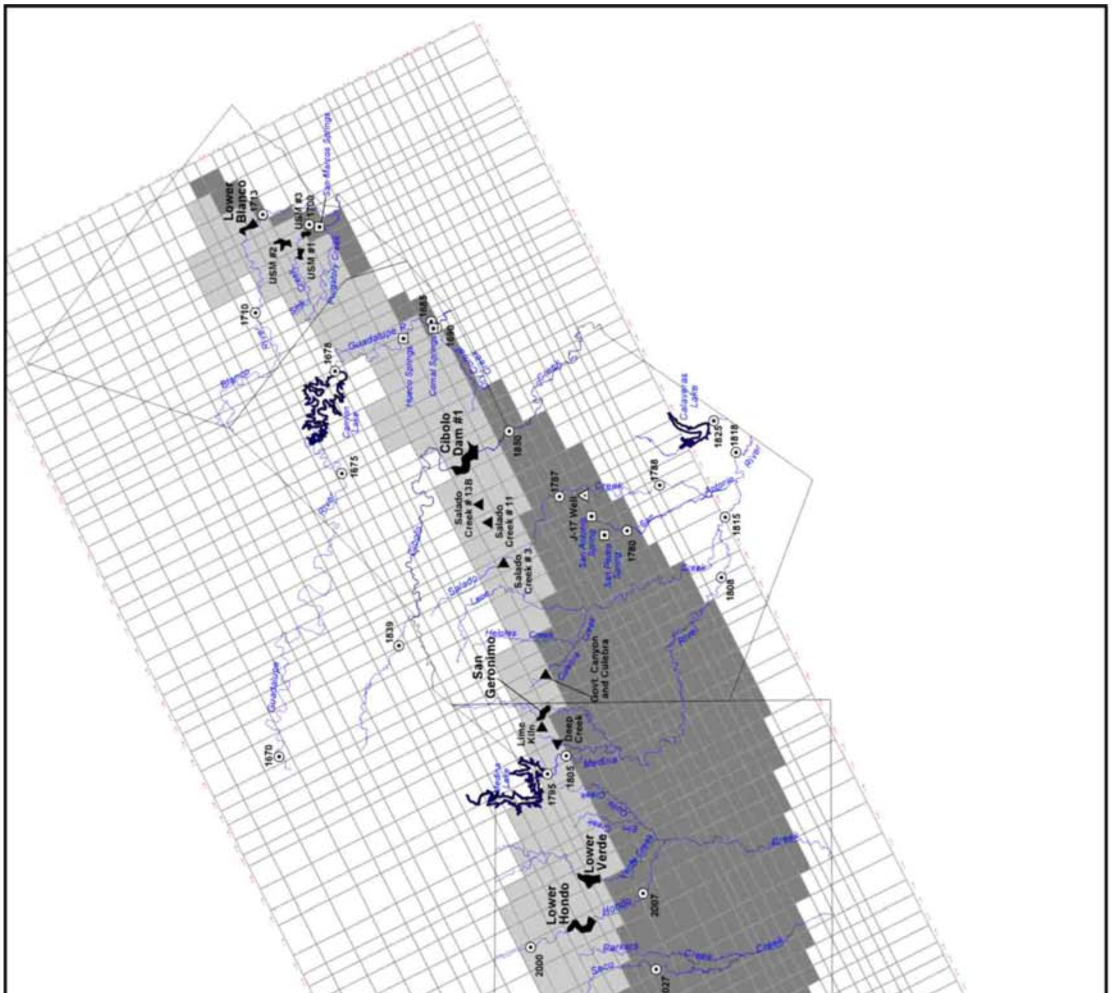


Figure 7.1-3. Edwards Recharge — Type 2 Projects

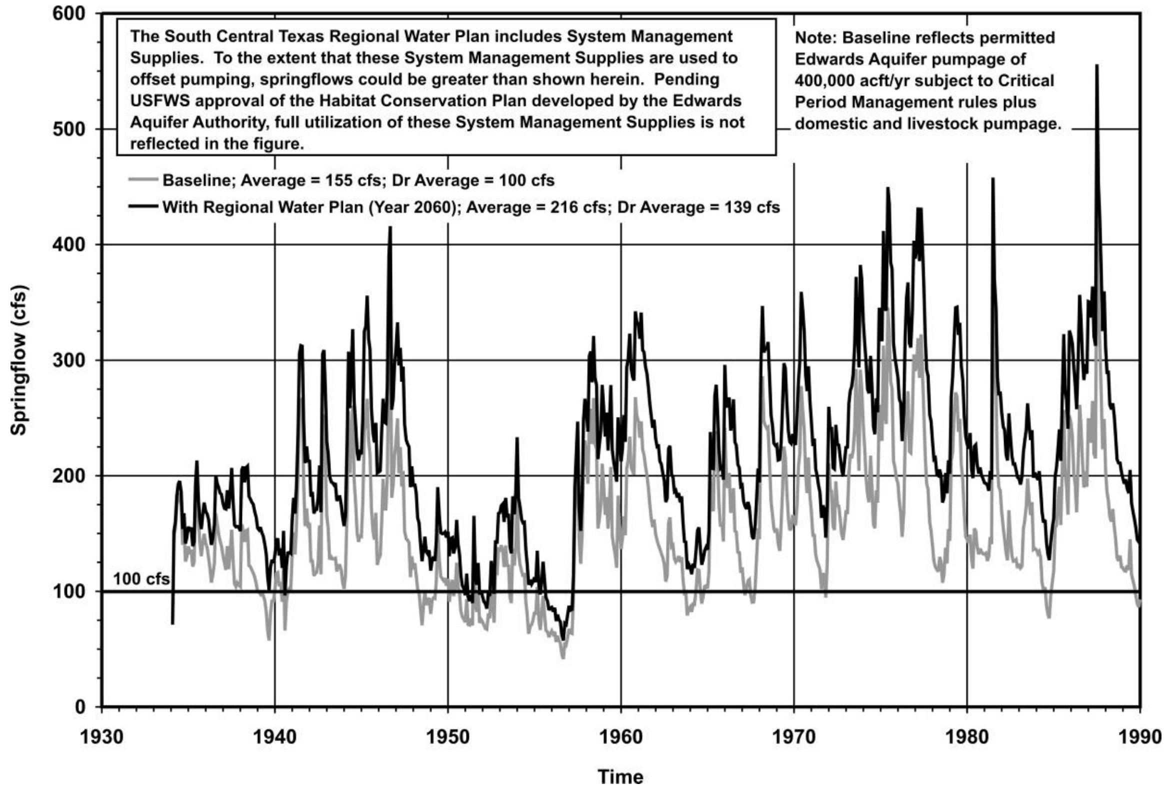


Figure 7.1-4. Simulated San Marcos Springflow

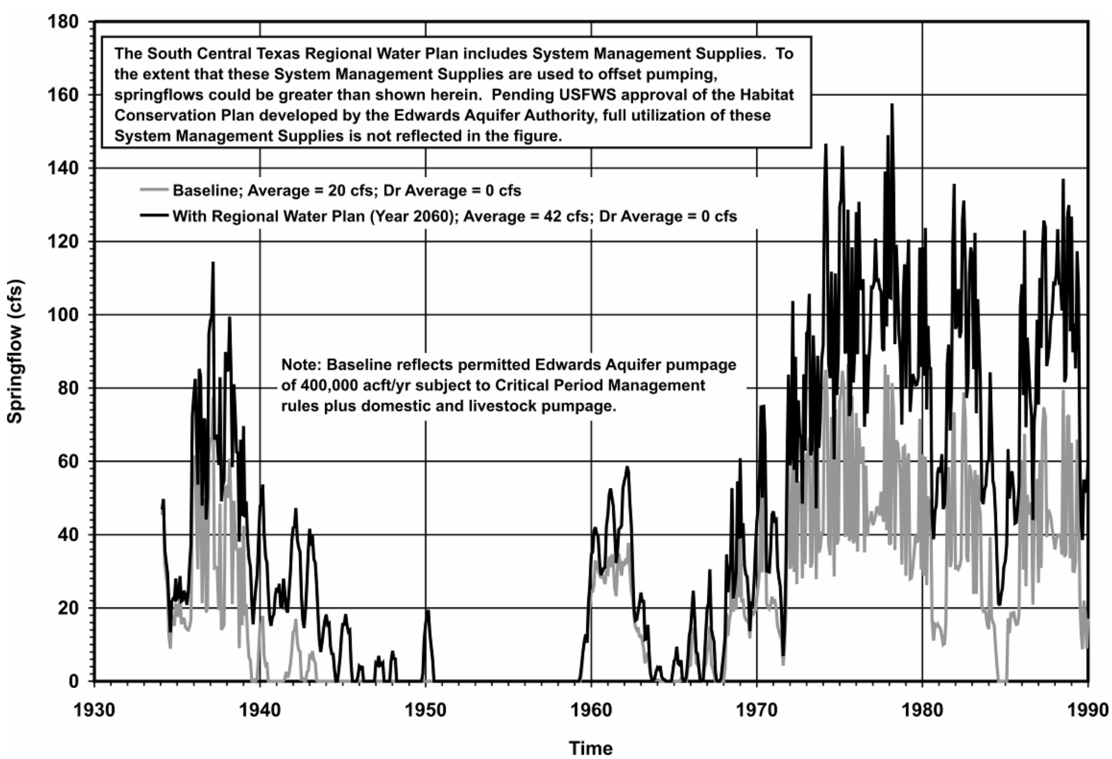


Figure 7.1-5. Simulated Leona Springflow

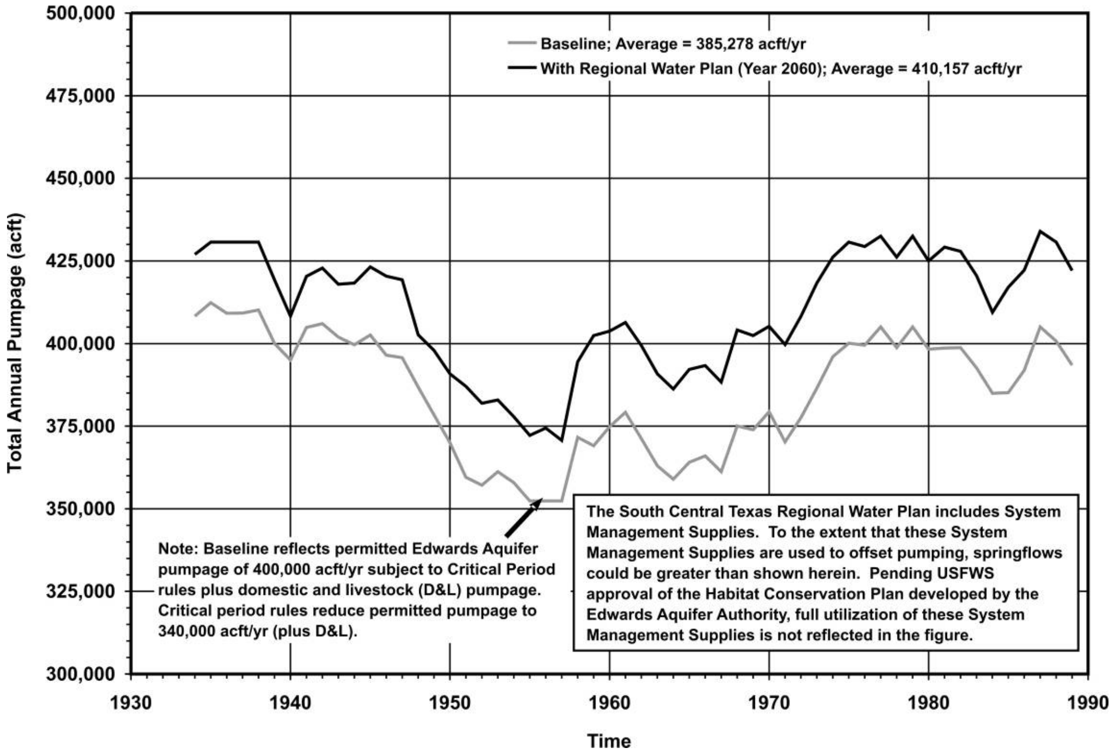


Figure 7.1-6. Simulated Edwards Aquifer Pumpage

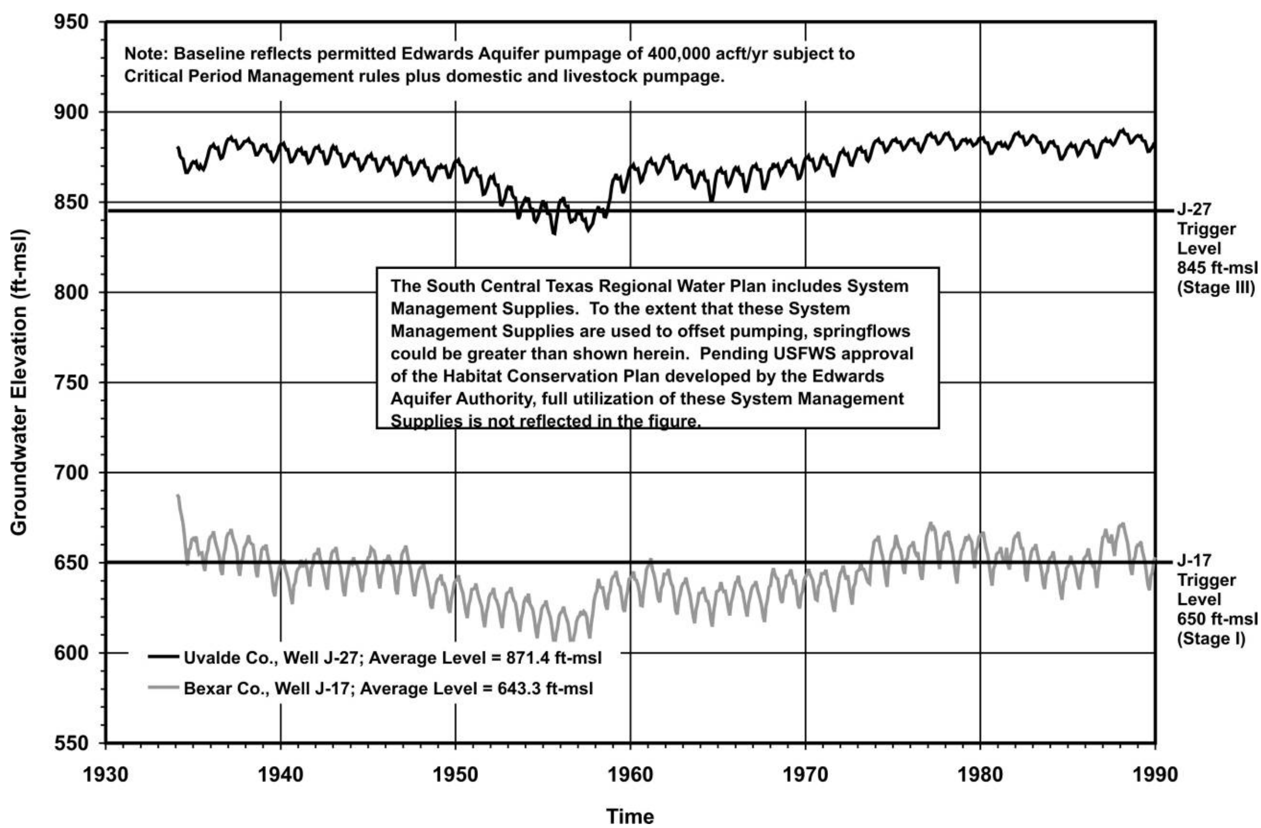


Figure 7.1-7. Simulated Edwards Aquifer Levels with Plan

The long-term cumulative effects of recommended water management strategies in the 2006 Regional Water Plan on the Carrizo Aquifer have been simulated using the SCCS groundwater model, at the direction of the RWPG[9]. Although several successive additive pumpage scenarios were modeled during the Water management Strategy evaluations (Sections 4C.12, 4C.14, 4C.15, 4C.16, 4C.17, and 4C.24), the purpose of those runs was to evaluate individual water management strategies, and not to assess cumulative effects. Pumping levels used in those simulations reflected requests made by the project sponsors, and may not reflect the needs assessments of the water providers involved. For the purpose of the cumulative effects evaluation, needs assessments were performed for each project sponsor, and the predictive pumpage was amended to conform to the planning group's evaluation of projected needs. Therefore, pumpage associated with some of the WMS projects was altered from the quantities represented in the WMS evaluations. Specifically, SSLGC pumpage was altered to slowly grow into an eventual demand of 25,000 acft/yr by 2060, instead of reaching that level of pumpage by 2020 and maintaining it at a constant level thereafter, as was done in the WMS evaluation. Also, the ultimate pumpage associated with the Hays/Caldwell project was decreased from a total of 27,000 acft/yr in 2060 to a total of 15,000 acft/yr in 2060. San Antonio Water System (SAWS) and Bexar Metropolitan Water District (BMWD), the Wells Ranch project sponsor, have unmet needs in excess of the amount of pumpage proposed for these projects in Sections 4C.14 and 4C.16, so these pumping quantities were maintained. In addition to projected pumpage for local supply (including BMWD's plans to produce 4,000 acft/yr from the Stagg Ranch wells in southern Bexar County), Carrizo Aquifer pumpage for the following recommended groundwater export projects is included at the amounts depicted in Figure 7.1-8 and presented in Table 7.1-1:

- Regional Carrizo for SSLGC Project Expansion (Gonzales and Guadalupe Counties) (4C.15, Volume II)
- Regional Carrizo for Bexar County (SAWS Project, Wilson and Gonzales Counties) (4C.14, Volume II)[10]
- Wells Ranch Carrizo Project (Gonzales and Guadalupe Counties) (4C.16, Volume II)
- Hays/Caldwell Carrizo Project (Caldwell, Gonzales, Bastrop, and Fayette Counties) (4C.17, Volume II)

[9] For additional pertinent information regarding consideration of water management strategies reliant upon the Carrizo Aquifer, please refer to Issues 2, 5, 6, and 7 in Section 10.2.2.3.
[10] Recent changes in the rules of the Evergreen Underground Water Conservation District may affect estimated costs for this project.

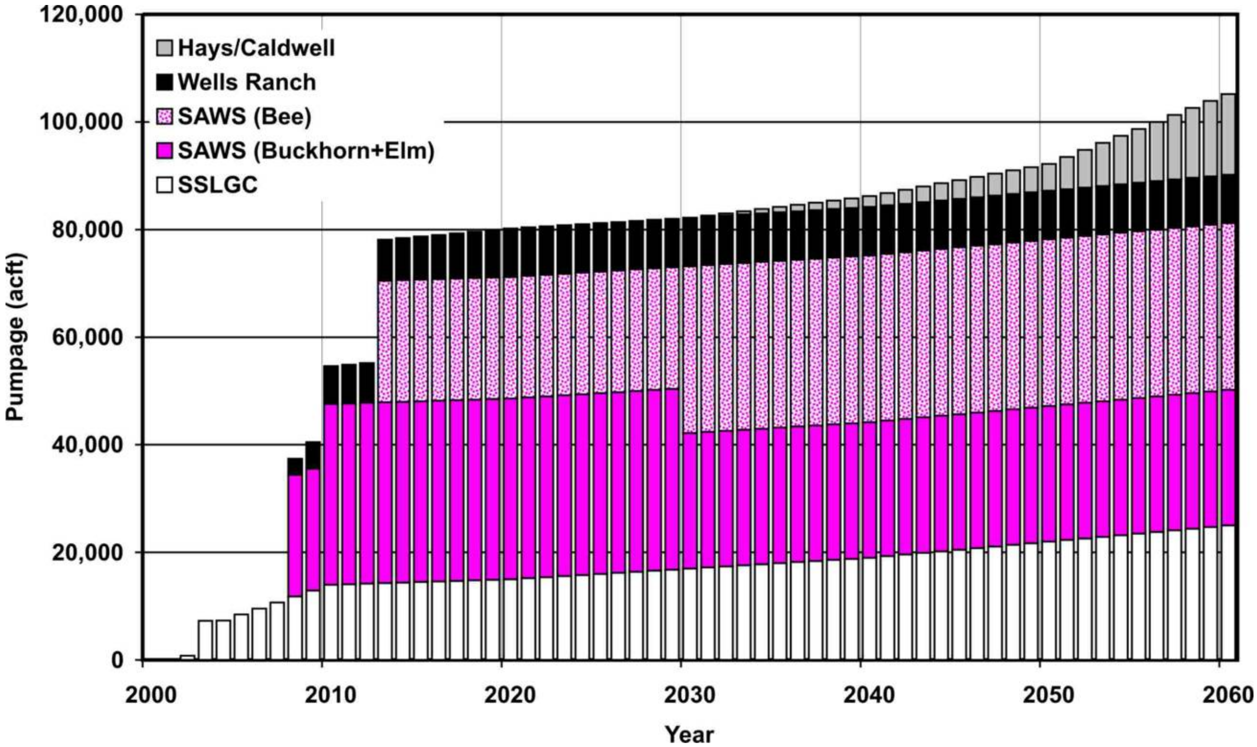


Figure 7.1-8. SCCS Cumulative Effects Simulation Predictive Groundwater Project Pumpage

Table 7.1-1.
Carrizo Groundwater Cumulative Effects Predictive Pumpage

Year	*SSLGC*	*SAWS Buckhorn*	*SAWS Elm*	*SAWS Bee*	*Wells Ranch*	*Hays/ Caldwell*	*Total*
2002	796	0	0	0	0	0	796
2008	11,794	22,600	0	0	3,000	0	37,394
2010	14,000	22,600	11,000	0	7,000	0	54,600
2013	14,300	22,600	11,000	22,600	7,600	0	78,100
2020	15,000	22,600	11,000	22,600	9,000	0	80,200
2030	17,000	16,950	8,250	31,000	9,000	200	82,400
2040	19,000	16,950	8,250	31,000	9,000	2,000	86,200
2050	22,000	16,950	8,250	31,000	9,000	5,000	92,200
2060	25,000	16,950	8,250	31,000	9,000	15,000	105,200

Predictive simulations were performed for the 2002-2060 time period. Local pumpage and groundwater project pumpage resulted in water level elevations in the Carrizo Aquifer and other aquifers being reduced over the time period of the simulation. The resulting Carrizo drawdown over the 59-year simulation period is presented in Figure 7.1-9.

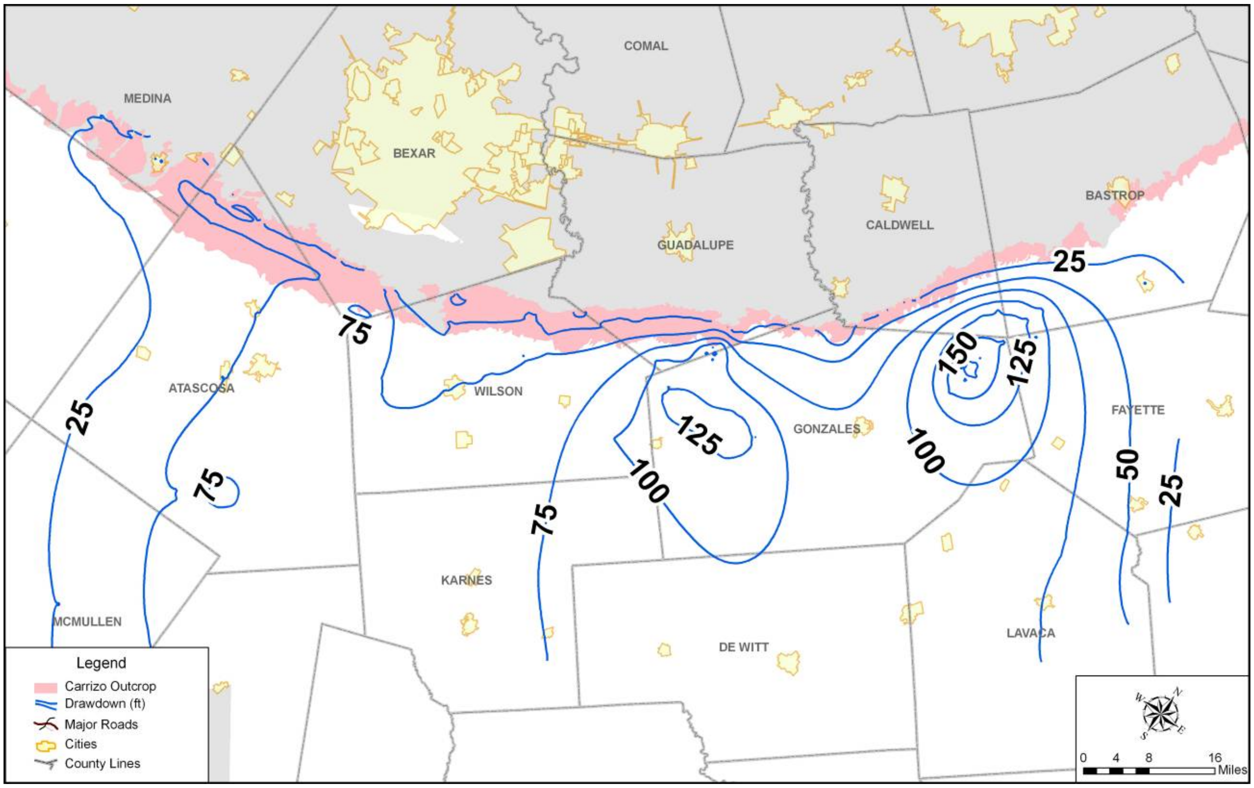


Figure 7.1-9. SCCS Cumulative Effects Simulation 2002 to 2060 Carrizo Drawdown

Due to the effect of vertical communication between adjacent geologic formations, pumping in the Carrizo may also cause lesser drawdown in adjacent formations such as the Wilcox, Queen City, and Sparta Aquifers. Drawdown in the outcrop areas of each aquifer, where hydrologic interaction between the aquifers and the stream channels occurs, resulted in a reduction of the modeled flow (flux) that naturally occurs from the aquifers to the stream channel. The cumulative effect of drawdown in all modeled aquifers in the SCCS model resulted in a reduction in the amount of discharge from the aquifers to the major stream channels within the model domain. This reduction occurs gradually over time. An example of the modeled change in surface water/groundwater interaction on the Guadalupe River is displayed in Figure 7.1-10. It is noted that this reduction does not occur at a single point in space or time, but is a cumulative result from diffuse sources along the bed and banks of the modeled streams in the watershed. The reduction depicted in Figure 7.1-10 represents the change over the entire length of stream channel in the model. Table 7.1-2 summarizes the ultimate simulated reduction in discharge from the aquifers to the streams at the end of the 59-year simulation period. These ultimate (2060) reductions or net changes are included in the surface water simulations described in Section 7.1.2.

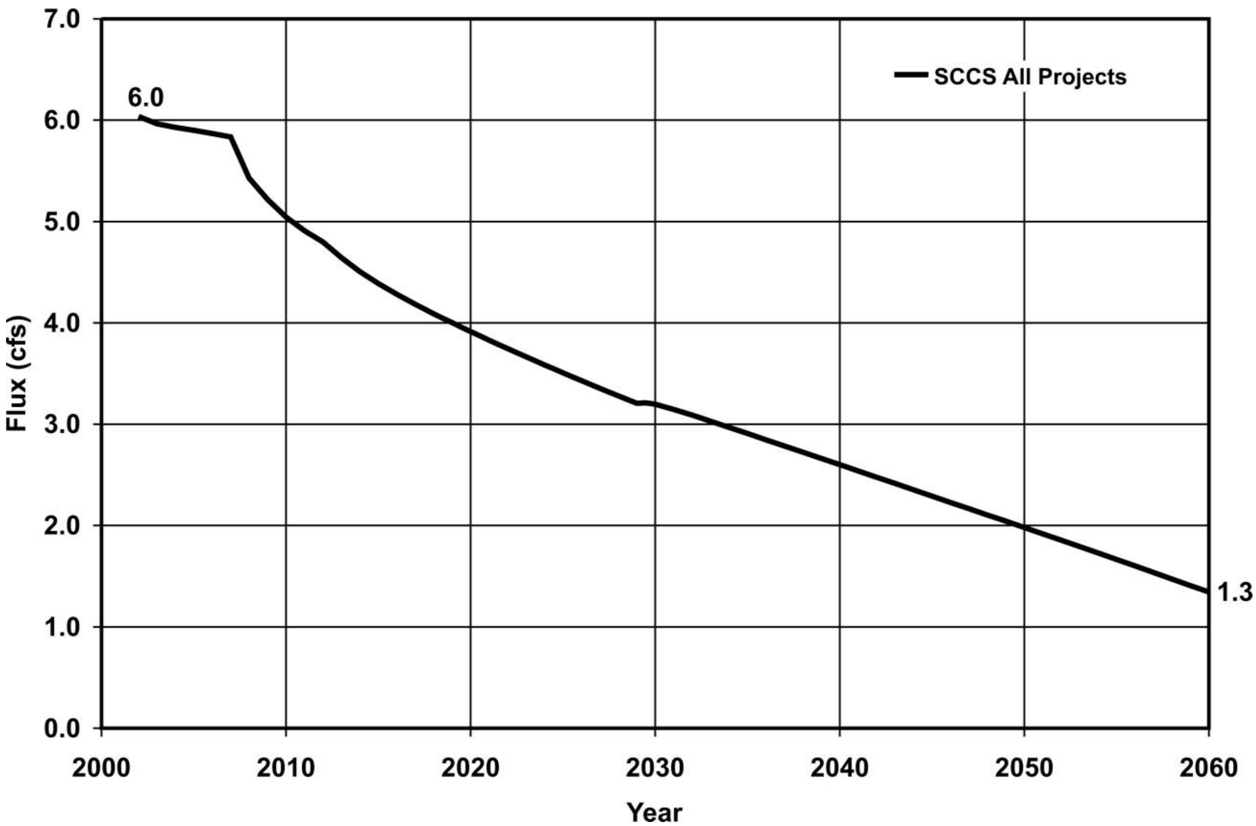


Figure 7.1-10. SCCS Cumulative Effects Simulation: Predictive Stream/ Aquifer Interaction at Guadalupe River

Table 7.1-2.
Flux From SCCS Aquifers to Streams (cfs)[1]

	San Antonio River (+Tributaries)	***Cibolo Creek***	***Guadalupe River***	***San Marcos River (+ Tributaries)***
2002	12.3	6.8	6.0	16.3
2060	0.7	0.6	1.3	8.4
Net Change	-11.6	-6.2	-4.7	-7.9

[1]Numbers represent flux from aquifers to stream channels. No initial upstream flow is included, nor adjustments for increased upstream municipal effluent.

Local groundwater demand and project-related pumpage were modeled using two versions of the Central Gulf Coast GAM – the Partially-Penetrating version (used to model local ground water demand) and the Fully-Penetrating version (used to model project-related pumpage). These models are essentially identical for most aquifer parameters, with one important difference—they differ in the representation of the hydraulic conductivity of the Evangeline Aquifer.

Recommended water management strategies or projects which minimally affect water levels in the Gulf Coast Aquifer in Region L include two potential projects recommended by the Coastal Bend Regional Water Planning Group (Region N). One of the Region N projects is under consideration by the San Patricio County Municipal Water District and would involve production of about 11,000 acft/yr from San Patricio and/or Bee Counties beginning in the near future. The other Region N project is under consideration by the City of Corpus Christi and would involve production of up to 7,000 acft/yr from southwestern Refugio County beginning in about 2055. Figures 7.1-11 and 7.1-12 illustrate the impacts of local groundwater demand and project-related pumpage on the Chicot and Evangeline Aquifers, respectively. The Region N projects minimally affect local water levels in the Chicot and Evangeline Aquifers. Apparent increases in water levels near Victoria are the result of the City's conversion to surface water as its primary source of supply beginning in 2001.

Due to the dependence of groundwater production on surface water availability for the City of Victoria, changes in the modeled flow or flux of water from the Gulf Coast Aquifer into streams and rivers is highly variable. Model simulations indicate that the net estimated changes in flux at the end of the drought of record, when groundwater production occurs at elevated rates as compared year 2000 conditions, may be summarized by location as follows:

- San Antonio River at Goliad — a reduction of 1.3 cfs in discharge from the aquifer to the stream;
- Guadalupe River at Victoria — an increase of 14.4 cfs in discharge from the aquifer to the stream; and
- Guadalupe River at Saltwater Barrier — an increase of 15.5 cfs in discharge from the aquifer to the stream.

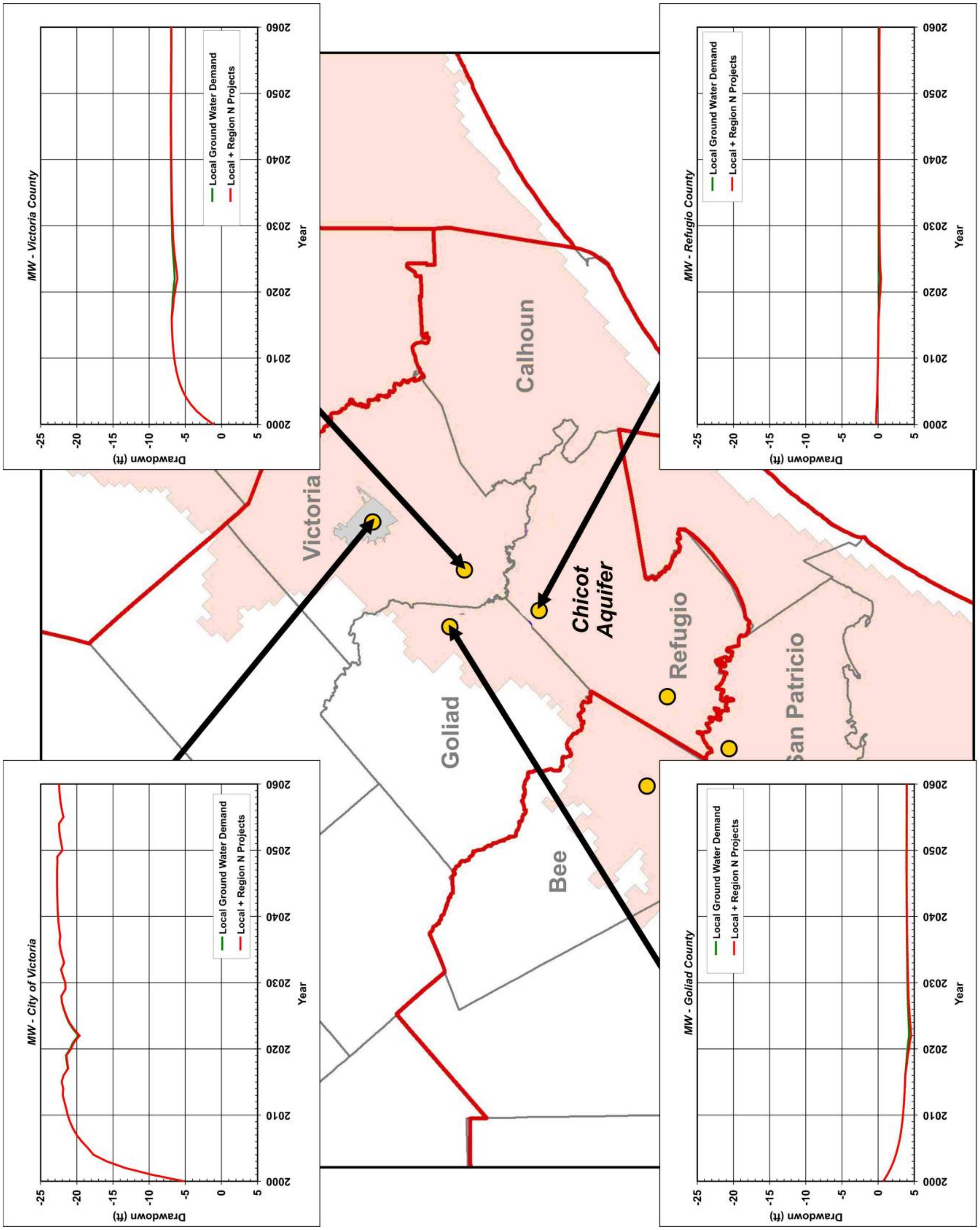


Figure 7.1-11. Predictive Drawdown Hydrographs for the Chicot Aquifer

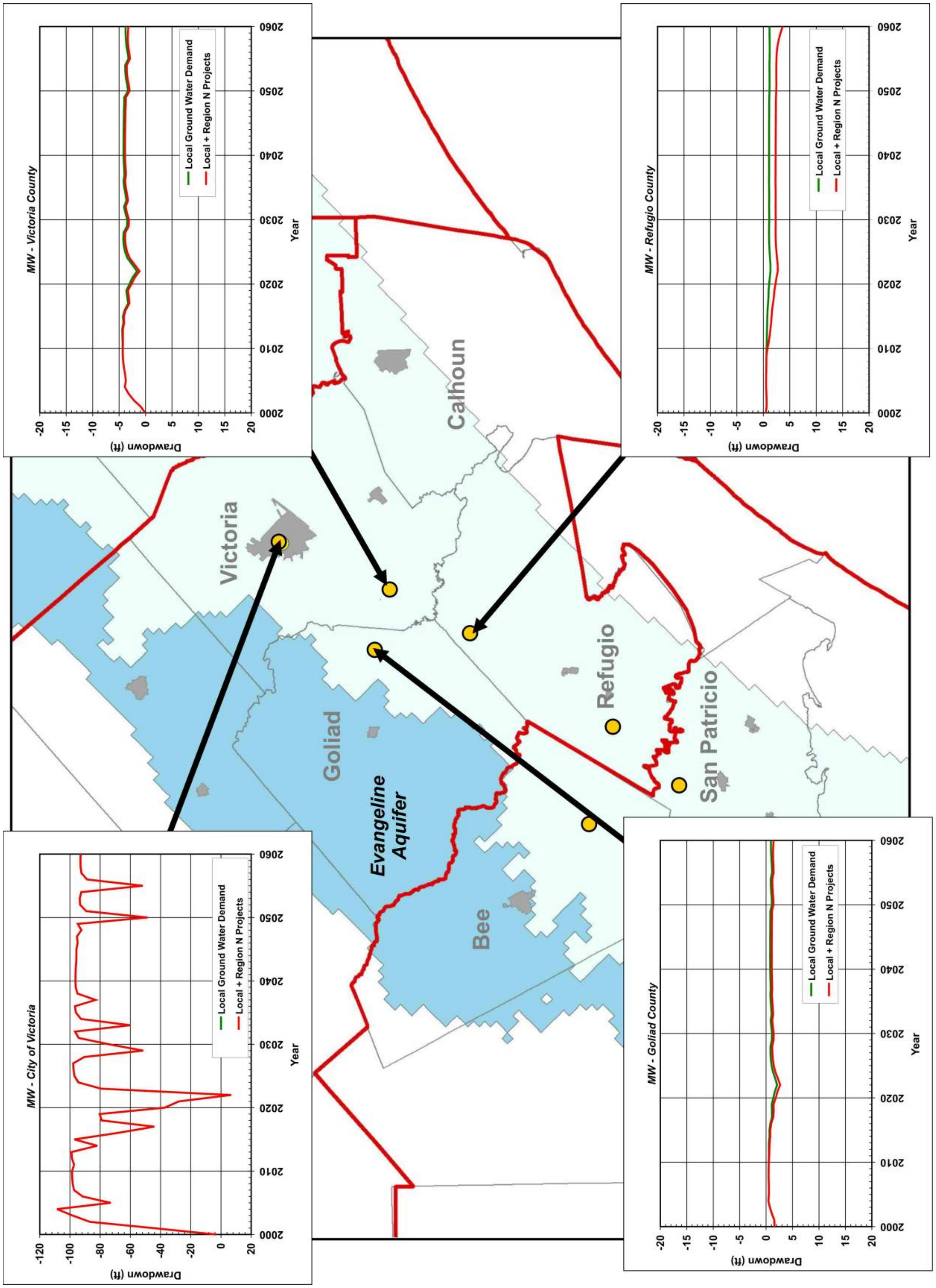


Figure 7.1-12. Predictive Drawdown Hydrographs for the Evangeline Aquifer

The apparent increase in discharge from the Gulf Coast Aquifer to the Guadalupe River at Victoria is a result of the City's historical reliance on groundwater and conversion to primary reliance on surface water beginning in 2001. For the purposes of conservative assessment of cumulative effects of groundwater production on surface water resources, these changes in flux representative of drought conditions are reflected throughout the period of record in the surface water simulations described in Section 7.1.2.

7.1.2 Surface Water

Potential cumulative effects of implementation of the 2006 South Central Texas Regional Water Plan on instream flows and freshwater inflows to bays and estuaries have been assessed for the eleven locations in the Guadalupe-San Antonio and Nueces River Basins shown in Figure 7.1-13. The cumulative effects simulation includes growth in effluent due to increased water demands for Bexar County (Table 7.1-3). The baseline for consideration of effects on flows reflects the baseline for the Edwards Aquifer, full utilization of existing water rights, and treated effluent discharge representative of current conditions.

The cumulative effects at these selected locations in the Guadalupe – San Antonio River Basin are summarized in Figures 7.1-14 through 7.1-20. Streamflow comparisons for the San Marcos River at Luling (Figure 7.1-15), the Guadalupe River at Victoria (Figure 7.1-16), the San Antonio River near Falls City (Figure 7.1-17), the San Antonio River at Goliad (Figure 7.1-18) the Guadalupe River at Diversion Dam & Saltwater Barrier near Tivoli (Figure 7.1-19), and the Guadalupe Estuary (Figure 7.1-20) indicate that streamflows are expected to increase with full implementation of the Plan. Increased streamflows at Luling and Victoria are due to Edwards Recharge – Type 2 Projects and the associated increases in Comal and San Marcos springflow. Increased streamflows at Falls City and Goliad are direct results of net projected increases in treated effluent discharge associated with increasing water use and expansion of SAWS Recycled Water Program in Bexar County. Figure 7.1-20 shows increases in estuarine inflows (as compared to the baseline) for the Guadalupe Estuary in 2060 mainly due to increase in effluent.

#	Location	USGS Streamgage #
Guadalupe-San Antonio River Basin		
1	Guadalupe River above Comal River @ New Braunfels	08168500
2	San Marcos River @ Luling	08172000
3	Guadalupe River @ Victoria	08176500
4	San Antonio River near Falls City	08183500
5	San Antonio River @ Goliad	08188500
6	Guadalupe River @ Diversion Dam & Saltwater Barrier near Tivoli	08188800
7	Guadalupe Estuary	-
Nueces River Basin		
8	Nueces River below Uvalde	08192000
9	Nueces River @ Cotulla	08194000
10	Frio River near Derby	08205500
11	Nueces Estuary	-

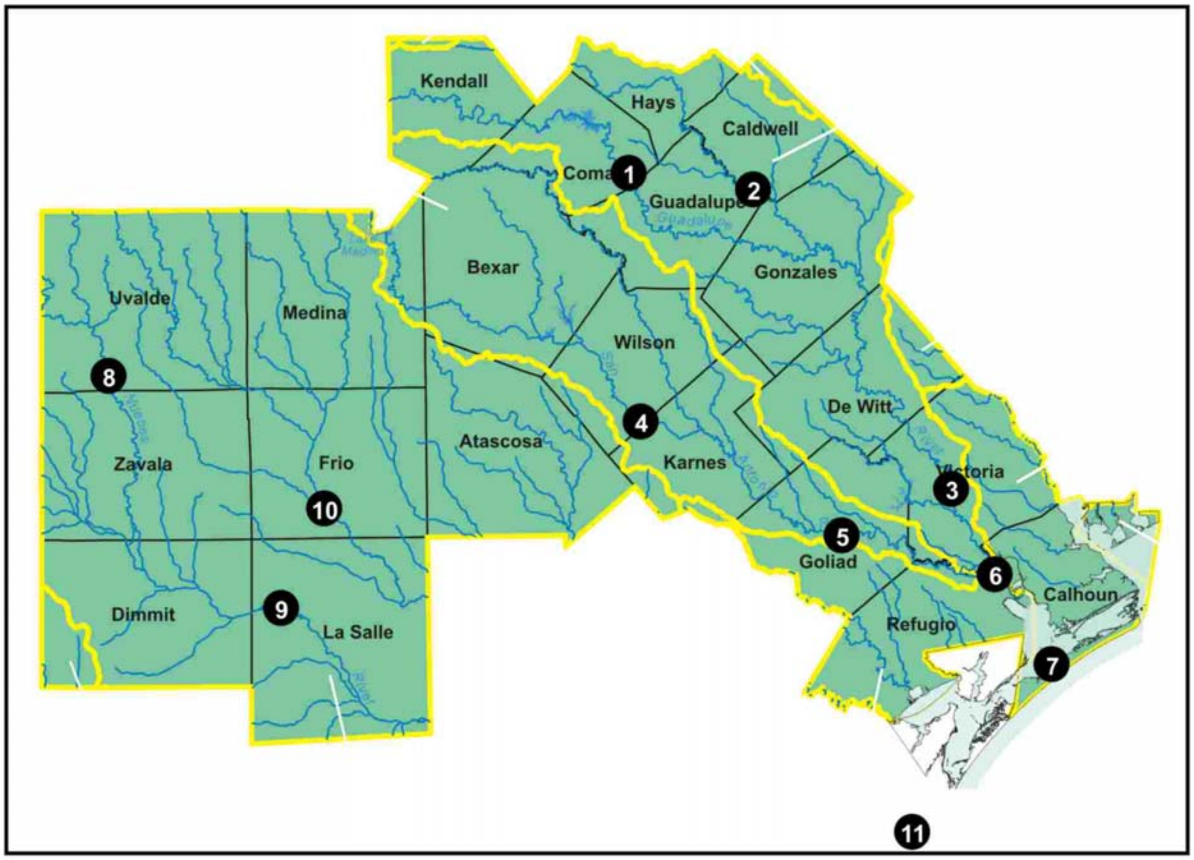
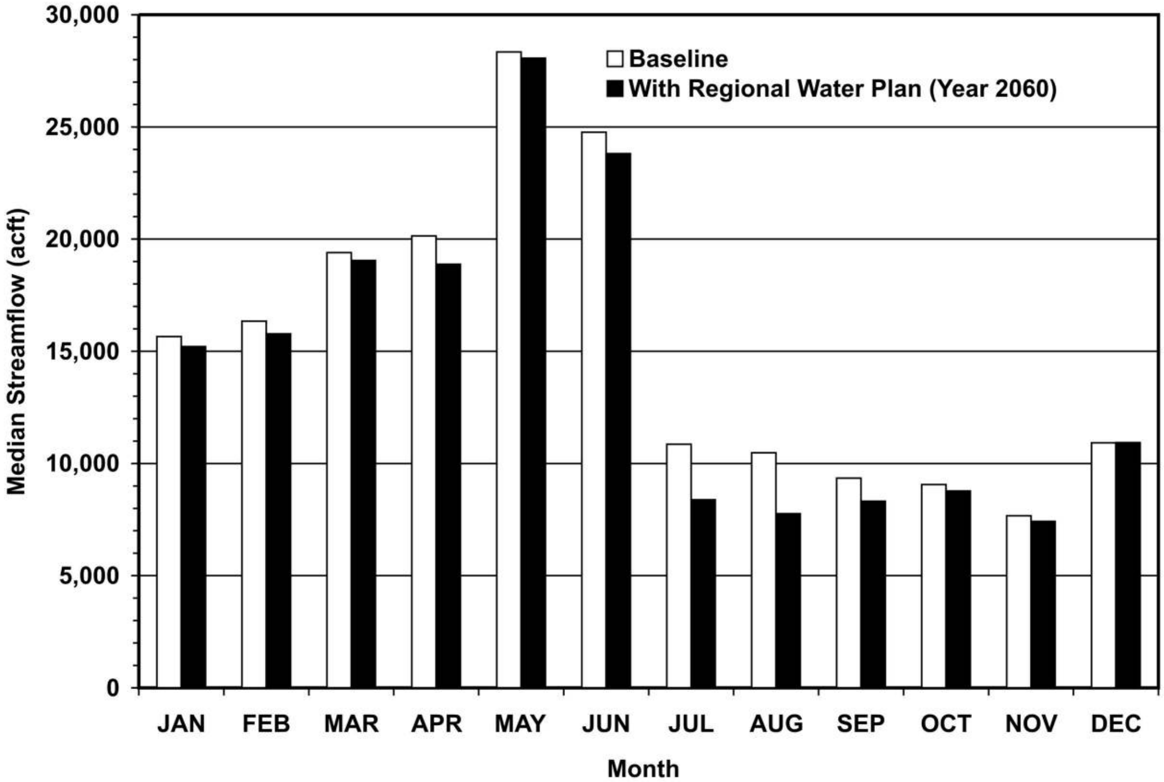


Figure 7.1-13. Flow Assessment Locations

Table 7.1-3. Effluent Accounting

Description	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
Municipal Demand, San Antonio (SAWS) [+]	172,815	198,065	220,078	241,043	256,842	272,214	287,593
Additional Municipal Conservation (SA Only) [-]		5,752	7,318	8,795	10,490	15,698	23,711
Industrial Demand, Bexar County [+]	21,252	25,951	29,497	32,775	36,068	38,965	42,112
Total M&I Demand [=]	194,067	218,264	242,257	265,023	282,420	295,481	305,994
20 % Total M&I Demand (Recycle Program Goal)	38,813	43,653	48,451	53,005	56,484	59,096	61,199
Current Recycle Program (Consumptive; Capacity = 35,000 Acft/yr)	24,941	24,941	24,941	24,941	24,941	24,941	24,941
Additional Future Recycle Program		**18,712**	**23,510**	**28,064**	**31,543**	**34,155**	**36,258**
SAWS Effluent (60% of Total M&I Demand)	116,440	130,958	145,354	159,014	169,452	177,289	183,596
SAWS Effluent After Consumptive Recycle Program (40% of Total M&I Demand)	77,627	87,306	96,903	106,009	112,968	118,192	122,398
Other Bexar Co Municipal [+]	56,879	64,039	69,994	75,381	79,191	83,032	86,943
Additional Municipal Conservation [-]	0	1,471	3,066	4,585	5,863	7,186	9,089
Other Bexar Co Industrial [+]	0	0	0	0	0	0	0
Other Bexar Co M & I Demand [=]	56,879	62,568	66,928	70,796	73,328	75,846	77,854
Other Bexar Co Effluent	**34,127**	**37,541**	**40,157**	**42,478**	**43,997**	**45,508**	**46,713**
Total Bexar Co Municipal Demand [+]	229,694	262,104	290,072	316,424	336,033	355,246	374,536
Additional Municipal Conservation [-]		7,223	10,384	13,379	16,353	22,884	32,800
Total Bexar Co Industrial Demand [+]	21,252	25,951	29,497	32,775	36,068	38,965	42,112
Total Bexar Co M & I Demand [=]	250,946	280,832	309,185	335,820	355,748	371,327	383,848
Total Bexar Co Effluent	**150,568**	**168,499**	**185,511**	**201,492**	**213,449**	**222,796**	**230,309**
Bexar Co Effluent After Consumptive Recycle Program*	**125,627**	**124,846**	**137,060**	**148,487**	**156,965**	**163,700**	**169,110**

** City Public Service (CPS) has an opportunity to divert effluent as make-up water in accordance with its water rights (CA# 19-2161 & CA# 19-2162). Subject to full authorized consumptive use at the reservoirs, total diversions from the San Antonio River range from about 36,000 acft/yr to about 72,000 acft/yr and average about 56,000 acft/yr.*



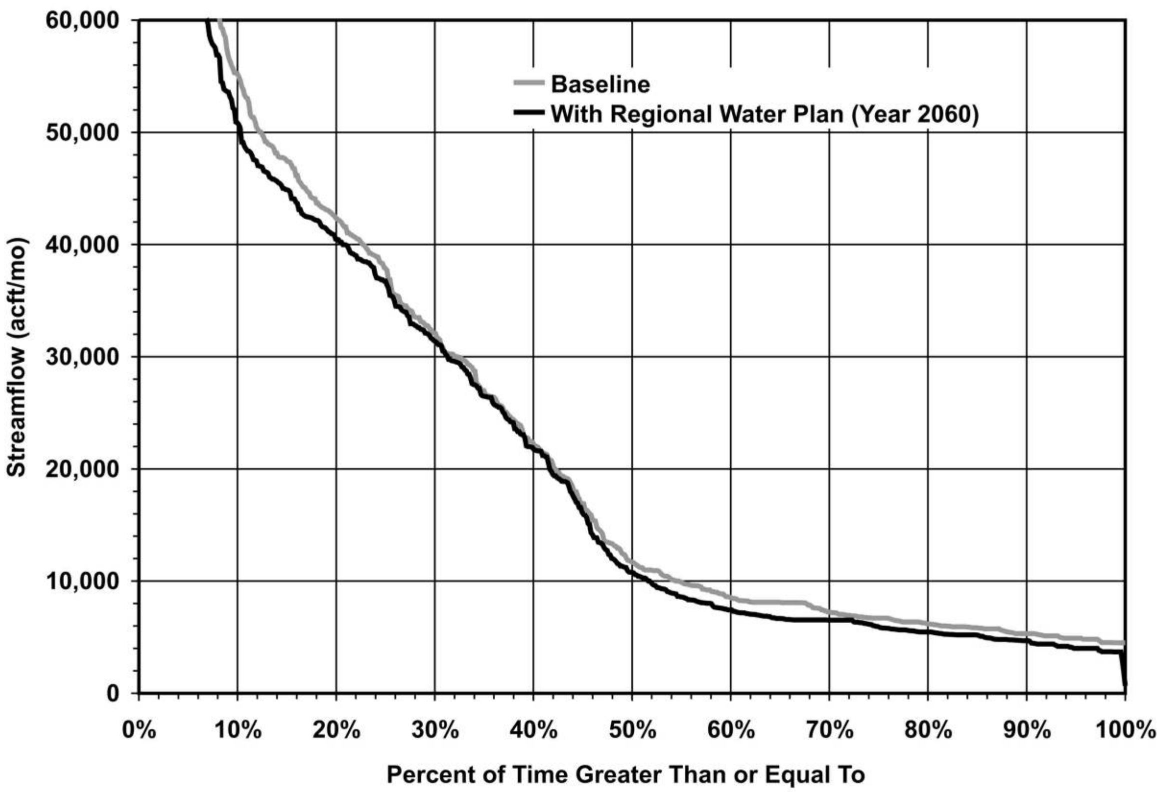
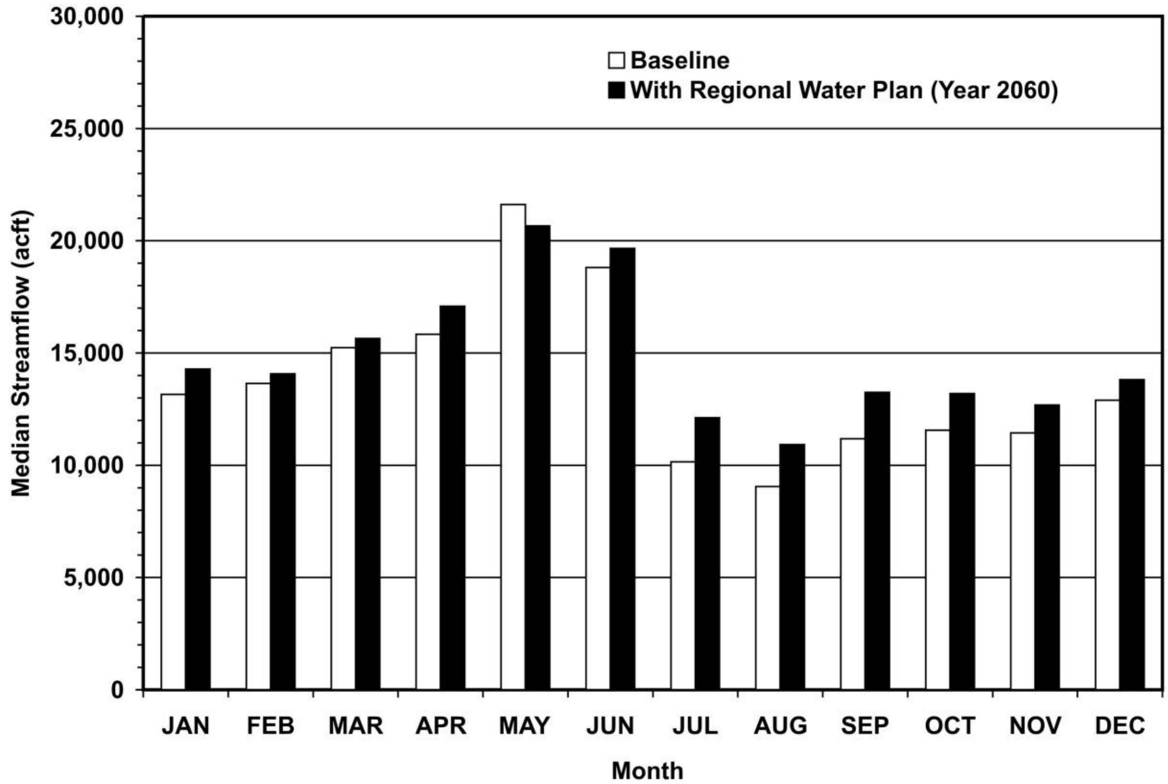


Figure 7.1-14. Guadalupe River above Comal River at New Braunfels



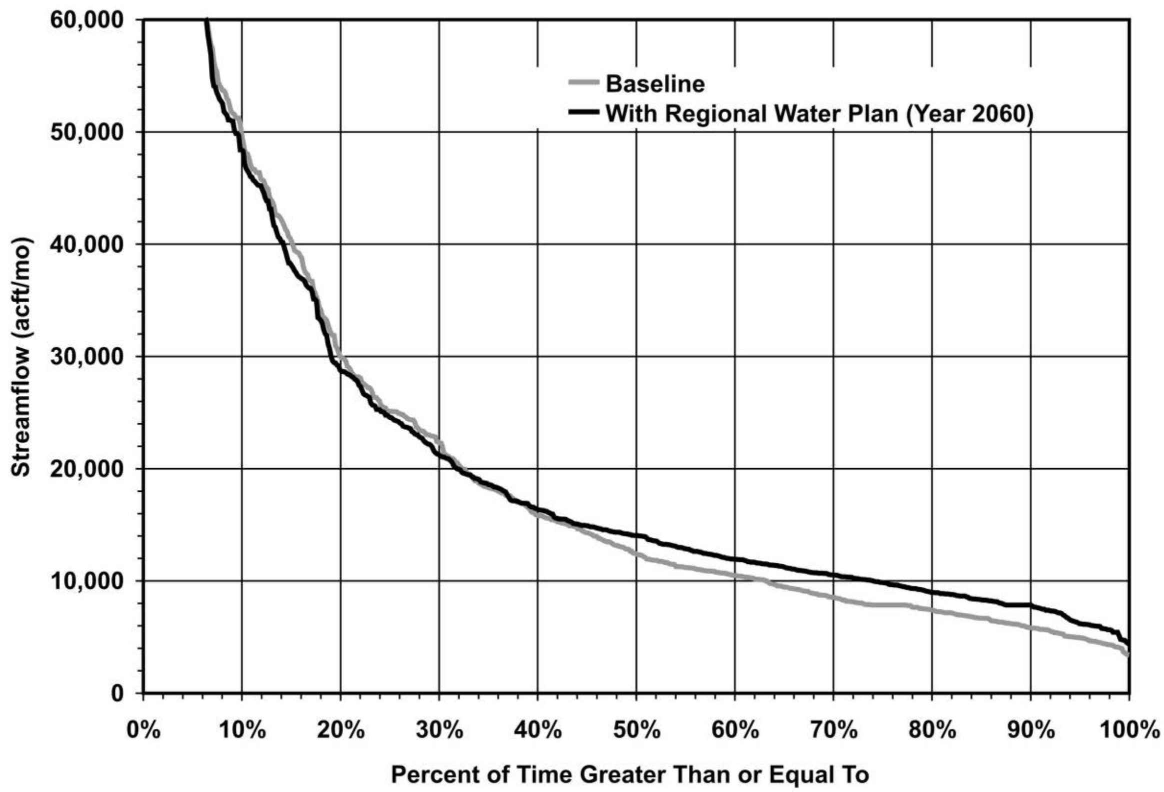
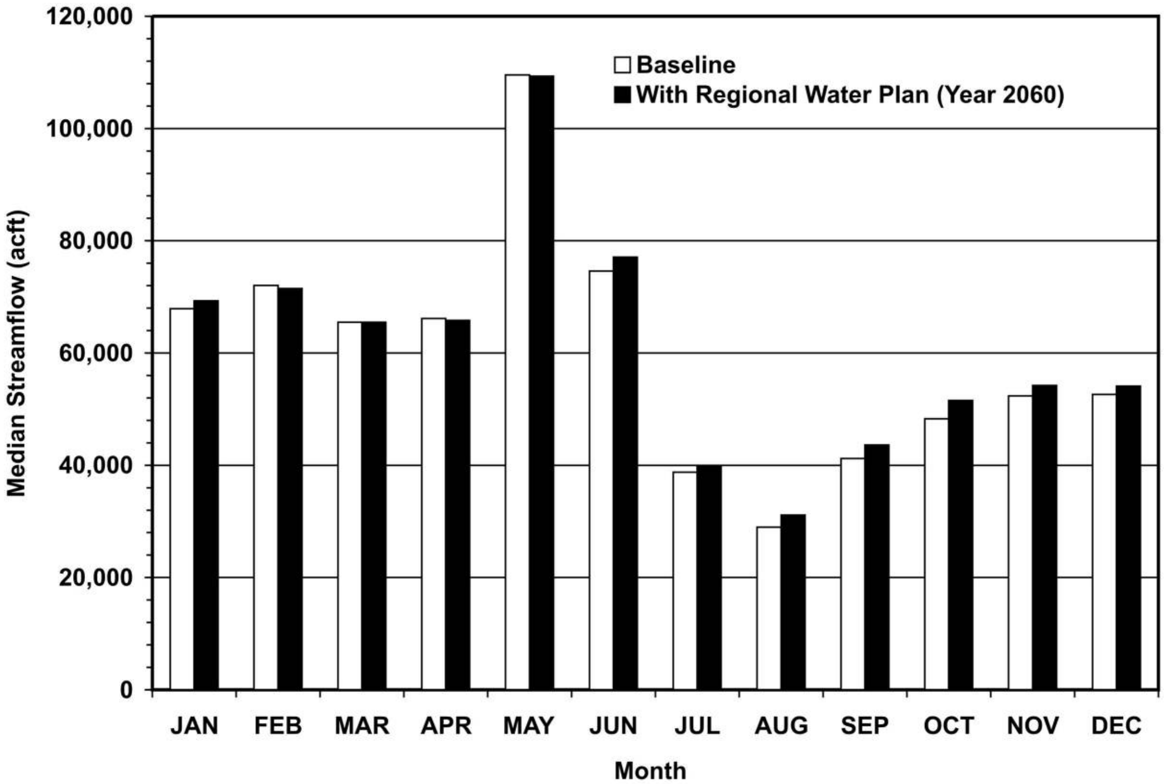


Figure 7.1-15. San Marcos River at Luling



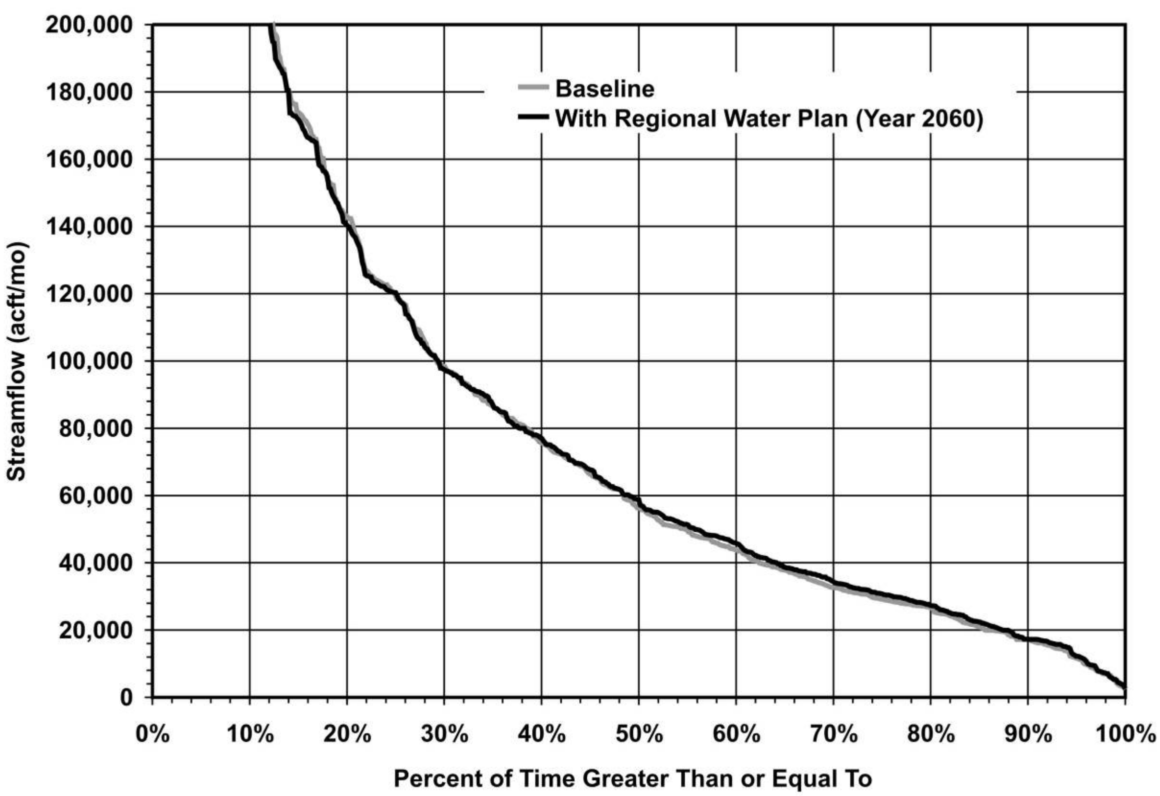
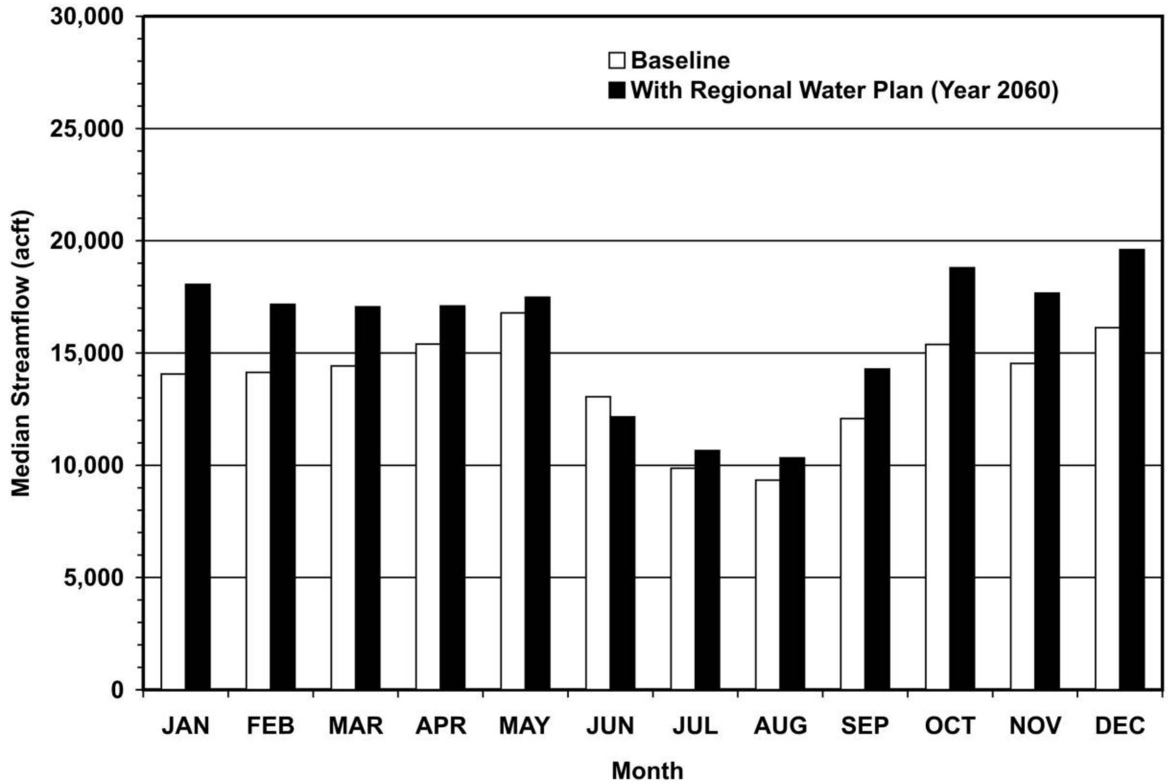


Figure 7.1-16. Guadalupe River at Victoria



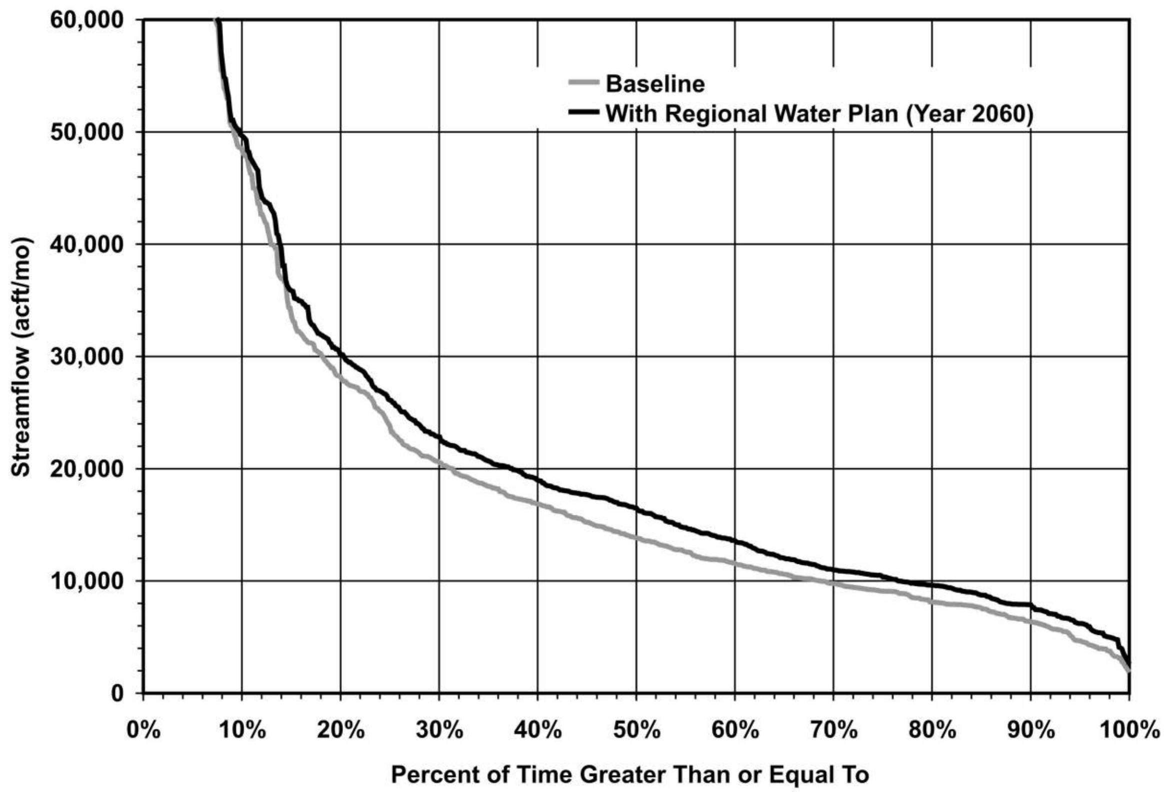


Figure 7.1-17. San Antonio River near Falls City

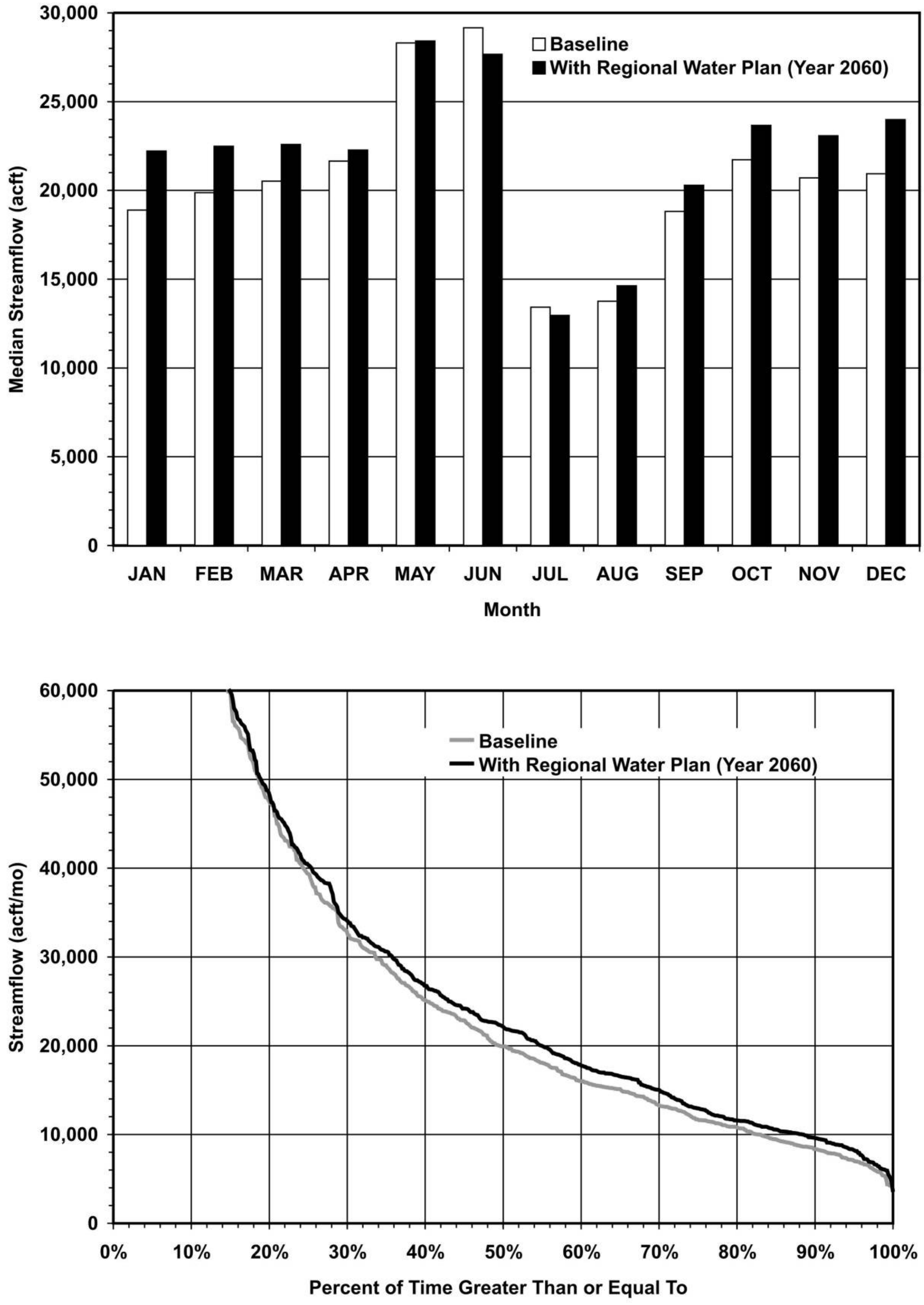
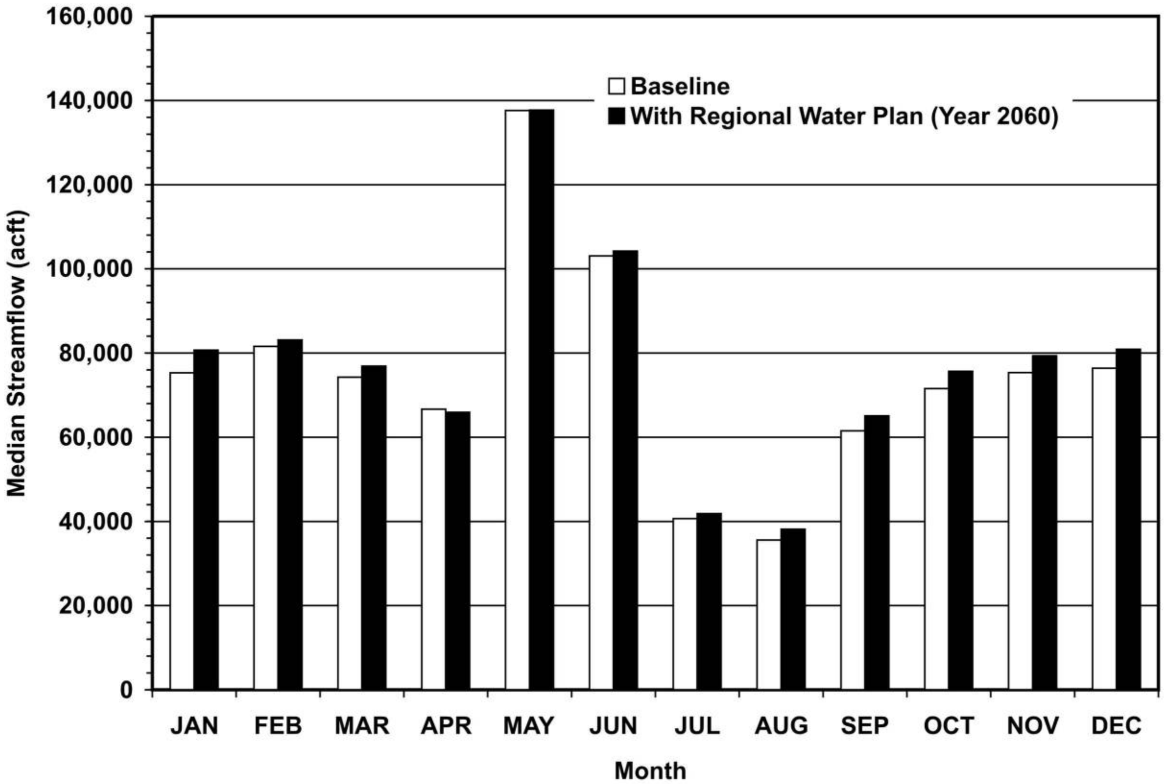


Figure 7.1-18. San Antonio River at Goliad



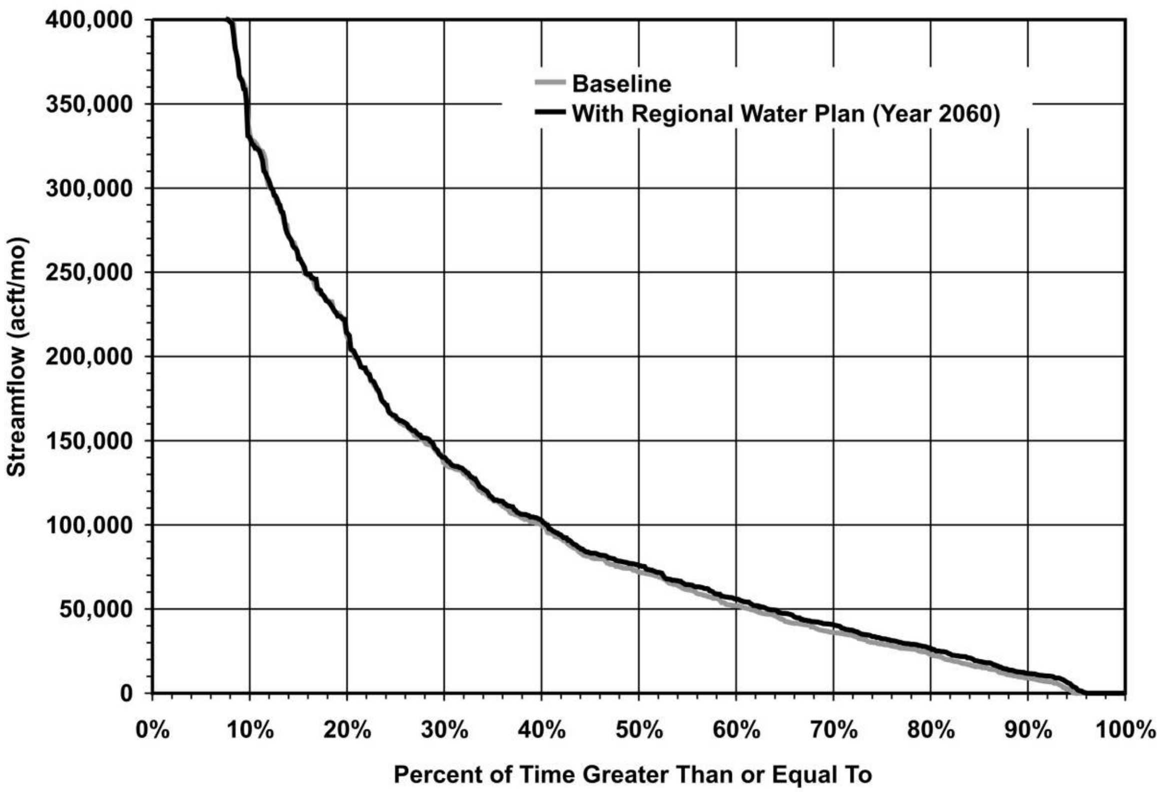
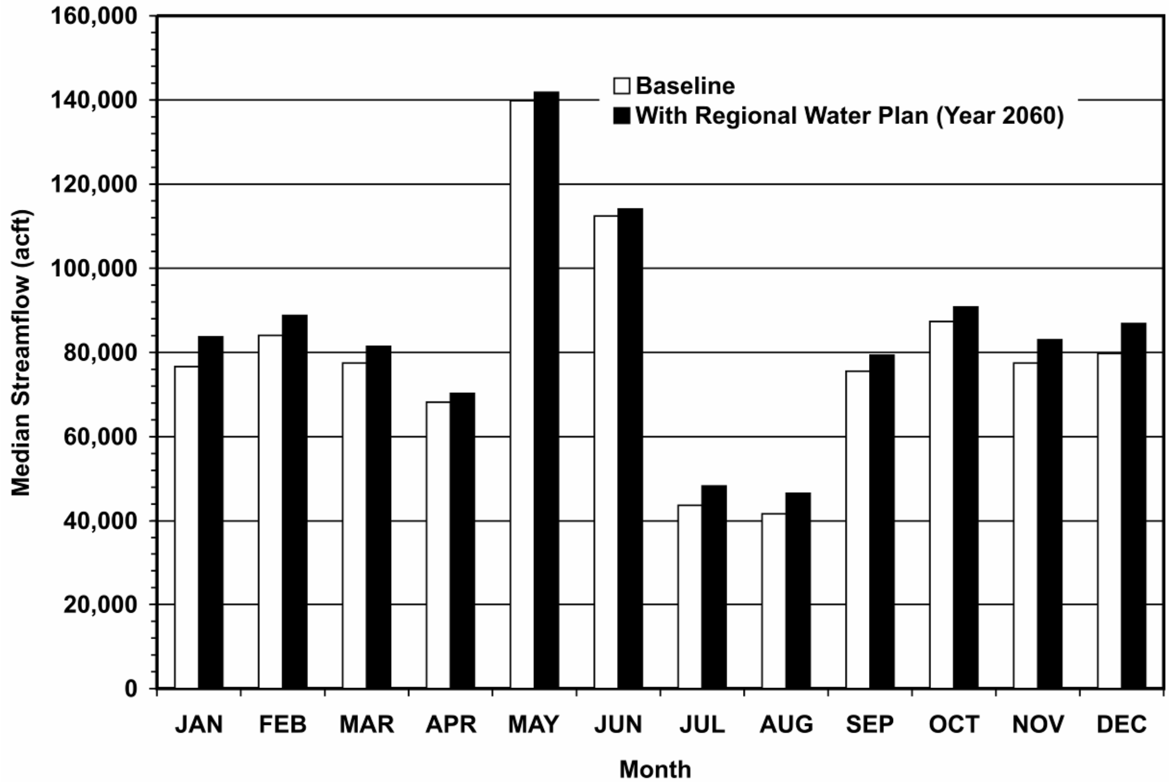


Figure 7.1-19. Guadalupe River at Diversion Dam and Saltwater Barrier near Tivoli



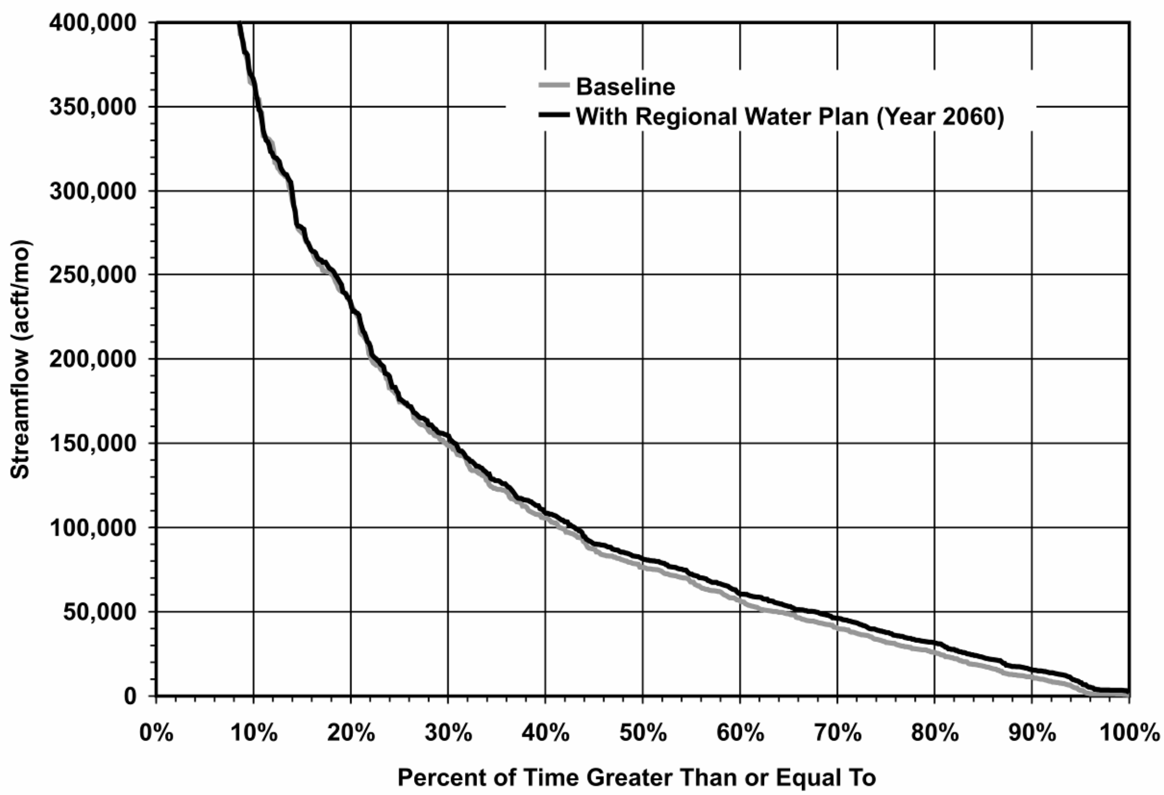


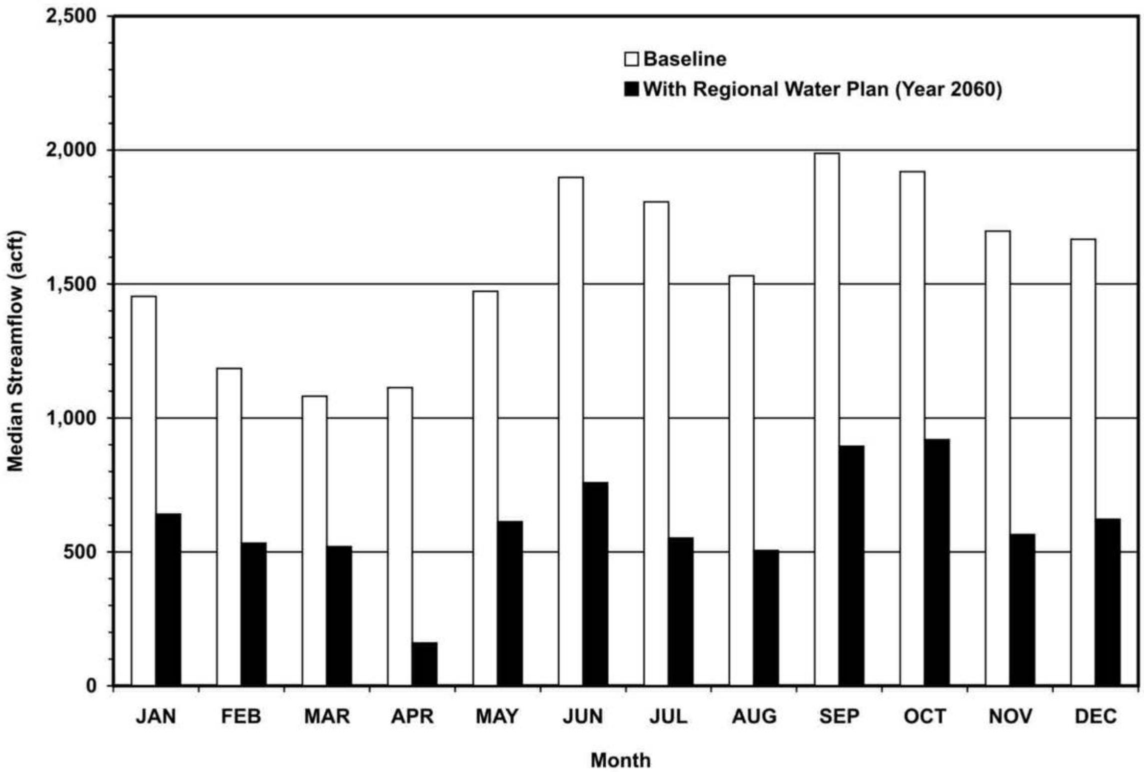
Figure 7.1-20. Guadalupe Estuary

Potential effects of implementation of the South Central Texas Regional Water Plan on flows in the Nueces River Basin are summarized in Figures 7.1-21 through 7.1-24. Decreased streamflows for the Nueces River below Uvalde (Figures 7.1-21) and the Nueces River at Cotulla (Figures 7.1-22) are attributed to enhanced recharge associated with Edwards Recharge – Type 2 Projects. Increased streamflows for the Frio River near Derby (Figure 7.1-23) in 9 of the 12 months may be attributed to increase in Leona Springs discharge due primarily to the Indian Creek Project, which is the largest of the Edwards Recharge – Type 2 Projects. Increased freshwater inflows to the Nueces Estuary (Figures 7.1-24) are net results of implementation of the Edwards Recharge – Type 2 Projects and increased return flows or treated effluent associated with implementation of water management strategies recommended in the 2006 Coastal Bend Regional Water Plan.

7.1.3 Supplemental Evaluations of Potential Long-Term Changes in Freshwater Inflows to the Guadalupe Estuary

The National Wildlife Federation (NWF) approached the SCTRWPG in May 2005 with a proposal to supplement the assessment of potential cumulative effects of regional water plan implementation on the Guadalupe Estuary by adding two alternative baselines for comparison and two ecologically-based assessments of inflows. Additional baselines for comparison include freshwater inflows under "Natural" and "Present" Conditions. The two ecologically-based assessments (described in Section 7.1.3.2) rely, in part, upon the freshwater inflow recommendations of the Texas Parks & Wildlife Department (TPWD) and the Texas Water Development Board (TWDB)[11] and focus upon spring / early summer freshwater inflow pulses and drought periods during the months of March through October as used in a recent NWF publication entitled "Bays in Peril, A Forecast for Freshwater Flows to Texas Estuaries."[12] Supplemental assessments of potential long-term changes in freshwater inflows to the Guadalupe Estuary are summarized in the following sub-sections.

[11] TPWD & TWDB, "Freshwater Inflow Recommendation for the Guadalupe Estuary of Texas," TPWD Coastal Studies Technical Report No. 98-1, December 1998.
[12] Johns, N.D., Hess, M., Kaderka, S., McCormick, L., & McMahon, J., "Bays in Peril, A Forecast for Freshwater Flows to Texas Estuaries," National Wildlife Federation, October 2004.



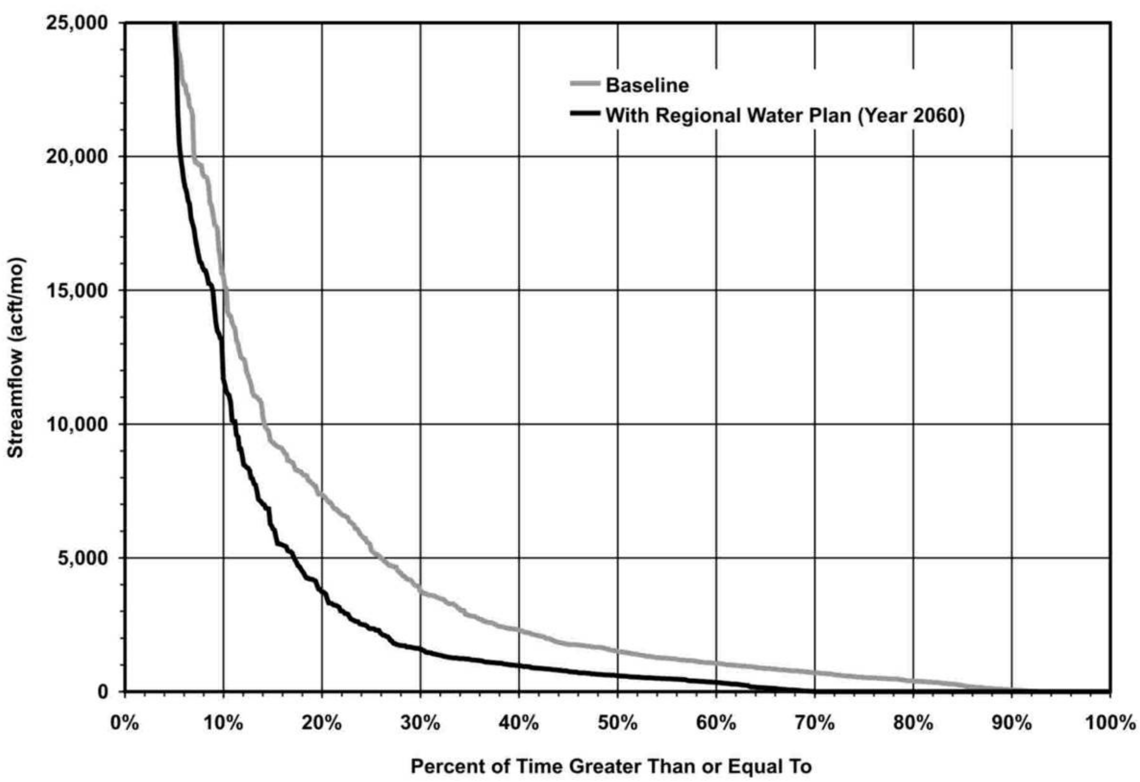
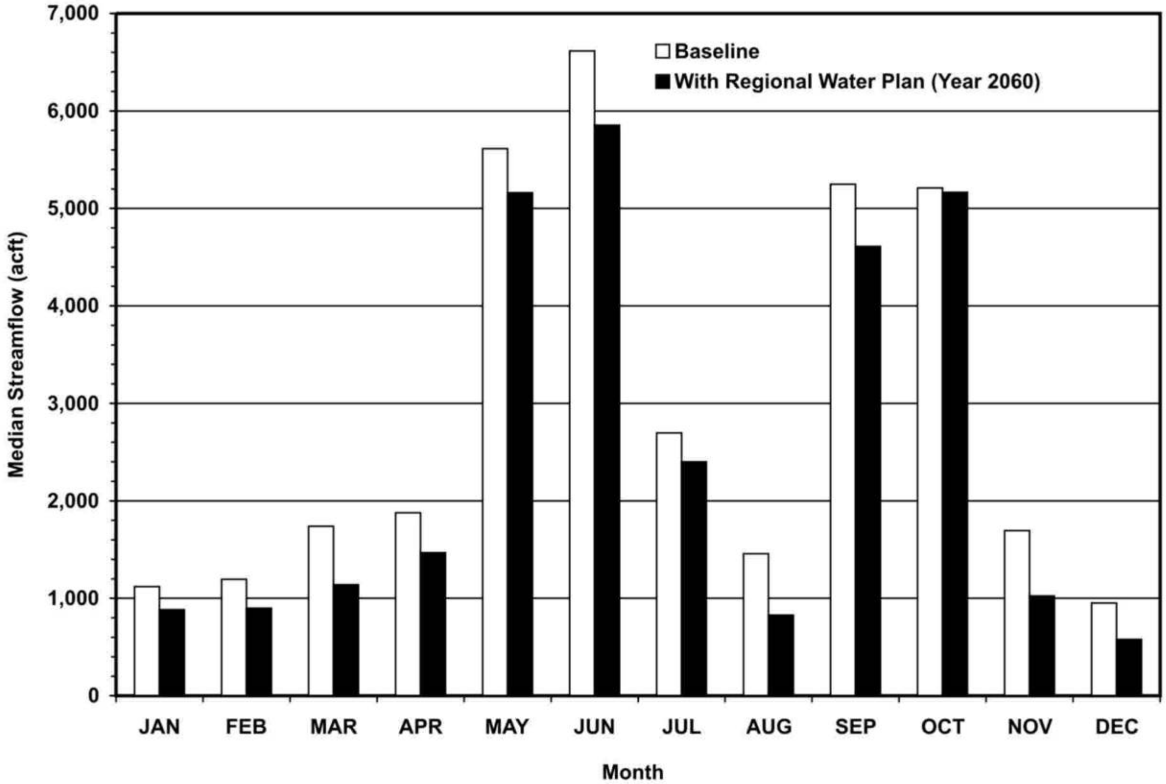


Figure 7.1-21. Nueces River below Uvalde



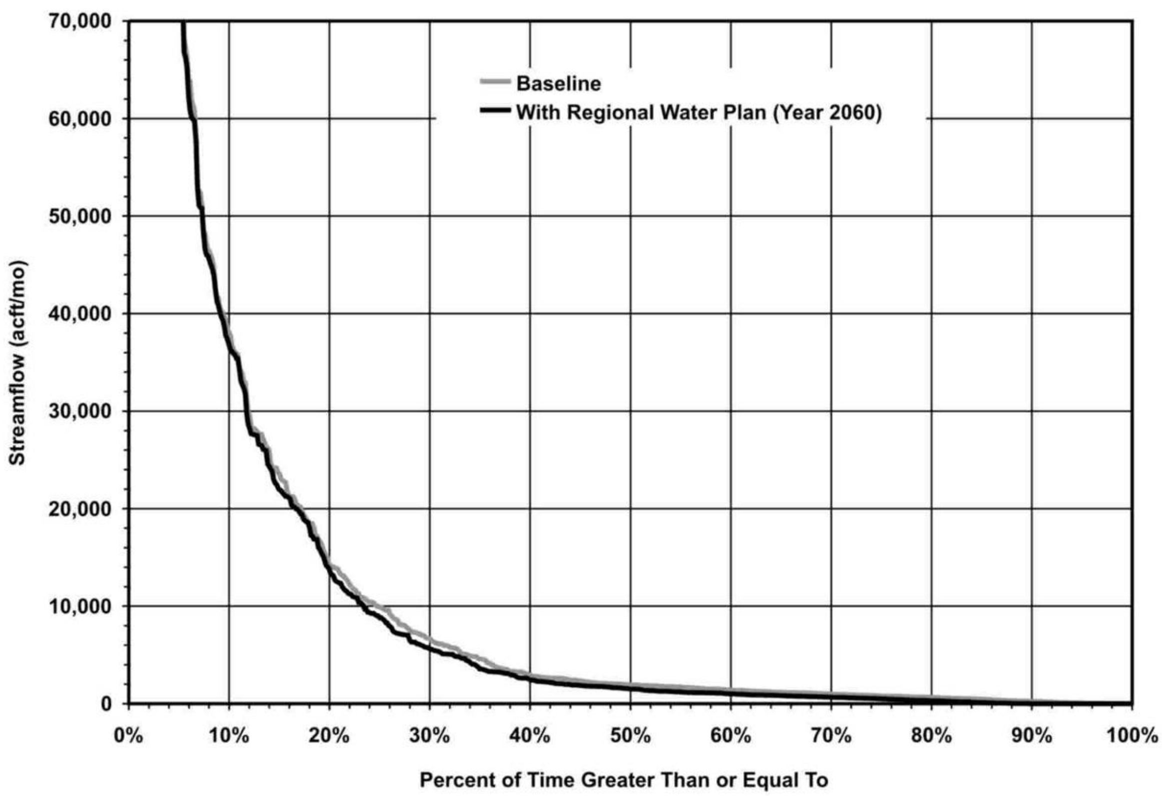
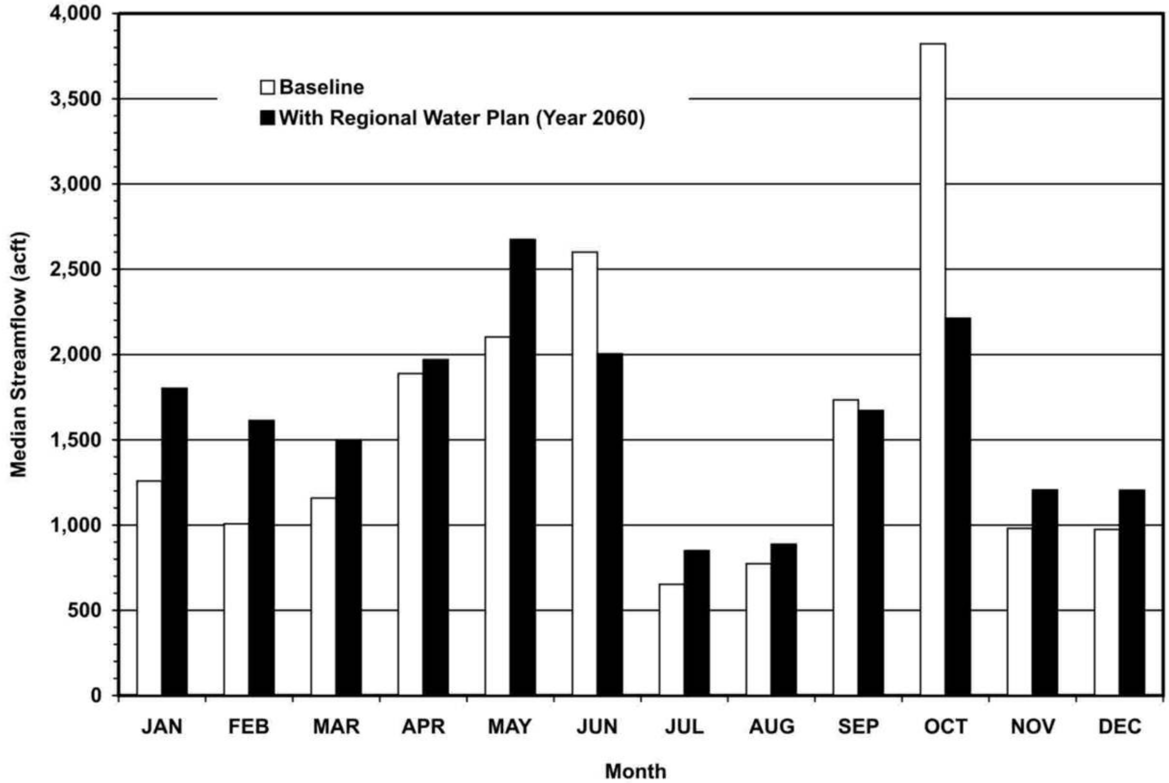


Figure 7.1-22. Nueces River near Cotulla



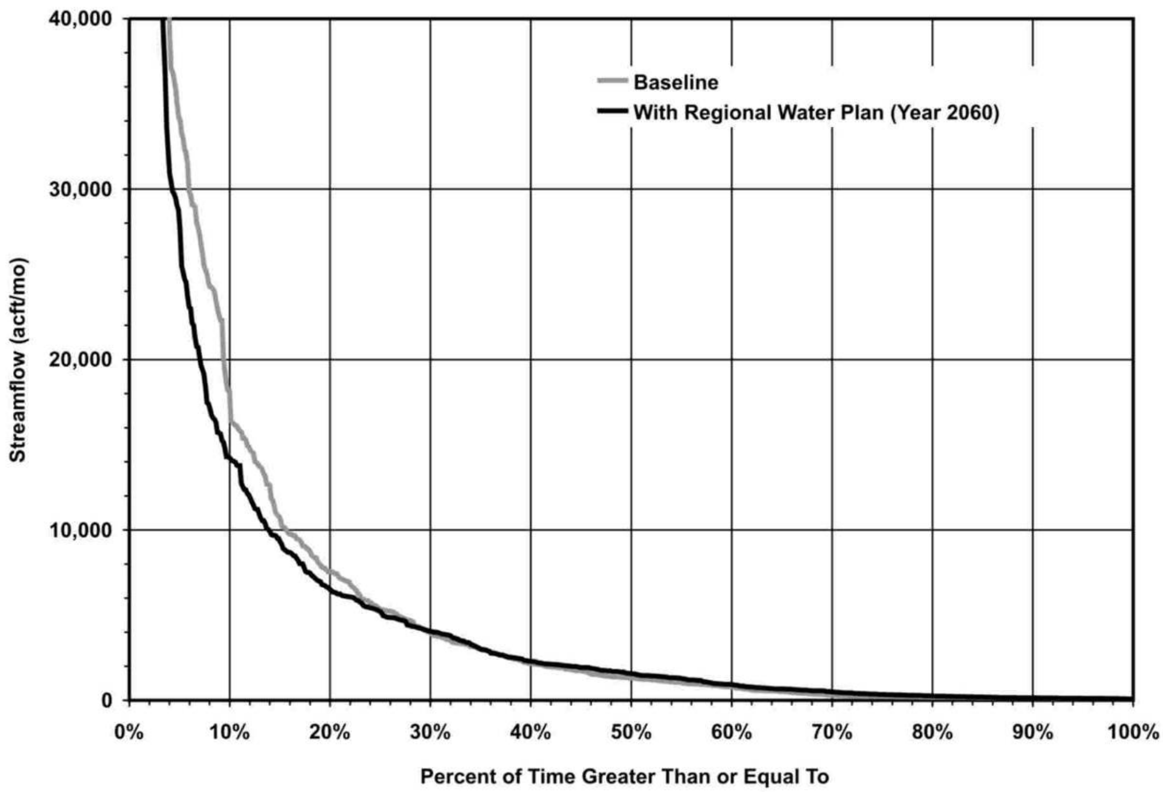
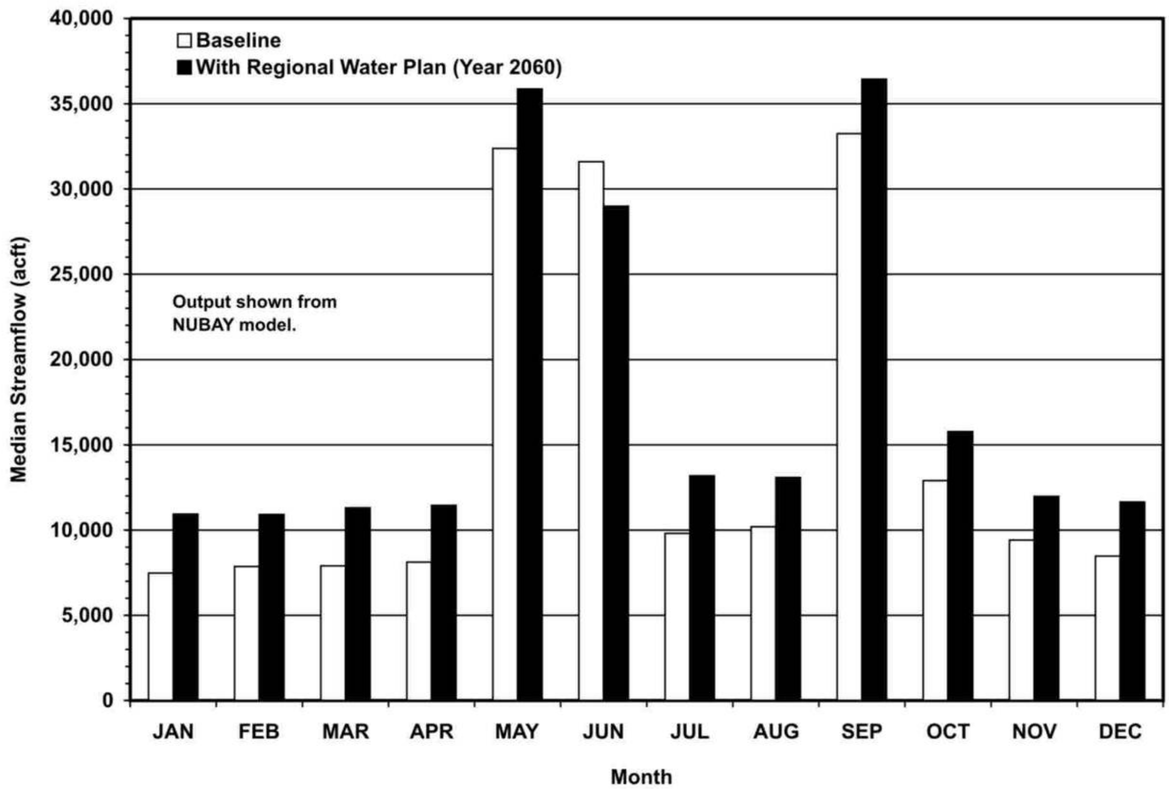


Figure 7.1-23. Frio River near Derby



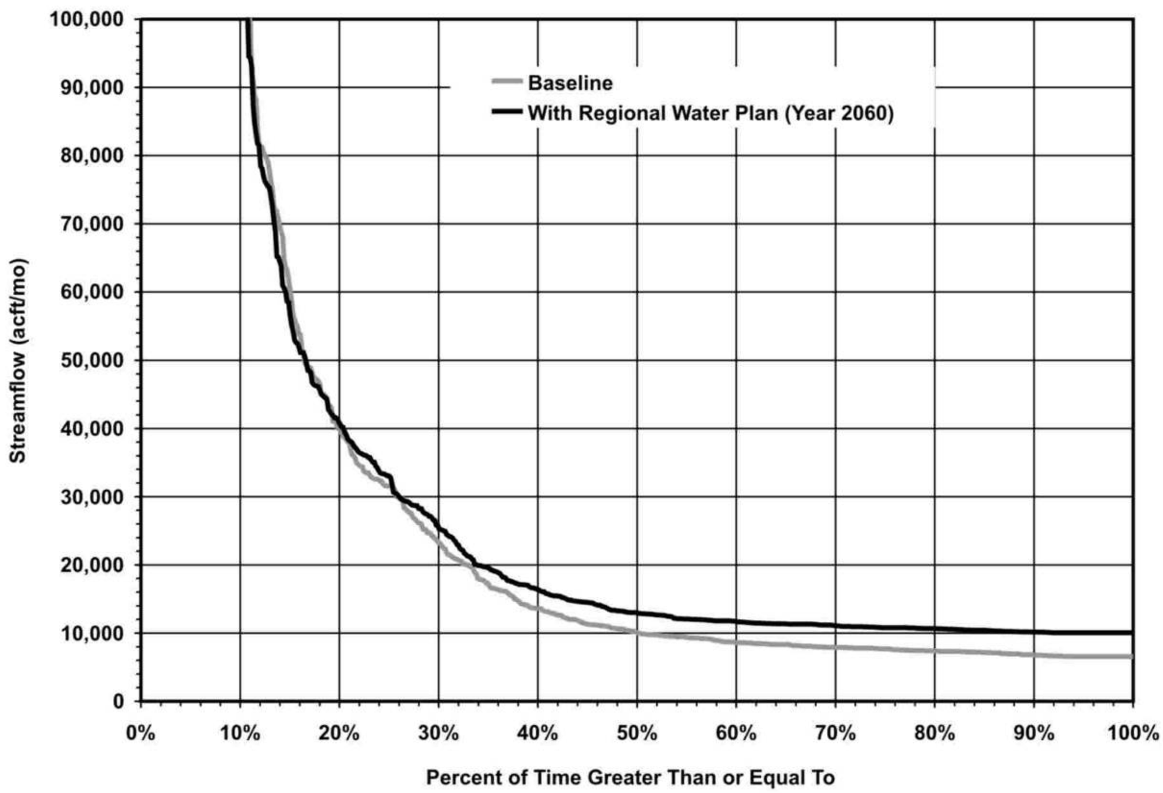


Figure 7.1-24. Nueces Estuary

7.1.3.1 Simulation Descriptions

Natural Conditions

The Natural Condition is an historical set of theoretical streamflows and estuarine inflows in which the effects of mankind on the water resource have been removed. Two such estimates of natural conditions are presented herein. One estimate (referred to as "Natural GSA WAM") uses the naturalized flows of the Guadalupe-San Antonio River Basin Water Availability Model (GSA WAM). While the effects of historical reservoir operations, diversions, and treated effluent have been accounted for, it is noted that these natural flows reflect historical pumpage and spring discharges from the Edwards Aquifer. Thus, while other effects of mankind on surface water flows have been removed, spring discharges, which have direct bearing on surface water flows, reflect historical pumping levels from the Edwards Aquifer. More conceptually appropriate estimates of natural flows could have been based upon simulated historical springflows with zero Edwards Aquifer pumpage, however, such simulated historical springflows were not deemed sufficiently accurate for release by TWDB technical staff at the time when natural flows throughout the Guadalupe – San Antonio River Basin were developed. As described in "Bays in Peril," the NWF has applied an Edwards Aquifer model to simulate historical springflows without pumpage and the GSA WAM to estimate resulting freshwater inflows to the Guadalupe Estuary. Such alternative natural flows and summary statistics are included in the comparisons and are referred to as "Natural (NWF Estimates)".

Present Conditions

The Present Conditions simulation is intended to be a realistic, but somewhat conservative, portrayal of present conditions with respect to springflows, water rights use, and effluent discharges. The present condition may be derived based on Texas Commission on Environmental Quality (TCEQ) Run 8 analyses with appropriate modifications. With the exception of the major water rights discussed below, the values found in the Run 8 data file are used as the present level of water rights use and wastewater discharges. The modifications below were made to reflect likely usage levels in the near-term (2-5years) if the South Central Texas Region were to experience a severe drought..

1. *Canyon Reservoir (CA# 18-2074E)* – GBRA has contracts for approximately 65,000 acft/yr. For the Present Conditions simulation, each of these contracts is modeled at its diversion location along the Guadalupe River. In addition, Canyon has an agreement with Guadalupe River Trout Unlimited that is in effect until the year 2018 that was modeled as well. Canyon operations are in accordance with CA#18-2074E.

2. *GBRA Lower Basin Water Rights (CA# 18-5173 through CA# 18-5178 and CA# 18-3863)* – GBRA has water rights totaling 175,501 acft/yr in the lower basin authorized for municipal, industrial, and irrigation use. During the period of 1996 through 2003, the municipal portion of these rights had a maximum annual use of 10,400 acft, the industrial portion had a maximum annual use of 26,600 acft, and the irrigation portion had a maximum annual use of 36,700 acft. Cumulatively, this totals 73,700 acft/yr. For the Present Conditions simulation, 73,700 acft/yr for these water rights, allocated by use type as listed has been simulated. Available information indicates that wastewater due to the municipal diversion does not return to the Guadalupe Estuary. Effluent discharges for the industrial portion of the GBRA Lower Basin water rights are included, as these industries discharge to the estuary via the Victoria Barge Canal. An estimated return flow of 50 percent is included for these industrial diversions.

3. *Invista/DuPont (CA# 18-3861)* – Information gathered from the South Texas Watermaster indicates that Invista/DuPont diverted 25,254 acft in 1999, their highest in the period of 1998 - 2003. This amount is included in the Present Conditions simulation for Invista/DuPont. It is important to note that Invista/DuPont has a return factor of 45 percent on the diversions, which is derived from the ratio of 27,000 acft/yr (total permitted diversion of 60,000 acft/yr minus permitted consumption of 33,000 acft/yr) over 60,000 acft/yr (total permitted diversion). Thus, the consumptive amount associated with the 25,254 acft/yr is 13,889.7 acft/yr.

4. *City of Victoria (Permit# 5466)* – Data from the City of Victoria indicates that their maximum diversion during the period of 1997-2004 was 9,854 acft in 2003. This amount is used in the Present Conditions simulation.

5. *Braunig & Calaveras Lakes (CA# 19-2161 & CA# 19-2162, respectively)* – Historical data received from City Public Service (CPS), which operates the steam-electric power generation facilities using these reservoirs, indicates that the maximum water use (from forced evaporation) during the period of 1992-2004 occurred in 1999 for Calaveras (13,365 acft) and in 2000 for Braunig (4,057 acft). These amounts are used in the Present Conditions simulation.

6. *Coleto Creek Reservoir (CA# 18-5486)* – Data from the report entitled "Power Generation Water Use for the Years 2000 through 2060 - Final Report," prepared for the TWDB in 2003 indicates that the 2000 consumptive use for Coleto Creek Reservoir (from forced evaporation) was 9,027 acft. For the Present Conditions simulation, this consumptive amount is used.

7. *Medina Lake System (CA# 19-2130)* – The Medina Lake System has used its full permitted amount in the recent past. Thus, the current use associated with the Medina Lake System is its authorized use.

In addition, springflows consistent with an Edwards pumpage of 400,000 acft/yr (plus domestic & livestock use of about 12,000 acft/yr) subject to EAA Critical Period Rules are used to represent present conditions. Except as noted above, effluent discharges, as reported for 1997 and adjusted for SAWS direct recycled water use of about 26,700 acft/yr (based on contracts for consumptive use), are also used in the Present Conditions simulation.

Baseline (Full Permits)

The Baseline simulation is the product of hydrologic assumptions and operational procedures for the assessment of surface water supply (Section 3.2.3.1) as adopted by the SCTRWPG and approved by the TWDB. These assumptions reflect Edwards Aquifer permitted pumpage of 400,000 acft/yr subject to Critical Period Management rules, full utilization of existing water rights, and treated effluent discharge representative of current conditions (1997 reported discharges adjusted for SAWS direct recycled water program). These are the same assumptions as used to determine surface water supply reliability and perform technical evaluations of surface water management strategies.

Regional Water Plan

The Regional Water Plan simulation attempts to portray the potential cumulative effects of all recommended water management strategies on streamflow and estuarine inflow. Starting with the baseline simulations, the water management strategies of the Edwards Aquifer are incorporated into the GWSIM-IV groundwater model. Resulting springflows from the Edwards Aquifer are then integrated into the GSA WAM data files. Streamflow impacts due to water management strategies in the Carrizo-Wilcox and Gulf Coast Aquifers are estimated using the South-Central Carrizo System (SCCS) Model and the Gulf Coast Groundwater Availability Models, respectively. These streamflow changes are also incorporated into the GSA WAM data files. Finally, the surface water management strategies are added to the GSA WAM to form the Regional Water Plan simulation.

7.1.3.2 Ecologically-Based Assessment Descriptions

Two ecologically-based assessments are used in comparison of simulated inflows to the Guadalupe Estuary under the five estuarine inflow scenarios described above. The two assessments are the spring / early summer freshwater pulse criteria and the low-flow inflow criteria.

Spring/Early Summer Freshwater Pulse Criteria

The spring/early summer freshwater pulse criteria examines how often adequate seasonal spring-to-early-summer pulses of inflows would occur. When looking at seasonal inflows, the focus is on a cumulative sum of inflow occurring within a multi-month period, rather than on the flows in each individual month within the period. The same total volume of water would be required to satisfy either standard, but with the seasonal approach higher flows in any of the four months apply toward the target cumulative sum of inflows. These spring/early summer "freshwater pulses," sometimes referred to as "freshetes" are generally indicated to support strong levels of reproduction and growth. Thus, the freshwater pulse evaluations represent an assessment of how well the estuaries would be expected to fare under 'Regional Water Plan' conditions during years that spring/early summer rainfall is in the normal to high range. For the analysis here, a seasonal spring/early summer window of 4 consecutive months during which the occurrence of a freshwater pulse would be assessed is identified. The 4 months included are those with the highest consecutive target level inflow criteria in the state's studies of freshwater inflow needs (known as MaxH). This is an attempt to focus on the most critical 4-month spring/early summer period, occurring no later than July. For the Guadalupe Estuary, the highest four consecutive months in this window are April – July. The sum of the MaxH recommendations for these 4 months (about 526,000 acft) is used as the benchmark or criteria for assessment of the spring/early summer freshwater pulse.

Low-Flow Inflow Criteria for the Guadalupe Estuary

Because of weather variability in Texas, a second assessment criteria is focused on whether enough freshwater would be available to maintain salinity conditions within reasonable tolerance ranges and enable sufficient populations of organisms such as oysters, shrimp, and crabs to survive drought periods.

In addition to the criteria used in the spring/early summer freshwater pulse analysis, the state's freshwater inflow study results for each bay also include a set of lower inflow criteria known as MinQsal. These inflows reflect the amount needed "…to avoid reproductive failure and loss of biodiversity…" during lower inflow periods. As noted in the state's studies, for inflows between the target and the drought tolerance values "biological productivity and fisheries harvest … are significantly reduced from average historical levels." Basically, these inflows are calculated to maintain salinity levels in the estuaries within identified salinity bounds. Thus, inflows equaling drought-tolerance values would just maintain salinity levels within tolerance limits for key species at various points in the estuary. Inflows at these low levels would not be expected to maintain substantial fishery production over an extended period.

For this analysis, a period of 6 consecutive months below MinQsal inflow is used because such a period represents a significant portion of the life-cycle of several principal estuarine species. Subject to a half-year-long period of inflows below the MinQsal level, any area of lower salinity would likely be compressed into regions near the mouth of Guadalupe River. Upper estuary marshes could begin to become saltier. Direct effects on populations of fishery species (crabs, shrimp, and some finfish) could be anticipated due to lack of food and habitat, or to unfavorable salinities, especially if occurring in the spring/early fall period. Thus, a six-month consecutive period is considered in this assessment to be indicative of a significant deprivation of freshwater inflows. This analysis is limited to periods of six consecutive months falling only within the March-October window because low flows in the winter and early spring months would be of lesser concern for biological activity within Texas estuaries[13].

7.1.3.3 Results of the Ecologically-Based Assessments

The GSA WAM simulates a repeat of the weather patterns and resulting streamflows over the 56-year period of 1934-89. However, only the period of 1941-89 (49 years) is used in the assessment for consistency with previous NWF analyses. Considering both the 'freshwater pulse' and 'low-flow inflow criteria,' how often the simulated inflows under natural conditions fall below the criteria is first tabulated. Then, how often the inflows predicted would fall below the inflow criteria under the Present Conditions, Baseline (Full Permits), and Regional Water Plan scenarios are tabulated for the same time period.

Tables 7.1-4 and 7.1-5 present the performance results of the freshwater pulse and low-flow inflow criteria, respectively, for the five estuarine inflow scenarios. There is not much effect of Regional Plan implementation, compared to present use conditions, as measured by the spring/early summer pulse criteria. The spring/early summer pulse criteria are a measure of fairly substantial inflows which generally can only be affected by a large capture and storage of inflows. The lack of change in meeting these criteria is a reflection of the fact that the regional water plan does not include any water management strategies based on new reservoirs. The number of years with low 4-month spring/early summer freshwater inflow pulses decreases between the Baseline and the Regional Water Plan due primarily to the increased effluent in the basin. In Table 7.1-4, the number of occurrences of six months or longer periods below drought tolerance for both the Baseline and the Regional Water Plan scenarios is seven. It is important to note that three of these seven years are consecutive (1954-1956) while the other four occurrences are isolated events (1963, 1967, 1984, & 1988).

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[13] A more complete discussion is available in the methodology section of Johns, N.D., Hess, M., Kaderka, S., McCormick, L., & McMahon, J., "Bays in Peril, A Forecast for Freshwater Flows to Texas Estuaries," National Wildlife Federation, October 2004.

Table 7.1-4.
Number of Years with Low 4-Month Spring/Early Summer Freshwater Inflow Pulses Defined by State Criteria

Estuary	No. of Years	Natural (NWF Estimates)	Natural (GSA WAM)	Present Conditions	Baseline (Full Permits)	Regional Water Plan
Guadalupe Estuary	49	19	20	21	23	22

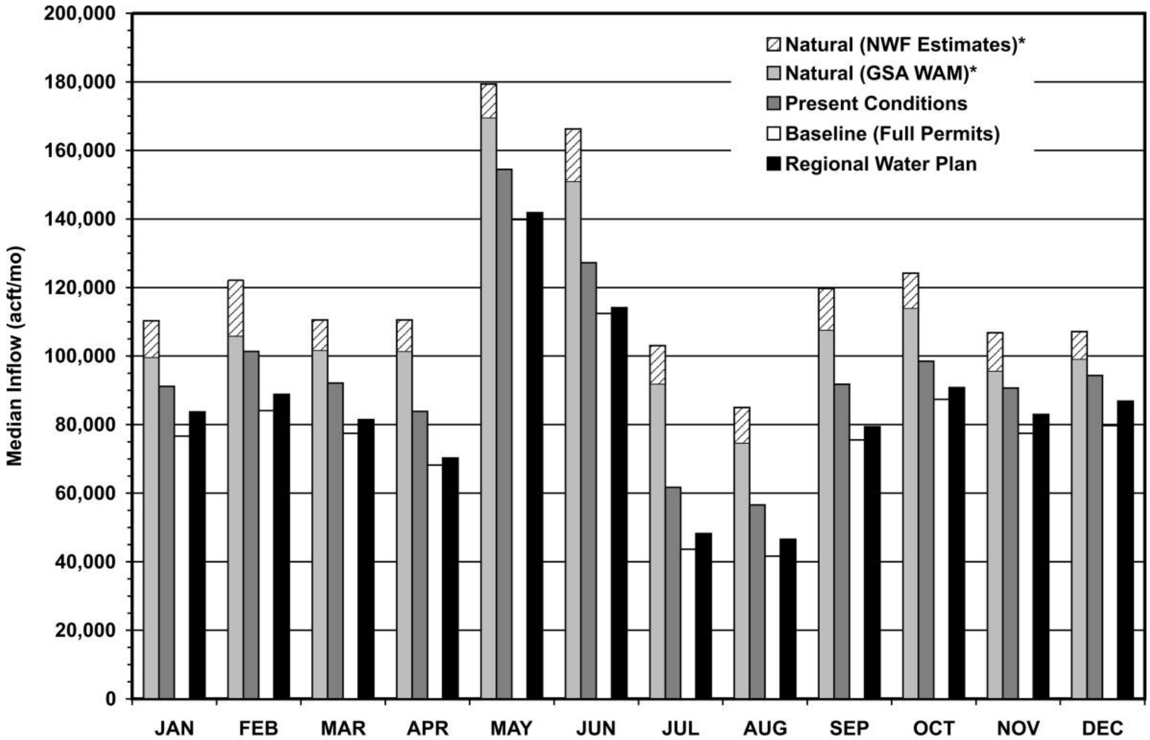
Table 7.1-5.
Number of Occurrences of 6 Months or Longer Periods Below Drought Tolerance Level (MinQsal) within Critical (Mar-Oct) Months

Estuary	No. of Years	Natural (NWF Estimates)	Natural (GSA WAM)	Present Conditions	Baseline (Full Permits)	Regional Water Plan
Guadalupe Estuary	49	2	4	5	7	7

Monthly median freshwater inflow to the Guadalupe Estuary for each of the five inflow scenarios is shown in Figure 7.1-25. In general, changes in estuarine inflow are greater going from Natural Conditions to Present Conditions than going from Present Conditions to full implementation of the Regional Water Plan. Changes from Present Conditions to the Regional Water Plan are associated in large part with moving from a current level to fully permitted use of existing water rights.

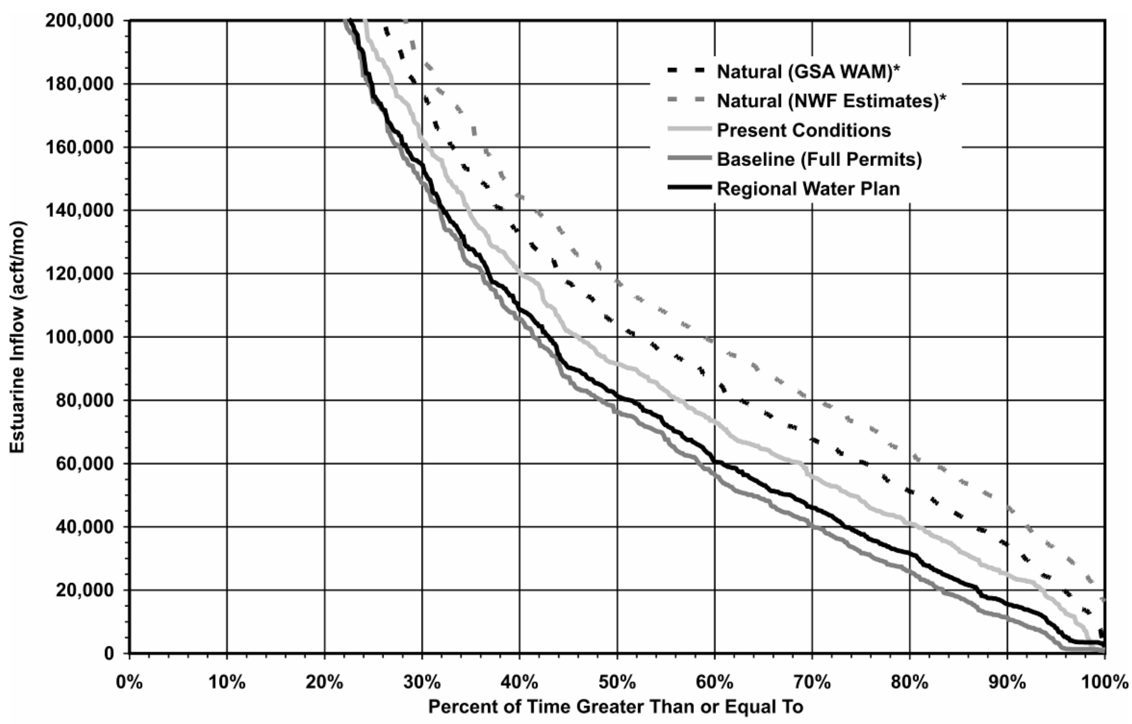
Figure 7.1-26 shows the frequency of the monthly freshwater inflow to the Guadalupe Estuary for the five inflow scenarios. Freshwater inflows under Natural Conditions exceed 100,000 acft/mo between 53 percent and 59 percent of the time. Under Present Conditions, this inflow level is reached at least 46 percent of the time. Looking at the Baseline (Full Permits) and the Regional Water Plan scenarios, the 100,000 acft/mo level is achieved about 42 percent and 43 percent of the time, respectively.

A time-series plot of freshwater inflows to the Guadalupe Estuary for the 1950 through 1956 period during the drought of record is shown in Figure 7.1-27. This figure illustrates freshwater inflows to the estuary during the most critical of low-flow times for each of the five inflow scenarios. As shown in Figure 7.1-27, freshwater inflows during drought with implementation of the Regional Water Plan are expected to be less than those under Natural and Present Conditions and greater than those under Baseline conditions.



Note: Solid bar indicates the standard Guadalupe-San Antonio WAM Naturalized Flow values. These flows reflect historical Edwards Aquifer pumpage. The additional cross-hatched height of these bars represents potential additional flow with no Edwards Aquifer pumpage, as derived by National Wildlife Federation.

Figure 7.1-25. Monthly Median Guadalupe Estuary Freshwater Inflows



*Note: Dashed black 'Natural' line is Guadalupe-San Antonio WAM Naturalized Flow values. These flows reflect historical Edwards Aquifer pumpage. The additional dashed grey 'Natural (NWF Estimates)' line reflects potential additional flow with no Edwards Aquifer pumpage.

Figure 7.1-26 Frequency of Guadalupe Estuary Freshwater Inflows

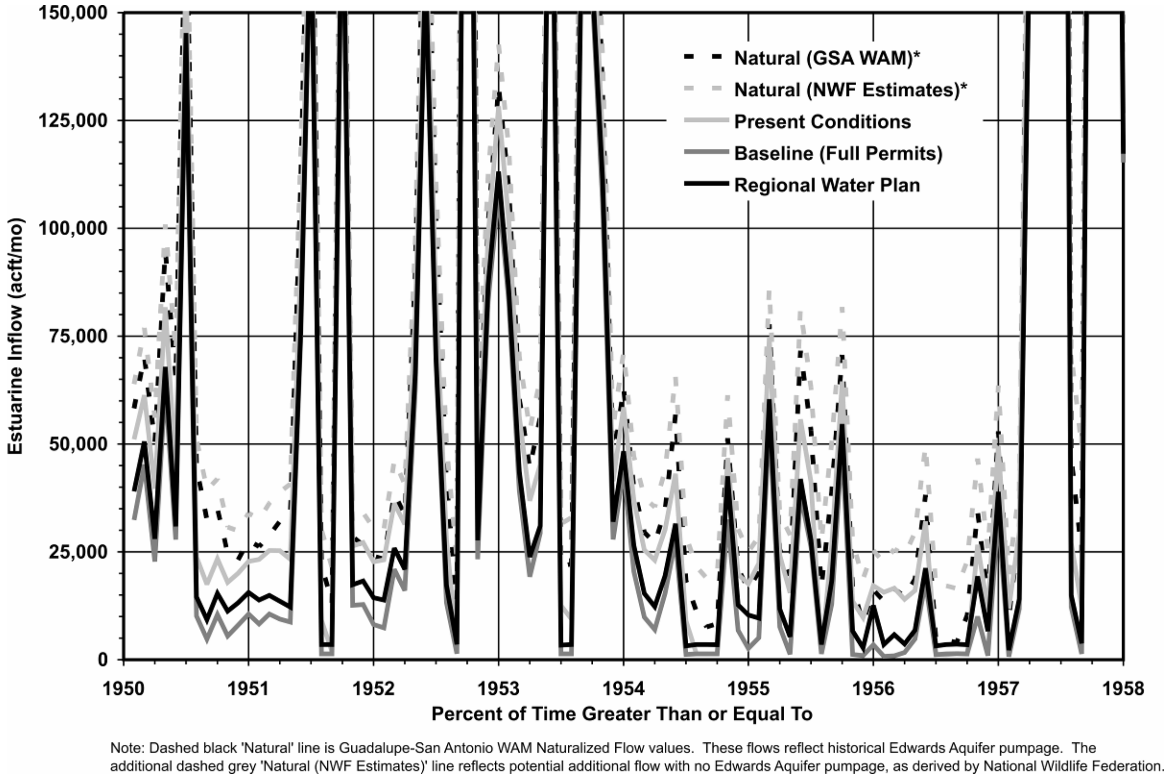


Figure 7.1-27 Guadalupe Estuary Freshwater Inflows during Drought

7.1.3.4 Discussion of Ecological Assessments

The results presented in Table 7.1-4 for the spring/early summer pulse inflow criteria are very encouraging and show that the regional plan would have virtually no effect. However, the low inflow period assessment (Table 7.1-5) may indicate some issues with regard to cumulative effects of the regional plan on the Guadalupe Estuary. These results taken together, also indicate areas of potential focus of attention for future efforts to consider the health of the estuary in the regional water planning process as it moves forward. Ongoing studies of the estuary will yield additional information on inflow and productivity relationships. It is anticipated that, with continued refinement in the assessment criteria and improved knowledge of the Guadalupe Estuary's inflow needs, the SCTRWPG will be able to further consider this issue in a future round of planning.

7.2 Environmental Assessment

7.2.1 Regional Environment

The South Central Texas Regional Water Planning Area (Region L) spans southern Texas from Hays and Caldwell Counties in the north to the Guadalupe Estuary on the Gulf Coast, to the headwaters of the Nueces River in Uvalde County. The region exhibits a unique biological diversity as a consequence of its location in an area of transition between major vegetational and faunal regions to the north, east and south (respectively, the Kansan, Austroriparian and Tamulipan), and its position astride migration corridors important to numerous bird, bat and insect populations. Locally, the prairie and coastal ecoregions circumscribe sets of habitats, plants and animals distinct from those of the Central Texas Plateau, and the more tropical affinities of the Southern Texas Plains. The major population centers in Region L are located along the eastern and southern margins of the Edwards Plateau, where a series of rugged, wooded canyons are traversed by clear, springfed streams intimately associated with the cavernous limestone Edwards Aquifer that provides the present major water supply for the region.

Omernik[14] utilized criteria that included topography, climate, vegetation type, and land use characteristics to divide the United States into ecological regions, or ecoregions, that exhibit more or less distinct sets of physical habitats and species. According to Omernik's classification, Region L includes parts of five Ecoregions: the Central Texas Plateau, Southern Texas Plains, Texas Blackland Prairies, East Central Texas Plains, and the Western Gulf Coastal Plains. Focusing specifically on Texas, and excluding explicit land use criteria, Gould[15] delineated ten vegetational areas, which generally correspond to the portions of Omernik's Ecoregions that extend into the state. The corresponding names for the vegetational areas in Region L are Edwards Plateau, South Texas Plains, Blackland Prairies, Post Oak Savannah, and the Gulf Prairies and Marshes (Figure 7.2-1).

The Edwards Plateau vegetational area encompasses approximately 24 million acres of tall or mid-grass understory and a brushy, savanna-type overstory complex of live oak (*Quercus virginiana*) and other oaks (*Q. fusiformis*, *Q. buckleyi*, *Q sinuata* var. *breviloba*), ashe junipers (*Juniperus ashei*), cedar elm (*Ulmus crassifolia*), mesquite (*Prosopis* sp.), various species of

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[14] Omernik, James M., "Ecoregions of the Conterminous United States," Annals of the Association of American Geographers, 77(1) pp. 118-125, 1987.
[15] Gould, F.W. 1975. The Grasses of Texas. Texas A&M University Press, College Station, Texas.

acacia (*Acacia* sp.), and sumacs, including the prairie flame-leaf (*Rhus copallina* var. *lanceolata*). The most important climax grasses include switchgrass (*Panicum virgatum*), several species of bluestem (*Schizachyrium* and *Andropogon* spp.), gramas (*Bouteloua* spp.), Indiangrass (*Sorghastrum nutans*), Canadian wild rye (*Elymus canadensis*), buffalograss (*Buchloe dactyloides*) and curly mesquite (*Hilaria belangeri*).[16]

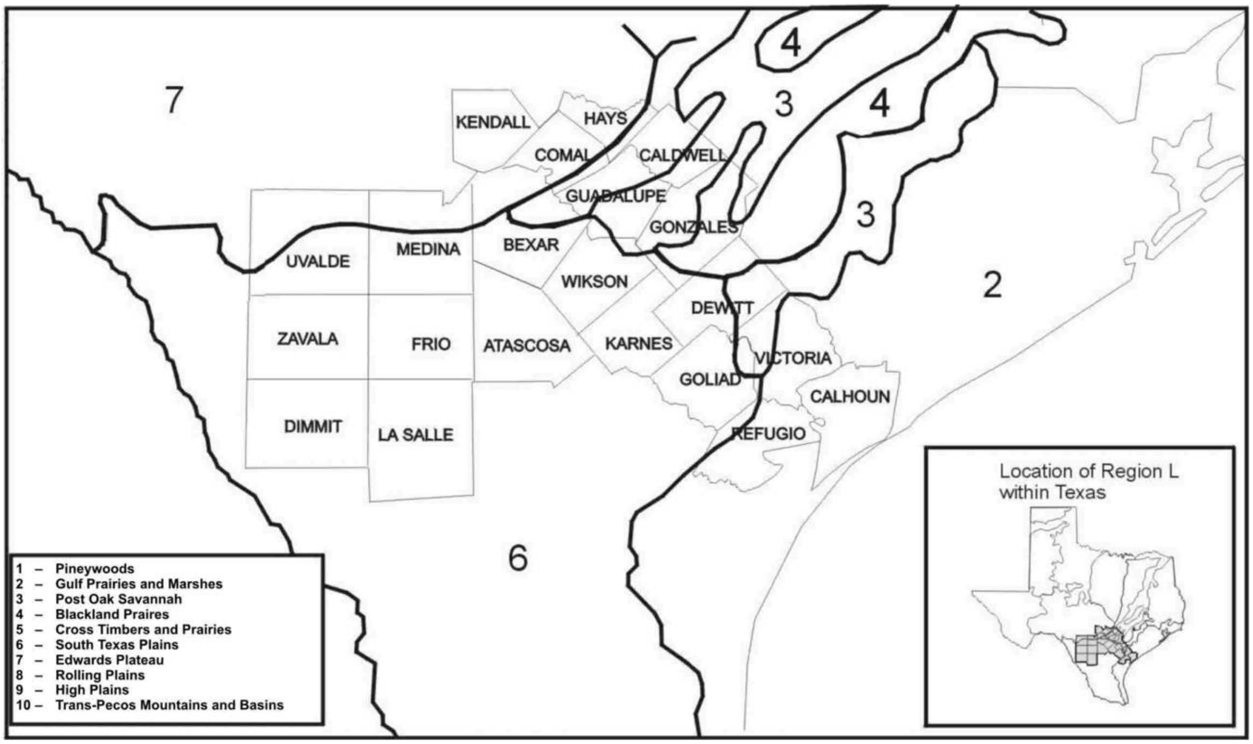

Figure 7.2-1. Gould's Vegetational Areas within Region L

Juniper and mesquite brush are generally considered invaders into a presumed climax of largely grassland or savannah, except on the steeper slopes which have continually supported a dense cedar-oak thicket. Bald cypress (*Taxodium distichum*) occurs along perennial streams and rivers, while pecan (*Carya illinoinensis*), Arizona and little walnut (*Juglans major, J. microcarpa*), hackberry (*Celtis laevigata*), black and sandbar willow (*Salix nigra, S. interior*), and eastern cottonwood (*Populus deltoides*) are more widely distributed in riparian areas of both perennial and intermittent streams. Cultivated fields are generally in the relatively broad, level

[16] Correll, D.S., and M.C. Johnston, "Manual of Vascular Plants of Texas," Texas Research Foundation, Renner, Texas, 1979.

stream valleys where deeper soils have accumulated.[17] Upland agriculture consists primarily of livestock grazing and harvest of cedar and oak for fence posts and firewood, respectively.

The Post Oak Savannah vegetational area, which covers approximately 8.5 million acres, consists of gently rolling or hilly country, with elevations ranging from 300 to 800 ft-msl. Upland soils of the region are light-colored, acid sandy loams or sands. Bottomland soils are light brown to dark gray and acid, with textures ranging from sandy loams to clays. The area is characterized by pastureland with frequent stands of woodland and occasional cropland. The dominant species of the Post Oak Savannah is post oak (*Quercus stellata*), which occurs in open stands with a ground cover of grasses.[18] Other associated species include blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), cedar elm (*Ulmus crassifolia*), and eastern redcedar (*Juniperus virginiana*). This vegetation type is either considered to be a part of the Eastern Deciduous Forest association or as part of the Prairie association.[19,20,21,22] During the last few decades, open savannah has been converted into dense woodland stands of post oak and winged elm (*Ulmus alata*). This has occurred as a result of overgrazing, abandonment from cultivation, and removal of fire. Grazing is the major land use of both upland and bottomland sites within the vegetation type. Large acreages of both upland and bottomland forests have been cleared for grazing and most of this is in tame pasture.

Elevations in the Blackland Prairies range from 300 to 800 ft-msl. Uniform, dark-colored calcareous clays, which are interspersed with gray acid sandy loams, constitute the fertile Blackland soils. According to Thomas, most of the region is, or has been under cultivation, although there are some excellent native hay meadows and a few unplowed ranches remaining.[23] The characteristic vegetation of the Blackland Prairies, which includes little bluestem (*Schizachyrium scoparium*) as the climax dominant of the region, is considered true prairie. Big bluestem (*Andropogon gerardi*), Indiangrass, switchgrass, sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), tall dropseed (*Sporobolus asper*), silver bluestem (*Bothriochloa saccharoides*), and Texas wintergrass (*Stipa leucotricha*) are other

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[17] Ibid.
[18] Ibid.
[19] Tharp, B.C., "The Vegetation of Texas," Texas Acad. Sci., Anson Jones Press, Houston, 1939.
[20] Braun, E.L., "Deciduous Forests of Eastern North America," Hafner Publishing Co., Inc., New York, 1950.
[21] Weaver, J.E. and F.E. Clements, " Plant Ecology," 2nd Ed. McGraw-Hill Book Co., New York, 1938.
[22] Daubenmire, Rexford, "Plant Geography with Special Reference to North America," Academic Press, New York, 1978.
[23] Thomas, G.W, "Texas Plants – An Ecological Summary," In: F.W. Gould. 1975. Texas Plants – a Checklist and Ecological Summary. Texas Agricultural Experiment Station, MP-585/Rev., College Station, Texas, 1975.

important grasses in the region.[24] If heavy grazing is allowed, Texas wintergrass, buffalograss, Texas grama (*Bouteloua rigidiseta*), smutgrass (*Sporobolus indicus*), and many annuals may increase or invade the prairies, causing deterioration of the native community.[25] Other invasive species are mesquite in the southern portion of the Blackland Prairies, and post oak and blackjack oak in areas of medium to light-textured soils. Grasses that have been used to seed improved pastures within the Blackland Prairies are dallisgrass (*Paspalum dilatatum*), common and coastal bermudagrass (*Cynodon dactylon*), and some native species.

The South Texas Plains vegetational area encompasses approximately 20 million acres of level to rolling topography, with elevations ranging from 1,000 ft-msl to about sea level. Soil types cover a wide range, from clays to sandy loams, creating variations in soil drainage and moisture-holding capacities. Though there are large areas of cultivated land, most of the area is still rangeland. The South Texas Plains region originally supported a grassland or savannah climax vegetation.[26] A long period of grazing and the reduction of fire have affected the plant communities and have led to an increase of brush. Species which have increased in the area include honey mesquite (*Prosopis glandulosa*), post oak, live oak, several acacias (*Acacia* spp.) and members of the cactus family (Cactaceae). Distinct differences in climax plant communities and successional patterns occur on the many range sites that are found in the region.

The Gulf Prairies and Marshes vegetational region of Texas consists of about 9,500,000 acres. This nearly level, slowly drained plain is less than 150 ft-msl in elevation and is cut by sluggish rivers, creeks, bayous, and sloughs. Habitats include coastal salt marshes, dunes, prairies, river bottoms, and freshwater ponds. Soils are acid sands, sandy loams and clays. The upland prairie soils tend to be heavier textured acid clays or clay loams. Much of the region is fertile farmland or pastureland. The climax vegetation of the region is mostly tall grass prairie or post oak savannah.[27] Principal grasses are big bluestem, little bluestem, seacoast bluestem (*S. scoparium* var. *litoralis*), Indiangrass, eastern gamma grass (*Tripsacum dactyloides*), Texas wintergrass, switchgrass, and gulf cordgrass (*Spartina* spp.). Seashore saltgrass (*Distichlis spicata*) occurs on moist saline sites. Since the region is heavily used for ranching and

[24] Correll, D.S., and M.C. Johnston, Op. Cit., 1979.
[25] Ibid.
[26] Thomas, G.W, Op. Cit., 1975.
[27] Correll, D.S., and M.C. Johnston, Op. Cit., 1979.

agriculture, extensive disturbance has allowed invader species, such as mesquite, huisache (*Acacia smallii*), prickly pear (*Opuntia* spp.), Acacia (*Acacia* spp.), ragweed (*Ambrosia psilostachya*), broomweed (*Xanthocephalum* spp.) and others to become well established.[28,29] Heavy grazing and/or abandoned farmland has changed the predominant grasses to species such as broomsedge (*Andropogon virginicus*), smutgrass, threeawns (*Aristida* spp.), and introduced bermudagrass, fescue (*Festuca* spp.), and dallisgrass.

Large acreages of both upland and bottomland forests have been cleared for grazing and much of this land is planted with domestic grasses. Major creek and river floodplains may retain more or less well-developed hardwood forests, but upland areas are generally cleared for cultivation or pasturage. However, uplands support scattered, dense, shrubby thickets of oak, huisache, and mesquite and occasional freshwater marshes in relict drainages. Principal tree and shrub species observed in uplands include live oak, post oak, cedar elm, hackberry, honey mesquite, huisache, and yaupon (*Ilex vomitoria*).[30,31,32]

In addition to the physiographic and biological diversity of Region L, it is also the location of a unique, region-wide geologic feature called the Edwards Aquifer. The Edwards Aquifer, together with the karst geology of its recharge zone and the remaining major perennial springs, constitute a unique set of habitats in which a significant concentration of isolated, endemic species has developed. The porous to cavernous limestones and dolomites making up the Edwards Aquifer are also the groundwater source that presently supplies water to the City of San Antonio and numerous other users. The Edwards Aquifer is the only underground aquatic habitat in Texas in which vertebrate species live[33] and it supports a surprisingly diverse ecosystem. The aquifer has three parts: the drainage, or catchment area, the recharge zone, and the reservoir zone. Input to the aquifer comes from rainfall over the watershed as a whole, but recharge occurs primarily in the beds of streams crossing the recharge zone. The recharge zone

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[28] Johnston, M.C., "The Vascular Plants of Texas, A List Updating the Manual of the Vascular Plants of Texas," Austin, Texas, 1988.
[29] Thomas, G.W, Op. Cit., 1975.
[30] U.S. Bureau of Reclamation, "Palmetto Bend Project – Texas Final Environmental Impact Statement," Bureau of Reclamation, U.S. Department of the Interior, 1974.
[31] Soil Conservation Service, "Soil Survey of Calhoun County, Texas," Soil Conservation Service, Temple, Texas, 1978.
[32] Texas Department of Water Resources, "Land Use/Land Cover Maps of Texas," Austin, Texas. LP-62, 1977, Reprinted 1978.
[33] Edwards, Robert J., Glen Longley, Randy Moss, John Ward, Ray Mathews, and Bruce Stewart, "A Classification of Texas Aquatic Communities with Special Consideration toward the Conservation of Endangered and Threatened Taxa," Vol. 41, No. 3, The Texas Journal of Science, University of Texas at Austin, Austin, Texas, 1989.

consists of a band of fractured and cavernous limestone (Karst geology) through which surface water enters the aquifer. In addition to the aquatic fauna of the aquifer, the karst limestones in the upland portions of the recharge and contributing zones also harbor a number of endemic, terrestrial cave species.

Where rivers flowing across the plateau have carved deep canyons and exposed the base of the Edwards Limestone, springfed streams arise and flow south and eastward over the less permeable older formations to the recharge zone, at the base of which a set of large springs (e.g., Leona, San Antonio, Comal, San Marcos Springs) emerge that support still more species of limited distribution. In addition to their importance as water supplies, the large springs and their associated rivers are also of regional economic importance as scenic and recreational destinations.

Species listed by the Federal and state governments as Endangered or Threatened, species that are candidates for listing as endangered and threatened, and other resources of concern are listed and discussed in terms of the potential impacts of each water management strategy in Volume II, and are summarized by county in Appendix F. Endangered species are not distributed uniformly throughout Region L; they tend to be most densely abundant in the canyons, caves, and springs on the eastern and southern edges of the Edwards Plateau (western Hays and Comal Counties, northern Bexar County) and in the wetland and brackish environments of Calhoun and Refugio Counties.

Listed species tend to fall into one of two broad categories. There are widespread, but rare species whose populations do not appear to be dependent on specific habitat resources that are (at this time) in limited supply (e.g., foraging and nesting areas). These include many of the birds, such as the eagles and hawks that suffered population declines as a result of persistent pesticide toxicity and whooping cranes that were decimated by market hunting). Other listed species tend to be rare because their habitat requirements are met in only a few locations. This group includes migratory songbirds with specific nesting requirements (i.e., Golden-cheeked Warbler and Black-Capped Vireo) and reaches the extremes of endemism in the spring and cave species found along the edges of the Edwards Plateau in Bexar, Comal, and Hays Counties.

As part of the previous round of water planning, the Texas Parks and Wildlife Department (TPWD) screened Texas rivers and streams for reaches or segments that supported unique biological resources or functions, or whose continued flows were deemed critical to the maintenance of a downstream resource or public property. Stream reaches identified by TPWD as Ecologically Significant River and Stream Segments in Region L are listed, along with the listing criteria employed in the identification process, in Table 7.2-1. Segment locations are shown in Figure 7.2-2.

With respect to Cultural Resources, Region L is the location of much of the earliest European activity in Texas, including concentrations of important historical sites on Matagorda Bay, along the Guadalupe and San Antonio Rivers, in Bexar County, and at the perennial springs along the margin of the Edwards Plateau. Prehistoric sites also tend to be concentrated in many of the same areas, and Region L contains some of the oldest Native American habitation sites known in the United States. Large National Historic Districts encompass areas on the lower Guadalupe and San Antonio Rivers that are particularly rich in both historic and prehistoric remains.

7.2.2 Environmental Effects

In attempting to evaluate the environmental effects of any activity it is often useful to consider the effects of construction and operations separately, even if only for "bookkeeping" purposes, so as not to miss anything. Construction effects are generally due to disturbance to vegetation and soils, although in specific locations and circumstances, waste disposal, construction in aquatic habitats, noise, or airborne particulates may be important factors. Operations effects may include (for example) impacts to vegetation, habitats, or endangered species through maintenance practices, changes in streamflows or water quality or groundwater availability. The potential environmental effects of each water management strategy were evaluated individually and the results are included with the discussion of that strategy in Volume II. The evaluation in this section focuses on the cumulative impact of all recommended water management strategies in the 2006 Regional Water Plan, and how that compares with the potential impacts of the water management strategies recommended for the South Central Texas Region in past state water plans.

The environmental assessments of the individual water management strategies should be regarded as "worst case" and preliminary in the sense that neither environmental nor engineering site-specific studies have been performed to verify the published data employed, finalize facility locations and operational routines, identify locations where risks to environmental resources can be avoided or minimized, and propose compensation for unavoidable impacts. Most of the

Table 7.2-1.
Ecologically Unique River and Stream Segments Nominated by TPWD in and Adjacent to the South Central Texas Regional Water Planning Area

	Biological Function	Hydrologic Function	Riparian Conservation	Water Quality Aquatic Life/Uses	Threatened & Endangered species
Arenosa Creek				ecoregion stream	
Blanco River		Edwards Aquifer Recharge		overall use	
Carpers Creek				ecoregion stream	
Comal River		Edwards Aquifer Recharge	Landa Park		multiple spring-dependent species
Cypress Creek		Edwards Aquifer Recharge		overall use	
Frio River	Texas Natural River Systems Nominee	Edwards Aquifer Recharge	Garner State Park	overall use, aesthetic	
Garcitas Creek	Estuarine wetlands			ecoregion stream	diamondback terrapin[1]
Geronimo Creek				ecoregion stream	
Guadalupe River, Upper		Edwards Aquifer Recharge	Guadalupe River Park	overall use #2 scenic river in Texas	
Guadalupe River, Middle					golden orb[1]
Guadalupe River, Lower	Freshwater and marine wetlands		Victoria Municipal Park Guadalupe Delta WMA	overall use	whooping crane
Honey Creek			Honey Creek Natural Area		
Mission River	Freshwater and marine wetlands				
Upper Nueces River	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic	
Sabinal River	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic	
Upper San Marcos River			multiple University and City parks	overall use	multiple spring-dependent species
Lower San Marcos River			Palmetto State Park		
San Miguel Creek				ecoregion stream	
West Nueces River		Edwards Aquifer Recharge			
West Verde Creek		Hill Country Natural Area			
West Carancahua Creek				ecoregion stream	
Colorado River-Bastrop				overall use	blue sucker
Tidal Colorado River	Freshwater and marine wetlands				
Onion Creek				ecoregion stream	

[1] Not listed as Threatened or Endangered by the State of Texas or U.S. Fish and Wildlife Service

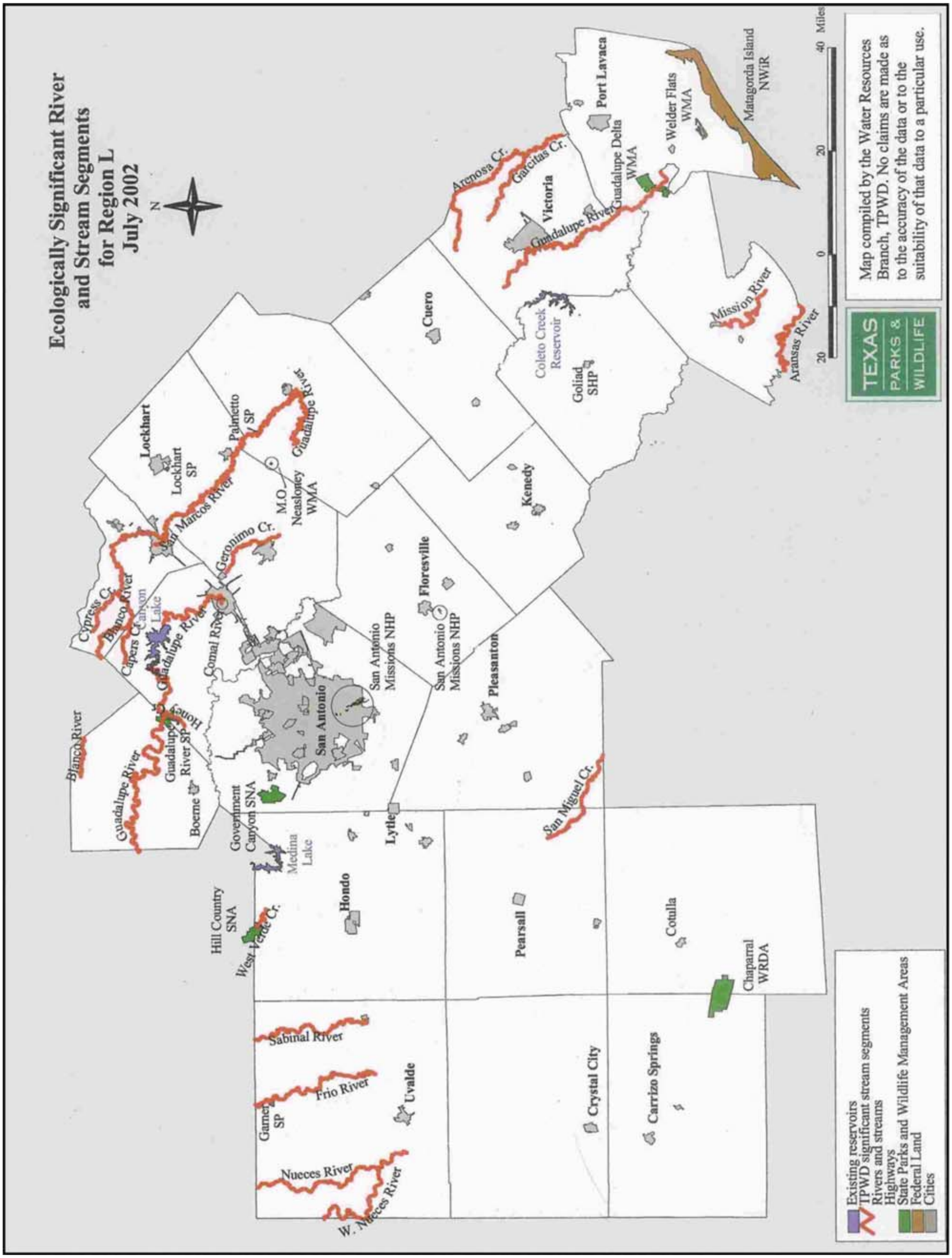

Figure 7.2-2. Ecologically Significant River and Stream Segments for Region L

facilities evaluated here have been designed and located only in a conceptual sense; the actual locations of intakes, pipeline rights-of-way, and other project features will not be finally determined until site-specific field studies and land acquisition programs have been completed. For that reason, many, if not most, of the potential impacts discussed in the respective water management strategies evaluations, can be avoided or significantly mitigated by relocation of project elements. This is particularly the case with respect to facilities such as pipelines and individual well pads and less so for reservoirs, for which there may be a limited set of suitable sites.

Some of the water management strategies considered in this regional water plan are expected to involve little potential impact to environmental or cultural resources, except secondarily with respect to changes in land use practices that may affect wildlife habitats and uses in both rural and urban areas. These would seem to include only the Municipal Water Conservation and Recycled Water strategies, and strategies that reallocate previously permitted and developed water among different sets of users (e.g., transfer of Edwards irrigation permits to municipal uses, delivery of water supplies from Canyon Reservoir to customers via the bed and banks of the Guadalupe River). While Aquifer Storage and Recovery (ASR) in the Carrizo-Wilcox Aquifer itself might be expected to entail few environmental effects, impacts associated with harvest or transport of the source water may be significant.

Potential adverse environmental and cultural resources impacts are minimized in the 2006 Regional Water Plan by the recommendation of strategies that maximize the efficient use of existing surface water resources, or which develop groundwater supplies. These water management strategies avoid the extensive habitat conversions and streamflow changes that can accompany comparable new surface water development. The estimated new water supplies provided by the water management strategies recommended in the current 2006 Regional Water Plan for Region L are summarized in Table 7.2-2, along with strategies included in previous State Water Plans. These water management strategies include three that involve diverting surface water from locations near the mouths of the Guadalupe and Colorado Rivers and from Canyon Reservoir, five strategies that rely on groundwater sources, an Edwards Aquifer recharge enhancement strategy, and two desalination projects, of which the Brackish Wilcox Desalination is also a groundwater source strategy.

Table 7.2-2.
Estimated Firm Yields of
Water Management Strategies in State Water Plans
(acft/yr)

ID#	Water Management Strategy	State Water Plan 1984	1990	1997	2002	2007
G-16C1	Cuero Reservoir	152,606	152,606			
G-17C1	Lindenau (Sandies) Reservoir	80,836	80,836	80,836		
G-40	Cloptin Crossing Reservoir	32,458				
G-21	Lockhart Reservoir	5,627				
S-14D	Applewhite Reservoir	4,032	4,032			
S-16C	Goliad Reservoir	99,687	99,687			
S-15C	Cibolo Reservoir	33,200				
S-15Da	Cibolo Reservoir w/ SA River		69,925	69,925		
LGWSP	Lower Guadalupe Water Supply Project				104,487	
LGWSP	LGWSP for GBRA Needs					63,072
LSWP	LCRA-SAWS Water Project				150,000	150,000
SCTN-3c	Simsboro Aquifer				55,000	
L-18a	Edwards Recharge Projects				21,577	21,577
SCTN-17	Seawater Desalination				84,012	84,012
CZ-10C	Carrizo Aquifer - Wilson & Gonzales				16,000	
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop				27,500	
G-24	Wimberley/Woodcreek from Canyon				4,636	4,636
	Canyon Amendment			40,000	40,000	
	Regional Carrizo for Bexar County					62,588
	SSLGC Carrizo Project Expansion				12,800	12,800
	Hays/Caldwell Carrizo Project					15,000
	Recycled Water Program Expansion		97,000		52,215	36,258
	Brackish Wilcox Desalination					5,662
	Wells Ranch / CRWA Dunlap Project				9,000	9,000
	CRWA Siesta Project				5,042	5,042
Totals		**408,446**	**504,086**	**190,761**	**582,269**	**469,647**

Regardless of water source and location, all the water management strategies comprising the Regional Water Plan, except the Edwards Recharge Projects, involve the construction of dispersed facilities that typically have substantial flexibility in terms of alignment or site selection such as water intakes, pipelines, and well fields. The recommended strategies typically result in relatively only localized disturbances. While a major pipeline may disturb several hundred acres in total, effects are generally minor at the landscape scale because construction and maintenance activities are dispersed among the much larger physiographic and habitat elements in which they are placed. In comparison with storage reservoir projects, the total land area impacted by a well field or river diversion and transmission pipeline is smaller, often by one or two orders of magnitude. Unlike reservoir projects, field studies conducted prior to design and easement procurement can substantially reduce the potential to adversely affect unique habitats, endangered species, historic and prehistoric sites, and other resources that are present only at particular locations. For example, where sensitive resources at stream crossings cannot be adequately protected or avoided, boring or tunneling can be considered as construction options to avoid disturbance to aquatic habitats.

The Edwards Recharge Projects (L-18a) involve construction of dams where selected streams cross the Edwards Aquifer recharge zone to increase the amount of water entering the aquifer. Most of the recharge occurs during heavy rains that result in streamflows exceeding the maximum possible recharge rate of the reach over the recharge zone that contribute instead to downstream flow. In addition, most of the time streambeds in the recharge zone (and for substantial distances downstream) are dry, and streamflows entering the recharge zone are usually well below maximum recharge amounts (i.e., streamflows are usually zero and the streambed dry at the downstream edge of the recharge zone). Slowing the flow of water in order to increase the amount of time water remains over the recharge zone will increase recharge to the aquifer without substantially impacting stream habitats and populations, because water is not present in most of the stream reaches recommended at frequencies sufficient to support other than ephemeral aquatic communities in the recharge and downstream reaches. The recharge structures are designed to drain rapidly and to pass minimum flows downstream for water rights holders and environmental flow needs based on default instream flow criteria for regional planning (Consensus Criteria for Environmental Flow Needs). As a result of the low frequency and persistence of inundation, little change in the terrestrial environment will occur in the recharge impoundment. Inspection of the existing recharge structures on Parkers and Seco Creeks shows little or no impact to vegetational cover within and downstream of their impoundments.

Major exceptions include the Nueces and Blanco River sites that do ordinarily exhibit surface water and aquatic communities at the proposed recharge sites. Perennial aquatic habitats are generally limited to pools in the Nueces River between US 90 and its "braided reach." The Frio River and its tributaries between US 90 and Choke Canyon Reservoir also experience intermittent flows. Impacts to the Blanco River are minimized because it joins with the San Marcos River only a few miles below the proposed recharge dam site. Most of the water entering the aquifer from the Blanco River recharge structure is expected to be discharged from the nearby springs in San Marcos and flow down the San Marcos River. Recharge sites proposed for northern Bexar County (e.g., a site in Government Canyon State Park) are near caves in which reside populations of federally listed endangered invertebrates. Construction of the recharge projects in the Nueces River Basin would result in small decreases in the firm yield of the Choke Canyon Reservoir/Lake Corpus Christi System and inflows to the Nueces Estuary. At the same time, instream flows would increase in the Guadalupe-San Antonio River Basin, as would inflows to the Guadalupe Estuary.

The large run-of-river diversion water management strategies, the Lower Guadalupe Water Supply Project (LGWSP) for GBRA Needs and the LCRA-SAWS Water Project (LSWP), envision diversion of both appropriated and unappropriated water for which rights will have to be obtained through the state permitting process. Under both strategies, off-channel storage facilities will be used to ensure firm supplies throughout a drought comparable to the most severe on record.. The off-channel storage is necessary because the existing water rights and the unappropriated water are either not physically present during low flow periods, or are unavailable due to the demands of senior water rights or environmental flow needs. The bulk of these proposed diversions will occur during higher flow periods—when streamflows exceed the monthly medians (for a given month in the period of record, half the time flows are less than the median, and half the time flows are greater than the median), and low flow regimes may not be affected at all. Operations of both water management strategies are consistent with the inflow needs outlined in the Inflow Needs Reports for the two estuaries.[34,35] However, there are substantial differences in the 2002 and 2007 versions of these projects. First, the yield of the LGWSP for GBRA Needs in the 2007 plan (63,072 acft/yr) reflects elimination of a groundwater component from the Gulf Coast Aquifer included in the 2002 plan. Furthermore, supplies from the project will serve only customers in the GBRA statutory district, thereby eliminating interbasin transfer considerations. Although the LCRA-SAWS Water Project retains its full 150,000 acre feet/year yield to Region L, the most recent water availability modeling has indicated the need for a substantial increase in off channel storage capacity. Although the amount of water available for diversion continues to be maximized and the impact to the river ecosystem minimized by locating the diversion points near the river mouths in these strategies, the resultant need to construct off-channel reservoirs and long transmission pipelines that traverse multiple ecologically distinct regions inflates potential effects on vegetation and terrestrial habitats, places project facilities adjacent to more protected species, and increases the potential for significant adverse effects. Potential impacts from increasing the capacity and footprint of the off-channel storage reservoirs (and the associated river intake structures) in the LSWP is reflected in the increased environmental impact scoring with respect to Vegetation and Wildlife Habitats in the following section. The 2007 configuration of the LGWSP for GBRA Needs, despite the reduction in yield, exhibits increased potential impact scores as a result of the pipeline location serving GBRA water customers traversing Bexar, Guadalupe, and Comal Counties.

The water management strategies that include development of large amounts of groundwater all avoid the potential environmental and cultural resources impacts usually attendant to development of similar volumes of surface water. However, local residents of the areas that would be affected have expressed concerns about declining well levels and potential impacts to springs and streamflows. Development of a large amount of groundwater from the Carrizo-Wilcox Aquifer will likely result in some reductions in streamflow in both the San Antonio and Guadalupe Rivers, and in inflows to the Guadalupe Estuary. However, modeling the net effect on streamflows in the San Antonio and Guadalupe Rivers of complete implementation

[34] Martin, Q., D. Mosier, J. Patek, C. Gorham-Test, "Freshwater Inflow Needs of the Matagorda Bay System," Lower Colorado River Authority, Austin, Texas, 1997.
[35] Texas Parks and Wildlife Department (TPWD) and Texas Water Development Board (TWDB), "Freshwater Inflow Recommendation for the Guadalupe Estuary of Texas," Coastal Studies Technical Report No. 98-1, TPWD and TWDB, Austin, Texas, 1998.

of all the currently recommended water management strategies has not indicated any significant change in streamflows in either river, particularly with respect to low flows.

The seawater and brackish groundwater desalination projects involve little construction disturbance except for the necessary raw water intakes or wells and transmission pipelines. Use of either seawater or brackish bay water sources will entail potential impacts due to impingement and entrainment of aquatic organisms at the intake, and to the need to discharge water 2-3 times as salty as the raw water. Potential impacts from desalination operations can be avoided or significantly minimized by appropriate site selection and design of intake and discharge structures based on the biological and hydrodynamic characteristics of the receiving water.

In order to assess the potential cumulative environmental impacts of all the recommended water management strategies having quantifiable impacts, a method was developed to numerically characterize the environmental effects of each water management strategy in terms such that very different kinds of impacts could be aggregated and the results compared. To evaluate the resulting impact scores of the current 2006 Regional Water Plan (which will become a part of the 2007 State Water Plan) relative to the possible universe of water management strategies available to the region, we compare the present set of recommended water management strategies to those proposed for the South Central Texas Region in previous State Water Plans.

The location and extent of potential disturbances to environmental and cultural resources are based on the descriptions and environmental assessments of the water management strategies in Volume III, Technical Evaluations of South Central Texas Region Water Supply Options (January 2001), and updated information developed by HDR Engineering, Inc. and Paul Price Associates, Inc. during the current regional water planning effort. Pipeline routes were provided digitally by HDR and overlaid on DRG (Digital Raster Graphic) maps of 7.5 minute USGS Quads using ArcView. From this, pipeline lengths and areas were calculated. A 30-foot permanent easement corridor was assigned to pipelines with pipe diameters less than 36 inches and a 40-foot corridor for those with diameters greater than 36 inches. A 100-foot temporary construction corridor was assumed for all pipelines. Areas inundated by reservoirs were obtained from the 2001 technical evaluations, as well as other estimations of land area disturbed. The total areas for facilities such as water treatment plants, pump stations, storage units, and wells were calculated by subtracting any reservoir areas and permanent pipeline easement areas from the total impact areas in the 2001 technical evaluations, or as updated during this year.

Recommended water management strategies that involve only reallocation of previously appropriated water using existing infrastructure are not included in this analysis. These strategies, which include conservation, reuse, transfer of water among user groups, and local groundwater development, do not generally require additional reservoirs, pipelines, or other structures that would have significant environmental impacts. For consistency with water planning evaluation protocols used in this report, diversion and use of appropriated water is not considered to result in environmental impacts.

This assessment was completed using a matrix approach to perform a series of parallel evaluations of each water management strategy for its potential to impact:

(1) Endangered and Threatened Species;
(2) Vegetation and Wildlife Habitats;
(3) Water Quality and Aquatic Habitats;
(4) Cultural Resources; and/or
(5) Ecologically Significant River and Stream Segments.

The impact values were tabulated, summed for all water management strategies in each of the State Water Plans, and the aggregate scores normalized by dividing them by the total firm yield of the respective State Water Plan strategies (Table 7.2-2), and again by the average score of the five State Water Plans.

7.2.2.1 Endangered and Threatened Species

The potential impacts of the individual water management strategies were first evaluated with respect to state- and federally-listed endangered and threatened species, and species of special concern, using a two-part index system. First, each listed species was assigned a score that reflected its status—1 for species of concern; 2 for threatened; or 3 for endangered. In cases where status varies among state and federal agencies, the higher status was used. The most current county lists and mapped occurrences of endangered and threatened species within Region L were obtained from the TPWD Natural Heritage Program and used.

Each water management strategy was then evaluated with respect to its potential impact on the species present by assigning a numerical value from zero (0) to three (3) to each instance in which construction or operational disturbances could result in an impact to one of these species according to the following criteria:

0 - No adverse impact expected, project in historic range only

1 - Species known to occur within county, but not likely to be impacted

2 - Species or potential habitat known to occur within the project area, may impact habitats or individuals of widespread species

3 - Species or habitat present within the corridor, significant reductions in critical habitat or population of endemic species possible.

Each potential impact score was then multiplied by the status score to obtain a final impact assessment for that species and strategy. Status, potential impact and impact assessment scores are shown in the Endangered Species tables in the respective water management strategy discussions (Volume II). The summed impact assessment scores are listed and the overall endangered and threatened species impact values for each of the State Water Plans are presented in Table 7.2-3.

The potential impacts to endangered and threatened species associated with the five State Water Plans are compared in Figure 7.2-3, which indicates a higher potential for impacts to occur in the two most recent plans. This finding is a direct result of the changing nature of the water management strategies; projects requiring long pipelines that cross numerous ecologically distinct areas, and those constructed in regions where many protected species occur will have more project facilities adjacent to sensitive species and habitats, and thus higher impact potential, than larger, more compact projects that are not located in areas of many protected species. In Table 7.2-3, the highest impact scores go to the water management strategies located in areas of relatively high protected species density and the projects requiring the longest pipelines. The high score for the Edwards Recharge Projects is due primarily to the proposed recharge sites located in northern Bexar County, where increased water levels during runoff/recharge events may adversely affect cave communities adjacent to and within the recharge reservoirs that include federally listed endangered invertebrates.

7.2.2.2 Vegetation and Wildlife Habitats

To evaluate potential impacts on vegetation and wildlife habitats, each of the water management strategies was given a "total adjusted impact value" based on the total area of each habitat type disturbed by construction activities and the level of potential impacts on those resources. For each water management strategy, the total land area potentially disturbed was

Table 7.2-3.
Potential Impacts to Endangered and Threatened Species from Water Management Strategies in State Water Plans

ID#	***Water Management Strategy***	***1984***	***1990***	***1997***	***2002***	***2007***
G-16C1	Cuero Reservoir	49	49			
G-17C1	Lindenau (Sandies) Reservoir	51	51	51		
G-40	Cloptin Crossing Reservoir	48				
G-21	Lockhart Reservoir	9				
S-14D	Applewhite Reservoir	34	34			
S-16C	Goliad Reservoir	67	67			
S-15C	Cibolo Reservoir	39				
S-15Da	Cibolo Reservoir w/ SA River		44	44		
LGWSP	Lower Guadalupe Water Supply Project				68	
LGWSP	LGWSP for GBRA Needs					104
LSWP	LCRA-SAWS Water Project				80	130
SCTN-3c	Simsboro Aquifer				68	
L-18a	Edwards Recharge Projects				104	104
SCTN-17	Seawater Desalination				79	79
CZ-10C	Carrizo Aquifer - Wilson & Gonzales				40	
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop				27	
	Regional Carrizo for Bexar County					42
	Hays/Caldwell Carrizo Project					29
G-24	Wimberley/Woodcreek from Canyon				57	57
	Brackish Wilcox Desalination					26
	Wells Ranch / CRWA Dunlap Project				34	34
	CRWA Siesta Project				29	29
Factor 1,000	**Raw Score**	**297**	**245**	**95**	**586**	**634**
	Score / Unit Supply	**0.727**	**0.486**	**0.498**	**1.006**	**1.350**
	Normalized Score / Unit Supply	**0.894**	**0.597**	**0.612**	**1.237**	**1.659**
	Rank	**3**	**1**	**2**	**4**	**5**

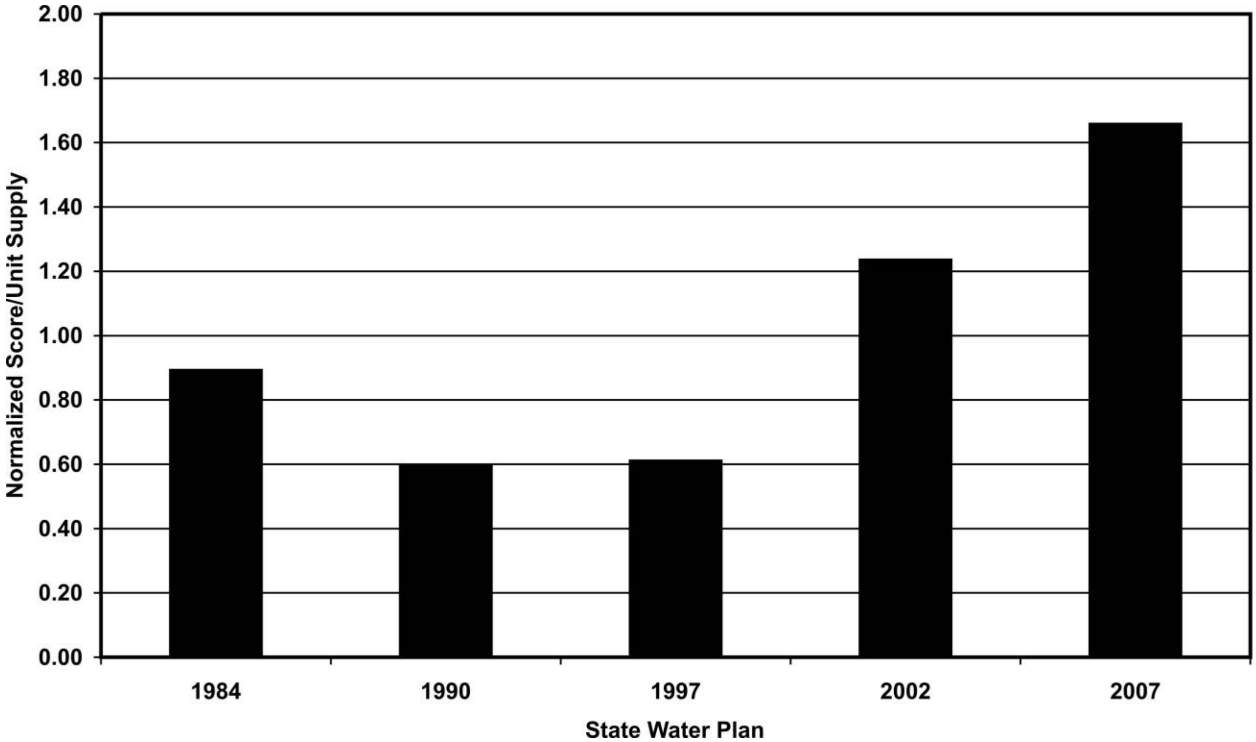

Figure 7.2-3. Cumulative Potential Impact Scores for Endangered and Threatened Species

divided into categories based on types of disturbance. For example, inundation of land due to the construction of a reservoir versus the temporary construction corridor of a pipeline easement. The potential level, or severity, of impacts to vegetation and wildlife was evaluated by assigning an expected impact score:

1 - Low impacts = temporary habitat disturbance (e.g., a pipeline construction corridor);
2 - Medium impacts = permanent or continuing habitat disturbance that does not entirely destroy its original ecological functions; or
3 - High impacts = habitat is permanently removed through inundation or construction.

The area of each type of disturbance was then divided into four categories of habitat type with corresponding scores reflecting their relative values (e.g., forests and wetlands are generally considered more important ecologically than grassland types):

1 - 0-30% canopy cover (grasslands, shrub land and cropland);
2 - 31-70% canopy cover (brush lands, and parkland);
3 - 70-100% canopy cover (woods and forestland); or
4 - All wetland and wooded riparian areas regardless of canopy cover.

These four categories were based on a clustering of the eight Physiognomic Regions of vegetation by the TPWD. The digital pipeline routes provided by HDR were then projected over a map of the vegetation types of Texas from the TPWD to determine the proportions of the four habitat categories potentially affected by each water management strategy.

The product of the level of impact score times the habitat value score times the acreage affected is the adjusted impact value. Adjusted impact values are summed for the habitats potentially affected by each water management strategy and overall vegetation and habitat scores are shown in Table 7.2-4. Figure 7.2-4 presents a graphical comparison of the five State Water Plans. These results are clearly the opposite of those obtained above for protected species; the present 2006 Regional Water Plan (2007 State Water Plan) exhibits the least impact to this environmental resource category. In this case, the large areas to be inundated in the storage reservoir projects recommended in the 1984 to 1997 State Water Plans eliminate large areas of terrestrial and flowing aquatic habitat, replacing them with a lake-type environment.

7.2.2.3 Water Quality and Aquatic Habitats

Potential impacts to water quality and aquatic habitats were assessed in a single stage as each water management strategy was evaluated with respect to a list of eight potential impact classes and assigned an appropriate score for each occurrence of the eight evaluation categories:

(1) Inundation/Conversion of lotic to lentic habitat: 1
(2) Streamflow reductions: 1, or 0.25 if compliant with Consensus Criteria for Environmental Flow Needs (CCEFN)
(3) Alteration of flood frequency (below storage reservoirs): 1
(4) Alteration of physio-chemical characteristics of streamflow: 1, or 0.25 if compliant with CCEFN
(5) Blocks aquatic migration (any dam on a perennial stream): 1
(6) Alteration of annual hydrograph: 1, or 0.25 if compliant with CCEFN
(7) Construction disturbance: 1 for each outfall, intake, pipeline stream crossing, and dam
(8) Bay and Estuary inflows: 1, or 0.25 if compliant with CCEFN

Scores were tabulated for each water management strategy and summed for each State Water Plan.

Table 7.2-4.
Potential Impacts to Vegetation and Wildlife Habitats from Water Management Strategies in State Water Plans

ID#	***Water Management Strategy***	***1984***	***1990***	***1997***	***2002***	***2007***
G-16C1	Cuero Reservoir	243,933	243,933			
G-17C1	Lindenau (Sandies) Reservoir	242,980	242,980	242,980		
G-40	Cloptin Crossing Reservoir	30,171				
G-21	Lockhart Reservoir	13,639				
S-14D	Applewhite Reservoir	12,712	12,712			
S-16C	Goliad Reservoir	136,422	136,422			
S-15C	Cibolo Reservoir	84,604				
S-15Da	Cibolo Reservoir w/ SA River		84,717	84,717		
LGWSP	Lower Guadalupe Water Supply Project				10,816	
LGWSP	LGWSP for GBRA Needs					12,004
LSWP	LCRA-SAWS Water Project				26,739	55,798
SCTN-3c	Simsboro Aquifer				4,422	
L-18a	Edwards Recharge Projects				13,769	13,769
SCTN-17	Seawater Desalination				4,343	4,343
CZ-10C	Carrizo Aquifer - Wilson & Gonzales				3,088	
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop				8,762	
	Regional Carrizo for Bexar County					4,797
	Hays/Caldwell Carrizo Project					2,921
G-24	Wimberley/Woodcreek from Canyon				1,128	1,128
	Brackish Wilcox Desalination					478
	Wells Ranch / CRWA Dunlap Project				1,307	1,307
	CRWA Siesta Project				1,149	1,149
Factor 1	**Raw Score**	**764,461**	**720,764**	**327,697**	**75,525**	**97,964**
	Score / Unit Supply	**1.872**	**1.430**	**1.718**	**0.130**	**0.208**
	Normalized Score / Unit Supply	**1.747**	**1.335**	**1.603**	**0.121**	**0.194**
	Rank	**5**	**3**	**4**	**1**	**2**

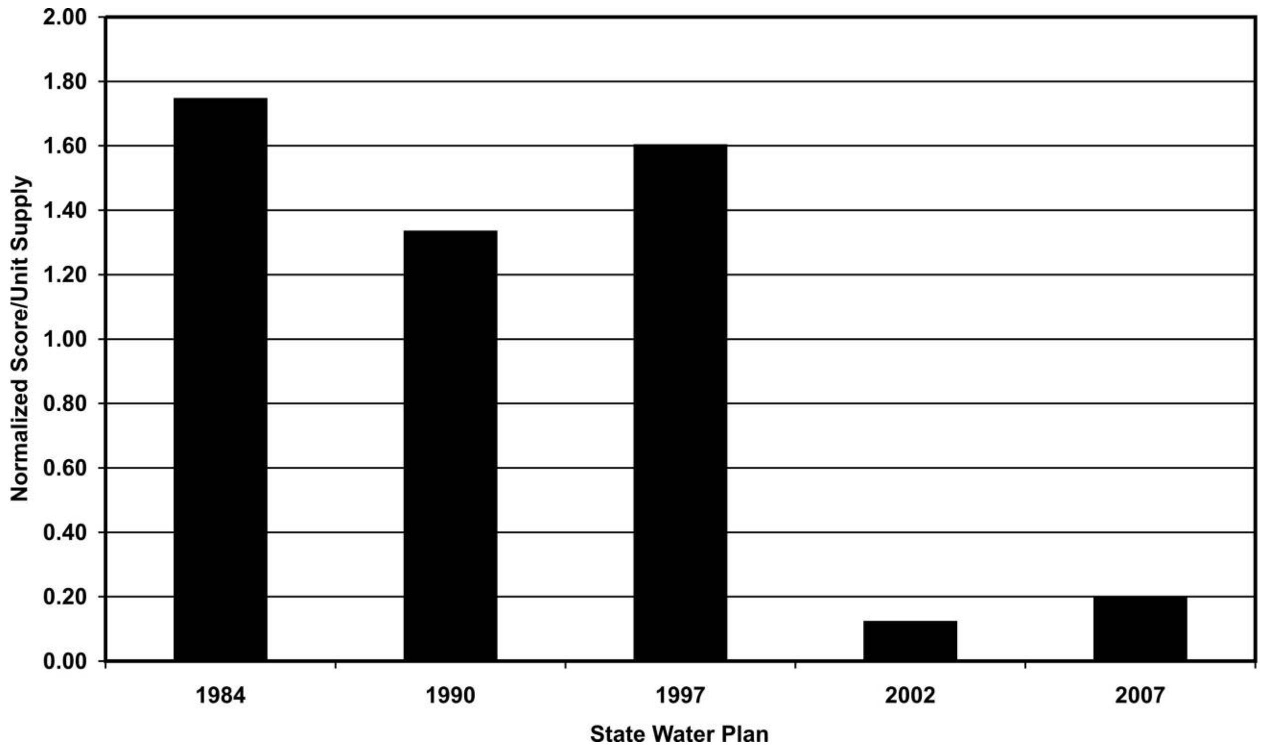

Figure 7.2-4. Cumulative Potential Impact Scores for Vegetation and Wildlife Habitats

The State Water Plans were also scored on the net flow impacts following implementation of all recommended water management strategies on major streams at five locations: Guadalupe River at Cuero/Victoria; San Antonio River at Falls City; Guadalupe River at Saltwater Barrier near Tivoli; Nueces Estuary near Corpus Christi; and Colorado River at Bay City. Net flow impact scores were based on the following scale, with the greatest impact score being associated with the greatest potential change in streamflow or freshwater inflow:

0 - Flow increase or no change at low (less than 50th percentile), no change or minor decrease at high flows;

1 - Moderate decrease at low flows (less than 10 percent between 25th and 50th percentiles);

2 - Moderate decrease at low flows, (greater than 20 percent decrease between 50th and 75th percentiles);

3 - Greater than 10 percent decrease between 25th and 50th percentiles; or

4 - Greater than 10 percent decrease between 25th and 50th percentiles, greater than 20 percent decrease between 50th and 75th percentiles.

The summed water quality/habitat and net stream flow scores for each State Water Plan, divided by the plan yields, were added together and normalized. The results are presented in Table 7.2-5 and Figure 7.2-5 is a graphical comparison of the five water plans. The water management strategies recommended for the two most recent water plans exhibit substantially smaller potential impacts on surface waters than do the reservoir strategies adopted in the earlier plans. Several factors work together to produce this result; reliance on groundwater projects, elimination of the impacts of river impoundment and riparian inundation, and location of diversions at the river mouths to eliminate streamflow impacts to the Guadalupe and Colorado Rivers.

7.2.2.4 Cultural Resources

Assessment of potential impacts to cultural resources included evaluation of both prehistoric (archaeological) sites and historic properties, including cemeteries and public property. Probable impacts to both prehistoric and historic sites were determined according to their proximity to the probable construction areas and the type of site, if known. All historic sites within a mile of the pipeline corridor were entered into the impact matrix along with their distances from the pipeline and other details relevant to determining probable impact. Impact scores were based on the following scale, with the greatest impact score being associated with permanent inundation of site:

0 - Historic sites mapped greater than 0.50 mile from the disturbance;
1 - Sites between 0.25 and 0.50 mile from the disturbance;
2 - Sites less than 0.25 mile from the disturbance;
3 - Permanently inundated sites; and
1 - Additional impact point assigned for cemeteries.

Table 7.2-5.
Potential Impacts to Water Quality and Aquatic Habitats from Water Management Strategies in State Water Plans

ID#	Water Management Strategy	1984	1990	1997	2002	2007
G-16C1	Cuero Reservoir	5.75	5.75			
G-17C1	Lindenau (Sandies) Reservoir	5.75	5.75	5.75		
G-40	Cloptin Crossing Reservoir	5.75				
G-21	Lockhart Reservoir	5.75				
S-14D	Applewhite Reservoir	6.75	6.75			
S-16C	Goliad Reservoir	5.75	5.75			
S-15C	Cibolo Reservoir	5.75				
S-15Da	Cibolo Reservoir w/ SA River		6.75	6.75		
LGWSP	Lower Guadalupe Water Supply Project				1.50	
LGWSP	LGWSP for GBRA Needs					1.50
LSWP	LCRA-SAWS Water Project				6.00	15.00
SCTN-3c	Simsboro Aquifer				3.00	
L-18a	Edwards Recharge Projects				3.25	3.25
SCTN-17	Seawater Desalination				1.00	1.00
CZ-10C	Carrizo Aquifer - Wilson & Gonzales				2.25	
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop				1.25	
	Regional Carrizo for Bexar County					1.00
	Hays/Caldwell Carrizo Project					1.00
G-24	Wimberley/Woodcreek from Canyon				1.00	1.00
	Brackish Wilcox Desalination					0.00
	Wells Ranch / CRWA Dunlap Project				1.00	1.00
	CRWA Siesta Project				1.00	1.00
	Raw Score	**41**	**31**	**13**	**21**	**26**
	Score / Unit Supply	**1.010**	**0.610**	**0.655**	**0.365**	**0.548**
Net Streamflow Change						
Guadalupe River @ Cuero/Victoria		4	4	4	0	0
San Antonio River @ Falls City		0	4	4	0	0
San Antonio/Guadalupe @ Saltwater Barrier		4	4	4	0	0
Nueces Estuary @ Corpus Christi		0	0	0	0	0
Colorado River @ Bay City		0	0	0	4	4
	Total	**8**	**12**	**12**	**4**	**4**
	Score / Unit Supply	**0.196**	**0.238**	**0.629**	**0.069**	**0.085**
	Combined Score / Unit Supply	1.206	0.848	1.284	0.434	0.633
	Normalized Score / Unit Supply	1.369	0.963	1.458	0.492	0.719
	Rank	**4**	**3**	**5**	**1**	**2**

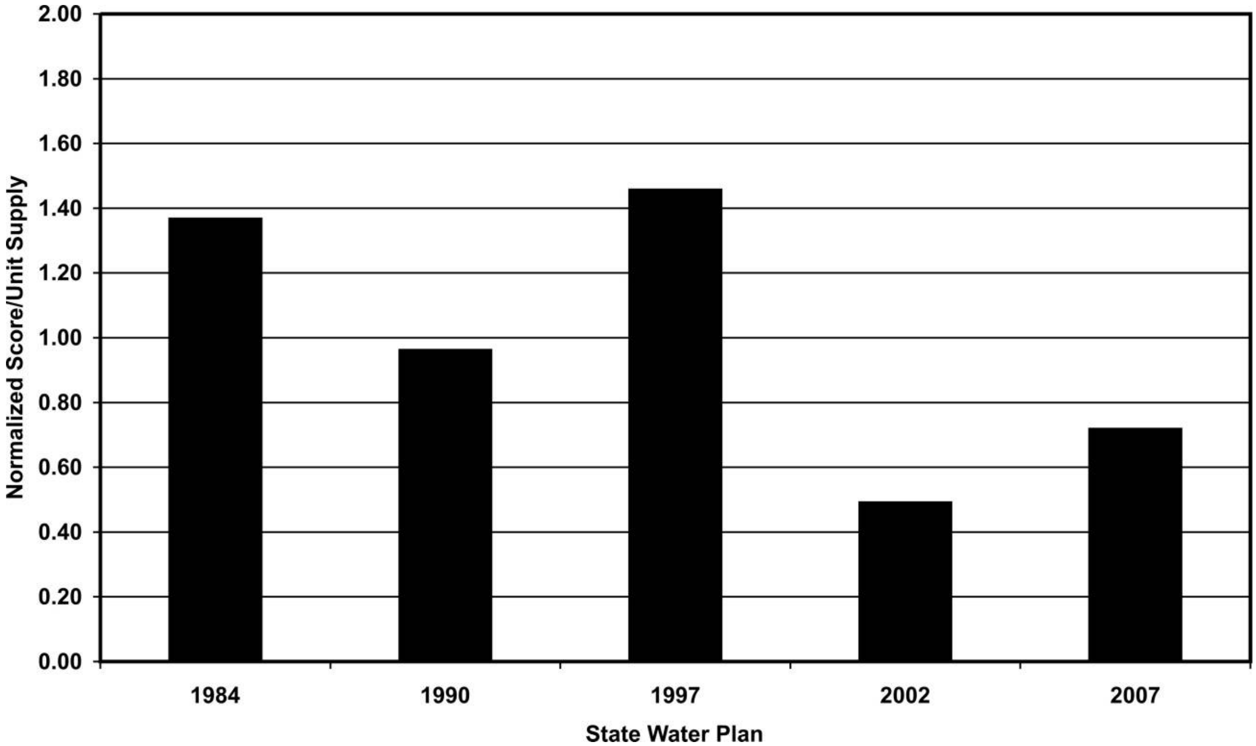

Figure 7.2-5. Cumulative Potential Impact Scores for Water Quality and Aquatic Habitats

Potential impacts to archaeological resources were estimated by compiling the number of proposed disturbances to landforms considered to be of relatively high potential for containing buried archaeological deposits. The high-potential areas were defined to be stream terraces bordering both perennial and intermittent streams. A probable impact index was devised which includes factors reflecting site potential and type of disturbance for each instance of the activity:

1.5 - Perennial stream crossings;
1 - Intermittent stream crossings;
2.5 - Construction parallel to perennial stream channels; or
2 - Construction parallel to intermittent stream channels.

For each water management strategy, impact values for historical sites were added to the potential archaeological site impact estimates to arrive at the total impact values shown in Table 7.2-6. Figure 7.2-6 presents a graphical comparison of the five State Water Plans. The large reservoir projects recommended in the three earlier State Water Plans would have

Table 7.2-6.
Potential Impacts to Cultural Resources from Water Management Strategies in State Water Plans

ID#	Water Management Strategy	1984	1990	1997	2002	2007
G-16C1	Cuero Reservoir	1,242	1,242			
G-17C1	Lindenau (Sandies) Reservoir	176	176	176		
G-40	Cloptin Crossing Reservoir	22				
G-21	Lockhart Reservoir	22				
S-14D	Applewhite Reservoir	55	55			
S-16C	Goliad Reservoir	144	144			
S-15C	Cibolo Reservoir	44				
S-15Da	Cibolo Reservoir w/ SA River		79	79		
LGWSP	Lower Guadalupe Water Supply Project				83	
LGWSP	LGWSP for GBRA Needs					114
LSWP	LCRA-SAWS Water Project				179	179
SCTN-3c	Simsboro Aquifer				89	
L-18a	Edwards Recharge Projects				26	26
SCTN-17	Seawater Desalination				95	95
CZ-10C	Carrizo Aquifer - Wilson & Gonzales				79	
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop				85	
	Regional Carrizo for Bexar County					125
	Hays/Caldwell Carrizo Project					15
G-24	Wimberley/Woodcreek from Canyon				18	18
	Brackish Wilcox Desalination					7
	Wells Ranch / CRWA Dunlap Project				54	54
	CRWA Siesta Project				17	17
Factor 10,000	**Raw Score**	**1,704**	**1,695**	**254**	**724**	**649**
	Score / Unit Supply	**41.719**	**33.625**	**13.315**	**12.426**	**13.808**
	Normalized Score / Unit Supply	**1.816**	**1.463**	**0.579**	**0.541**	**0.601**
	Rank	**5**	**4**	**2**	**1**	**3**

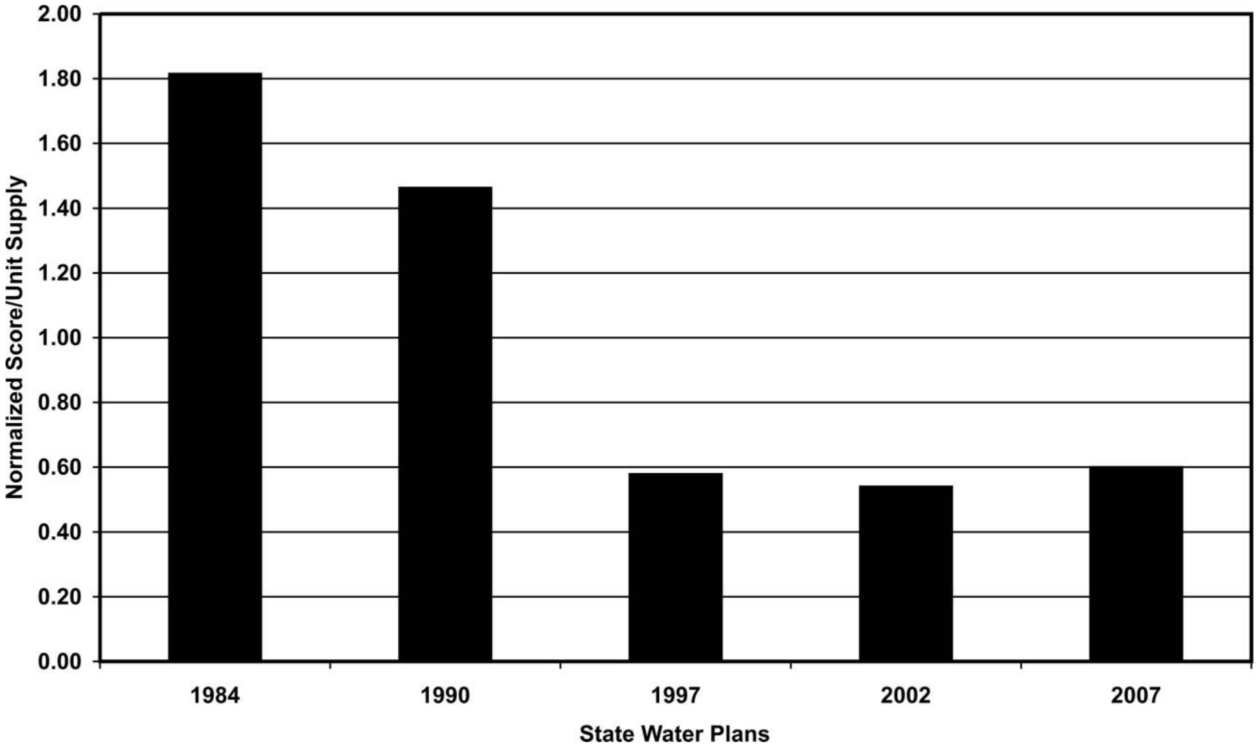

Figure 7.2-6. Cumulative Potential Impacts to Cultural Resources

inundated large areas of substantial prehistoric and historic value, as evidenced by the National Historic District designations in the Cuero and Goliad Reservoir sites. The high impact scores for water management strategies with long pipelines also reflect the large number of stream terrace transgressions that will occur as pipelines are constructed across the tributaries of the San Antonio, Guadalupe, and Colorado Rivers.

7.2.2.5 Ecologically Significant River and Stream Segments

Potential impacts to stream segments identified as Ecologically Significant River and Stream Segments by TPWD (Table 7.2-1 and Figure 7.2-2) were assessed by tabulating the instances of the following construction and operations items occurring in or affecting a unique segment:

- Recharge dam;
- Channel dam, diversion pool only;
- Reservoir diversion;
- River diversion;
- Tributary impoundment;

- Pipeline crossing;
- Groundwater withdrawals with a significant effect on streamflow; and/or

Reduced flood peaks from upstream dam operation.The summed, normalized scores for the five State Water Plans are presented in Table 7.2-7 and Figure 7.2-7. The locations of the water management strategies recommended for the 2006 Regional Water Plan result in more potential conflicts with the ecological functions or features of the identified segments than do those in earlier plans. However, inspection of Table 7.2-1 indicates that the recommended water management strategies will generally be compatible with the existing uses and ecological functions listed by TPWD for these reaches.

7.2.2.6 Composite Comparison

Figure 7.2-8 is a composite comparison of the five State Water Plans aggregating the results of the assessments of four of the individual environmental resource categories. The scores associated with Ecologically Significant River and Stream Segments are excluded as the basis for such ecological significance is typically related to the first four categories for which scoring has been performed (endangered & threatened species, vegetation & wildlife habitats, water quality & aquatic habitats, and/or cultural resources). This comparison shows that reliance on conservation, groundwater, and run-of-river diversion projects, rather than large storage reservoirs, has resulted in a reduction in potential environmental impacts in the recent Regional and State Water Plans. Because the nature of many of these projects is such that actual impacts can be identified and avoided or mitigated based on information from field studies required by permitting agencies, realized impacts are expected to be significantly less than the potential impacts discussed herein. This would not be expected to be the case with respect to the reservoir projects, which offer little opportunity for impact avoidance due to inflexibility in size and location, and whose primary impacts (permanent disturbance, inundation of lotic and terrestrial habitats, streamflow perturbations) may not be amenable to minimization or compensation.

Table 7.2-7. Potential Impacts to Ecologically Significant River and Stream Segments from Water Management Strategies in State Water Plans

	1984	*1990*	*1997*	*2002*	*2007*
Crossings	0	0	0	11	6
Unappropriated Div.	1	0	1	4	3
Dam	1	0	0	4	4
Raw Score	**2**	**0**	**1**	**19**	**13**
Score / Unit Supply	**0.049**	**0.000**	**0.052**	**0.326**	**0.277**
Normalized Score / Unit Supply	**0.348**	**0.000**	**0.372**	**2.316**	**1.965**
Rank	**2**	**1**	**3**	**5**	**4**

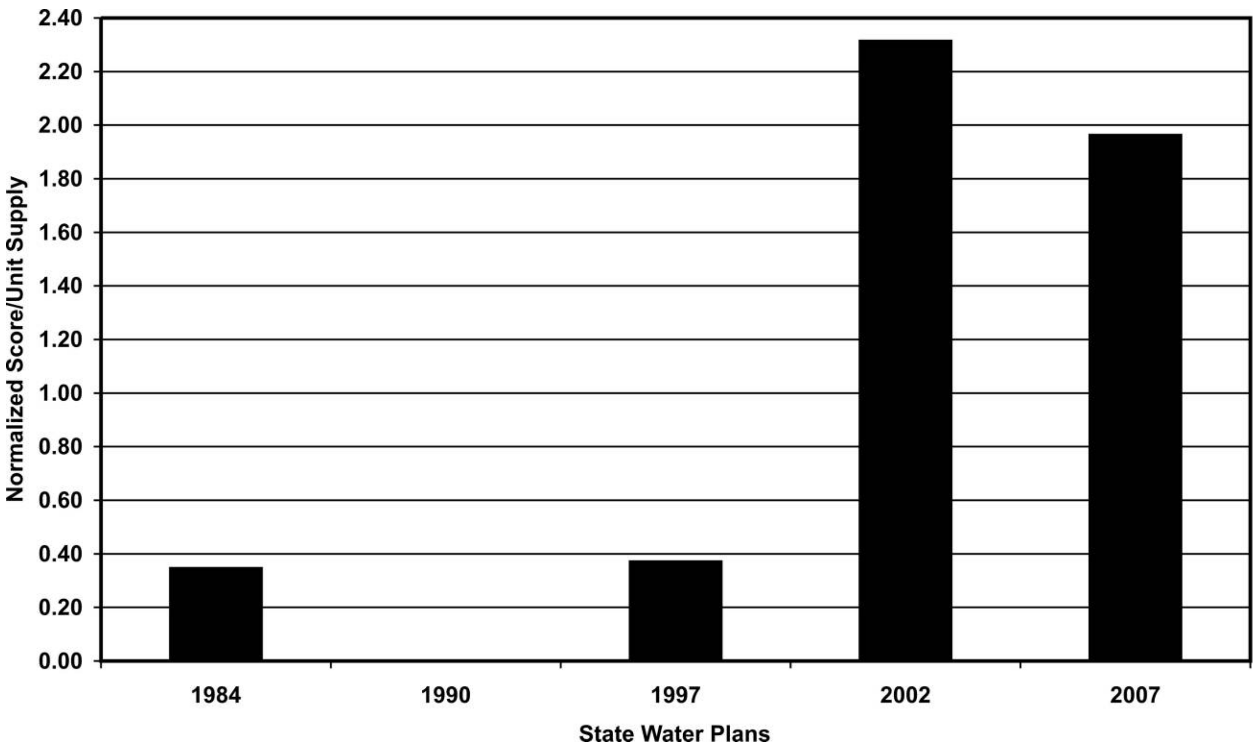

Figure 7.2-7. Cumulative Potential Impacts to Ecologically Significant River and Stream Segments

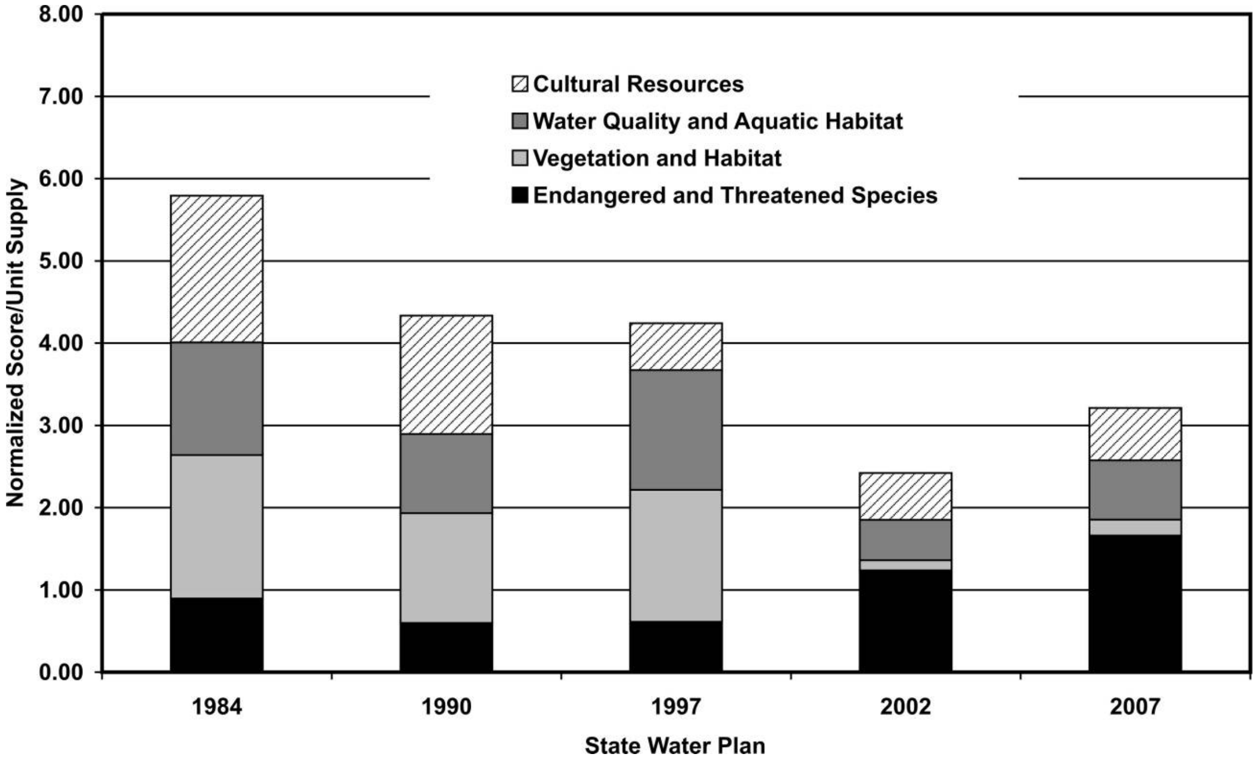

Figure 7.2-8. Cumulative Potential Impact Scores for South Central Texas Regional Water Planning Area

7.3 Environmental Benefits and Concerns

The South Central Texas Regional Water Planning Group has identified the following environmental benefits and concerns associated with the implementation of the 2006 Regional Water Plan.

7.3.1 Environmental Benefits

- Substantial commitment to water conservation through adoption of an aggressive water conservation water management strategy effectively reduces projected water shortages thereby delaying or eliminating the need for implementation of other water management strategies having greater associated environmental impacts.
- Development of new water supply sources for Bexar, Comal, and Hays Counties reduces reliance on the Edwards Aquifer during drought thereby contributing to maintenance of springflow and protection of endangered species. The Regional Water Plan recognizes the on-going initiatives of the Edwards Aquifer Authority (EAA) to obtain U.S. Fish & Wildlife Service approval of a Habitat Conservation Plan which will help to define the requirements for maintenance of springflow and protection of endangered species.

- Implementation of the 2006 Regional Water Plan is likely to result in increased instream flows in the San Antonio River.
- Edwards Aquifer Recharge Enhancement through the construction of Type 2 recharge dams (L-18a) contributes not only to municipal water supply, but also to maintenance of springflow, protection of endangered species in and below the springs, increased instream flows, and increased freshwater inflows to the Guadalupe Estuary.
- The Regional Water Plan makes greatest beneficial use of existing surface water rights and major storage facilities (Canyon Reservoir, Highland Lakes System) thereby minimizing the development of new water supply sources and associated environmental impacts. Examples include reliance on presently under-utilized water rights held by the Guadalupe-Blanco River Authority (GBRA) and Union Carbide Corporation (UCC) below the confluence of the Guadalupe and San Antonio Rivers and by the Lower Colorado River Authority (LCRA) on the Lower Colorado River. Enhanced use of existing surface water rights and major storage facilities accounts for approximately one-third of the total new water supplies for municipal, industrial, steam-electric, and mining uses by 2060.
- The Regional Water Plan avoids large-scale development of new reservoirs having associated terrestrial and aquatic habitat and cultural resources impacts and focuses on smaller, off-channel balancing reservoirs essential for efficient operations and meeting peak seasonal water needs.
- Inclusion of Edwards Aquifer transfers from irrigation use to municipal use through lease/purchase of pumpage rights and development of conserved water through installation of LEPA irrigation systems results in substantial increases in municipal water supply without construction of additional transmission and storage facilities having associated environmental effects.
- The San Antonio Water System (SAWS) goal of meeting 20 percent of projected water demand through its Recycled Water Program makes greatest use of developed water resources.
- Inclusion of groundwater development has limited associated environmental effects as compared to those typically associated with development of new surface water supply reservoirs.
- Inclusion of Seawater Desalination is perceived to have fewer associated environmental effects, as compared to those typically associated with development of new (fresh) surface water supplies.

7.3.2 Environmental Concerns

- Potential reductions in freshwater inflows to bays and estuaries, including associated effects on wetland and marsh habitats and marine species, are identified as matters of concern. Primary concerns focus upon the potential effects of the LCRA-SAWS Water Project on freshwater inflows to Matagorda Bay and the Lower Guadalupe Water Supply Project for GBRA Needs on freshwater inflows to the Guadalupe Estuary.
- Concentration of Edwards Aquifer pumpage closer to Comal Springs as a result of implementation of Edwards Transfers tends to reduce discharge from Comal Springs.

- Potential conflicts with stream segments identified by TPWD as ecologically significant are associated with the LCRA-SAWS Water Project, Lower Guadalupe Water Supply Project for GBRA Needs, and Edwards Recharge – Type 2 Projects (L-18a).
- Potential effects on small springs and instream flows below these springs may be associated with the development of groundwater supplies.
- Intake siting, brine discharge location(s), and potential effects on marine habitat and species are environmental concerns associated with Seawater Desalination.

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Section 8
Policies and Recommendations
[31 TAC §357.7(a)(10); 31 TAC §357.8; and 31 TAC §357.9]

8.1 Agricultural Water

Feasibility of Meeting Irrigation Water Needs: The SCTRWPG finds that, under current conditions, it is not economically feasible for agricultural producers to pay for additional water supplies to meet all of the projected irrigation water shortages. See Section 4C.1.2 for an analysis of economic feasibility underlying this finding of the Regional Water Planning Group.

The SCTRWPG recommends that the TWDB undertake economic studies of water management strategies that may meet irrigation needs in Texas.

Agricultural Water Conservation Programs: The SCTRWPG recommends restoring funding to the Agricultural Water Conservation programs provided by the TWDB.

Water Use Information: The SCTRWPG recommends that TWDB improve the water use information for irrigation and livestock watering categories.

8.2 Rural Water

Given the increasing number of proposals to export large amounts of water, the legislature should review Section 36.122 of the Texas Water Code. Any necessary changes should allow for sufficient revenue to support high quality technical studies and should be made to ensure that districts are fully equipped to analyze and respond to such proposals, to fully consider their effect on local communities, the rural environment and economy.

8.3 Groundwater

Groundwater Management: The SCTRWPG respects the rules and regulations of groundwater districts, just as it does those of all other state subdivisions and agencies. The SCTRWPG believes that all rules should be adopted pursuant to accepted administrative procedures based on the standards of rationality, equity and scientific evidence.

Groundwater Sustainability: The SCTRWPG has adopted the goal of groundwater sustainability and recommends management strategies needed to accomplish this goal. This recommendation is intended to help protect all users of those aquifers that are subject to increased withdrawals, to help preserve the long-term integrity of those aquifers, and to build awareness of the effects of pumping on those aquifers and of their recovery capabilities. The SCTRWPG recommends that any person implementing any groundwater option or strategy identified as part of this Regional Plan consider and incorporate groundwater monitoring of both quantity and quality, recharge protection and enhancement, conservation methods and related practices, as determined to be appropriate by local groundwater districts. Where no district exists, the developer should monitor impacts and, when appropriate, take corrective action consistent with the goal of groundwater sustainability.

Shared Groundwater Resources among Planning Regions: In the event a Water User Group relies on a groundwater management strategy to meet the Water User Group's demand during the planning period and the strategy would have a significant impact on a groundwater resource shared among planning region(s), notice shall be provided to the region(s) of the proposed date of implementation and anticipated acre-feet per year demand on the shared groundwater resource.

Equity in Groundwater and Surface Water Law: The SCTRWPG recognizes a need for equity in groundwater and surface water law to facilitate the proper balance of the use of those resources. The SCTRWPG recommends that the state provide incentives to develop conjunctive use projects that more efficiently utilize groundwater and surface water.

Land Stewardship: The SCTRWPG encourages State support of implementing or enhancing land stewardship management practices that are shown to augment the quality and quantity of the state’s surface water and groundwater resources.

Development and Use of Groundwater: The SCTRWPG encourages legislation requiring public or private entities planning to develop groundwater projects to provide an economic analysis of the impact to communities, instream flows, and bay and estuary systems incurred by movement of the groundwater.

Funding of Groundwater Conservation Districts: Given the increasing number of proposals to export large amounts of water, the Legislature should review Section 36.122 of the Texas Water Code. Any necessary changes should allow for sufficient revenue to support high quality technical studies and should be made to ensure that Groundwater Conservation Districts are fully equipped to analyze and respond to such proposals, and to fully consider their effect on local communities, the rural environment and the economy.

Region L’s Matrix Approach: The SCTRWPG encourages the Texas Water Development Board to fund development, in general accordance with the SCTRWPG proposal to TWDB submitted in June 2004, of a generic "Analytical Tool" that will provide a standard method for regional water planning groups, groundwater conservation districts, groundwater developers, and others to use to evaluate local hydrologic, environmental, social, and economic impacts on specific groundwater exportation/marketing proposals.

8.4 Surface Water

Surface Water Rights Monitoring and Administration: The TCEQ should be adequately staffed and funded to ensure the legal and appropriate use of permitted surface water rights through comprehensive monitoring and administrative programs, such as the Watermaster program.

Equity in Groundwater and Surface Water Law: The SCTRWPG recognizes a need for equity in groundwater and surface water law to facilitate the proper balance of the use of those resources. The SCTRWPG recommends that the state provide incentives to develop conjunctive use projects that more efficiently utilize groundwater and surface water.

Surface Water Rights and Interbasin Transfer: The SCTRWPG considered the positive and negative impacts of certain provisions added to Chapter 11.085 of the Texas Water Code regarding Interbasin Transfers pursuant to Senate Bill 1 of the 75th Legislature. Among the negative impacts cited by some members are these:

- It imposes limitations on surface water rights permits that have previously been issued, possibly diminishing the value of some permits to the owners.
- It forces greater use of groundwater supplies, and potentially, encourages the mining of aquifers.
- It can result in construction of new reservoirs that would not be needed if seniority of rights and existing environmental flow requirements were preserved in interbasin transfers because of the need to provide reliable water supplies in the plans.

Other members of the SCTRWPG cite the following positive effects of these provisions added by Senate Bill 1.

- The junior water rights provision protects municipalities and other water users, especially in cases where the interbasin transfer of senior water rights would put junior rights at risk.
- Bays and estuaries and instream flows have added protection from the impact of water exportation.
- Establishing the seniority of basin-of-origin water rights over those used for export preserves the economic value of the resource for the future development of the basin-of-origin.

The SCTRWPG makes no specific recommendation at this time for legislative changes to Chapter 11.085 of the Texas Water Code.

Lockhart Reservoir: The Lockhart Reservoir is recognized as a potential supply for the City of Lockhart and others. This water management strategy may be considered as an amendment to the Regional Water Plan.

8.5 Conservation

Conservation Planning Guidelines: Because of the central role of conservation in achieving the water supply objectives of the South Central Texas Regional Plan, the SCTRWPG has adopted the Water Conservation Implementation Task Force recommendation to establish GPCD Targets and Goals related to average annual reductions in residential indoor use. The SCTRWPG recognizes that the creation of conservation programs and the selection of specific conservation technologies is a matter of local choice and recommends that the water user groups reference the Water Conservation Best Management Practices Guide, TWDB Report 362, as an educational tool that can facilitate understanding of the importance of conservation efforts and the wide range of methods available for use.

Region L has addressed, defined, and adopted the most reasonably practical level of conservation to be:

(1) For Water Use Groups (WUGS) with per capita water use of 140 gpcd and greater in year 2000, reduce gpcd by 1 percent per year until reaching 140 gpcd, and reduced gpcd by 0.25 percent per year thereafter.
(2) For WUGS with per capita water use less than 140 gpcd in year 2000, reduce gpcd by 0.25 percent per year.

Implementation of Water Conservation Task Force Recommendations: SCTRWPG supports legislation for funding to implement the Water Conservation Task Force recommendations, particularly the statewide public education programs, such as Water IQ. Further, SCTRWPG supports the recommendations and legislative initiatives contained in the report of this task force.

Irrigation Technology Center: The State should provide additional funding for the Irrigation Technology Center, as instituted by the Texas A&M University System, in order to provide hands-on access to state-of-the-art water conservation technologies tailored to the specific urban and agricultural conservation needs of this region.

8.6 Innovative Strategies

Assistance for Alternative Water Supply Strategies: The State should increase funding to assist water planning regions and local water entities in developing demonstration projects for alternative water supply strategies and technologies, such as, but not limited to, desalination. With this assistance, water planning regions could avoid short-term projects that may be less costly but also less desirable because of environmental and socio-economic impacts. By funding demonstration projects for alternative technologies that may not yet be cost-effective, the State can help local water management entities avoid adverse impacts to the environment, to property rights and to local socio-economic conditions. In this way, the State can play a crucial role in guiding regions to water supply solutions that meet needs while also resolving conflict. Funding to demonstrate the value of innovative long-term strategies thus can help achieve cost-saving, efficient regional water management solutions.

Desalination: The SCTRWPG supports the funding of a state and/or federal program for research and potential incentives to make desalination more affordable. This includes both brackish groundwater and seawater desalination. Should such incentives, technical advances, and/or other factors make a seawater desalination strategy similar to that described in Section 4C.22 sufficiently attractive to a water user group or WWP that implementation prior to year 2050 is desired, it is explicitly recognized by the SCTRWPG that such rescheduled implementation is consistent with the 2006 South Central Texas Regional Water Plan.

Rangeland Management (Brush Management): The SCTRWPG encourages the Legislature to increase funding to the Texas State Soil and Water Conservation Board for the purpose of increasing brush control programs integrated with proven rangeland management practices.

Rainwater Harvesting and Other Systems: The SCTRWPG encourages the use of rainwater harvesting systems in both commercial and residential new development. The SCTRWPG recommends the TWDB develop programs to educate the public and building industry on the benefits of rainwater harvesting, water re-use and gray water systems. The educational programs should include distribution of materials to the building industry to encourage use of these systems.

Weather Modification: The SCTRWPG urges the state to continue to support the existing Weather Modification Program.

Drought Contingency Plan: Drought Management/Drought Contingency Planning (DM/DCP) is not yet incorporated as a recommended water management strategy in the 2006 South Central Texas Regional Water Plan. Water user groups (specifically municipal water suppliers) are, however, required to articulate DM/DCP within their TWDB management plans.

Calculations for the 2006 plan, using the TWDB socioeconomic impact analysis of unmet water needs in the region – and assuming that none of these needs would otherwise be met – resulted in unacceptable high projections of business, personal income, and tax revenue losses. There are predictions of even greater costs outside these clearly defined categories, though they are acknowledged as being more difficult to measure. Experience does not, however, support this conclusion to the extent that is would either preclude the viability of DM/DCP as a strategy or dictate its exclusion from the plan.

Among principal impacts of DM/DCPs being incorporated as a water management strategy are the following:

- that economic ramifications of stages one and two DM measures are considered to be minimal and should not be overstated in the analysis, i.e., each stage's impacts – one through four – should be evaluated independently; and
- that DM/DCP, in concert with anticipated user conservation responses to sever drought conditions, may obviate the necessity for developing water resources/supplies that carry very high unit costs.

The SCTRWPG recommends that a more thorough analysis of DM/DCP as a water management strategy be conducted during the planning interim. The experience of water suppliers who have planned and implemented DM/DCP should prove of benefit in this analysis and lead to a practical DM strategy.

8.7 Environmental

Protection of Edwards Aquifer Springflow and Downstream Water Rights: While the plan assumes annual withdrawals of 340,000 acft from the Edwards Aquifer under drought of record conditions, it is projected that this level of pumpage will not protect springflows in all drought conditions.. A draft Habitat Conservation Plan has been completed and is currently under review by the United States Fish and Wildlife Service (USFWS). If the USFWS or other government authorities mandate reductions in pumpage from the Edwards Aquifer below

340,000 acre-feet, annually, water options and management strategies in addition to those identified in this plan will be needed to meet the projected demands of Water User Groups.

Ecosystem Health, Quality of Life, and Growth Management for Texas: The rapid growth occurring in South Central Texas has the potential to negatively impact quality of life. Human demands for water and infrastructure development may outstrip the ability of all of the region's resources to respond and to be sustainable. Texas should focus on these issues and evaluate land use and the health of its ecosystem in order to prepare for the future and support a sustainable quality of life for all Texans.

Ecologically Unique Stream Segments and Unique Reservoir Sites: The Legislature has clarified that the designation of a unique stream segment "solely means that a state agency of political subdivision of the state may not finance the actual construction of a reservoir in a specific river or stream segment." This clarification does not address the uncertainties that a unique stream segment designation made by a regional water planning group might create during the Texas Legislature's ratification process or during state or federal permitting process for projects other than reservoirs.

Until the Legislature provides further clarification regarding projects other than reservoirs, the SCTRWPG recommends that there be no designation of sites in this round of planning. However, the SCTRWPG recognizes the great importance of the issue for the protection of sites of high ecological value.

The SCTRWPG has ample evidence of the existence in this region of many streams that may deserve recognition and protection, including the list prepared by the Texas Department of Parks and Wildlife identifying 20 stream segments meeting one or more of the criteria specified in Senate Bill 1. There have been additional suggestions of sites made by members of the SCTRWPG, by many individuals through our public involvement process and by such organizations as the San Antonio River Basin Alliance, the Texas Rivers Protection Association, the San Marcos River Foundation, and the Wimberley Valley Watershed Association.

The SCTRWPG believes there should be a clear process for the development of recommendations on site designation. Such a process should include extensive public involvement and ample opportunity and resources for the assessment of all potential impacts.

Instream Flows and Bays and Estuaries: Legislative framework and funding are needed for improved science and diverse regional stakeholder input into the process for selection of appropriate freshwater inflow goals on an estuary-by-estuary basis. The appropriate balance of environmental and human needs during severe drought has very significant effects on the firm yield and associated cost of potential water supply projects.

The SCTRWPG encourages completion of the Texas Instream Flow Studies Program and improvement of the State's bays and estuaries freshwater inflow studies, with special attention paid to the report of the Science Advisory Committee of the Study Commission on Water for Environmental Flows

The SCTRWPG supports an overall environmental flow strategy that facilitates change as future information becomes available, provides for a sound ecological environment, and assures dependable water supplies for human use.

The SCTRWPG requests better policy direction in the law regarding environmental flows and reuse that would streamline and provide greater predictability in the permitting process for projects.

The SCTRWPG encourages TCEQ and TWDB to evaluate the relationship between groundwater and surface water to ensure that riverine base flows derived from groundwater springs are maintained. The SCTRWPG supports a holistic approach to watershed management that considers the cumulative effects of all water uses in a basin.

Environmental Studies: The SCTRWPG recognizes that significant needs exist in Bexar and the surrounding counties and that new supplies need to be developed in the Guadalupe River and San Antonio River watersheds. There are issues related to environmental impacts that need further study to determine feasibility of reuse of wastewater effluent, Edwards Aquifer recharge dams, the proposed Dunlap and Siesta water supply projects, and the resulting groundwater-surface water interaction from the existing and proposed Carrizo projects. Therefore, the SCTRWPG recommends that additional environmental studies be undertaken to be able to evaluate the effects of such projects on the ecosystems that rely on inflow to San Antonio Bay and flows of the Guadalupe River and San Antonio River watersheds.

8.8 Providing and Financing Water and Wastewater Systems

Plan Implementation: Given the unprecedented level of time and money expended in the development of Regional Water Plans across the state, the SCTRWPG urges the Legislature to act promptly to help ensure full implementation of these plans.

Funding: The SCTRWPG believes that State funding should be provided as a key incentive for partnership in funding from local, regional and federal governmental agencies.

The SCTRWPG encourages a more active State support in solicitation of Federal funding for development of new water supply sources, especially when the need for which is based in part upon Federal requirements, such as the Endangered Species Act.

State Water Plan Implementation: State support is fundamental for the successful implementation of the water resources projects in the State Water Plan resulting from the SB-1 Regional Planning Process. Specifically, new legislation to create State support for implementation of the State Plan should include the following:

- A statewide funding mechanism for projects included in the State Water Plan.
- Sufficient funding for TWDB and TCEQ to administer their programs and activities associated with planning, financing and permitting of the projects in the State Plan.

Continuation of Regional Water Planning: The SB-1 Planning Process is an important program, and funding should be continued to sustain the work of the Regional Water Planning Groups.

State Position in Federal Permitting: In the context of the federal permitting processes pertaining to water resources, all state agencies should present a single position consistent with the State's position as articulated in the State Water Plan.

The SCTRWPG supports the concept that a state agency (TWDB) be responsible for implementation of and advocacy for projects in the State Water Plan with regard to funding and permitting at the state and federal levels.

8.9 Data

Water Data Collection: The Legislature should fully fund the cooperative, federal-state-local program of basic water data collection, including (a) Stream gages-quantity and quality; (b) Groundwater monitoring-water levels and quality; (c) Hydrographic surveys-sediment accumulation in reservoirs; (d) Water surface evaporation rates; (e) Water use data for all water user groups; and (f) Population projections.

Access to State Water Data: There should be adequate funding for the critical roles of TWDB and TCEQ in facilitating access to water data essential for local and regional planning and plan implementation purposes.

Population and Water Demand Projections: The SCTRWPG recognizes that the TWDB bases its water demand projections on patterns of population and economic growth while also permitting revisions of state data to incorporate additional information developed by the planning regions. Nevertheless, some groups believe that the methodology puts an unfair limitation on access to water for future growth, particularly in areas that may experience more rapid change than they have in the past. The Legislature should modify the Regional Water Planning process to allow for greater flexibility and for earlier and more active involvement of the Regional Water Planning Groups in developing growth and water demand projection methodologies consistent with water availability strategies. Water demand projections used in developing the Regional Water Plan should be consensus figures arrived at by using TWDB data along with local input from the cities, counties and groundwater districts.

Coastal Basins: Coastal basins adjacent to major river basins are considered part of the major basins. The SCTRWPG recommends eliminating the requirement to tabulate data for these areas by county and basin boundary since the result is a set of essentially empty tables.

8.10 Other Issues

Planning for System Management Water Supplies: System management water supplies, i.e. supplies over and above those apparently needed to meet projected demands, may be included in the plan for the following reasons: 1) to recognize both the long lead times and the uncertainty associated with risk factors that may prevent implementation of water management strategies and necessitate replacement strategies; 2) to preserve flexibility for water user groups or wholesale water suppliers to select the most feasible projects among several consistent with the Regional Plan and therefore potentially eligible for permitting and funding; 3) to serve as additional supplies in the event rules, regulations or other restrictions limit use of any planned strategies, and 4) to ensure adequate supplies in the event of a drought more severe than that which occurred historically. The plan should specify those factors affecting reliability of the recommended options and strategies and indicate what alternatives are available as possible replacements.

The amount of the management supply should be limited by consideration of the following factors: 1) potential disruptive impacts of planning for projects that have low probability of implementation; and 2) citing of specific reasons for management supplies that exceed the projected needs of the region.

Public Education on Water: The State should fund a state-wide program to educate the general public about water in coordination with the Agricultural Extension Service offices. The program should produce water-related materials with special components adapted for each water planning region and should also include a component comparable to the "Major Rivers" program that would be available to the public schools through the Regional Education Service Centers and by other means.

SCTRWPG supports legislation for funding to implement the Water Conservation Task Force recommendations, particularly the statewide public education programs, such as Water IQ.

County Authority: Counties should have additional authority for land use planning and for regulating development based on availability and protection of water resources.

Planning Requirements: There should be no changes in the planning process or additional planning requirements except through the formal rule-making procedure. Contract requirements should be established and in place prior to submission of grant proposals.

Regional Boundaries Should Foster Collaboration: The SCTRWPG recommends that the Legislature make it very clear to all Texans that the boundaries of the regional water planning regions were drawn only to define water planning regions and that the boundaries are not intended to be barriers to prevent water transport from one region to another – nor to pit one region against another for any reason.

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Section 9
Water Infrastructure Funding Recommendations
[31 TAC §357.7(a)(14)]

9.1 Introduction

Senate Bill 2 (77th Texas Legislature) requires that an Infrastructure Financing Report (IFR) be included in the 2006 regional water plan. In order to meet this requirement, each regional water planning group (RWPG) is required to examine the funding needed to implement the water management strategies and projects identified and recommended in the region's January 2006 regional water plan.

9.2 Objectives of the Infrastructure Financing Report

The primary objectives of the Infrastructure Financing Report are as follows:

- To determine the financing options proposed by political subdivisions to meet future water infrastructure needs (including the identification of any State funding sources considered); and
- To determine what role(s) the RWPGs propose for the State in financing the recommended water supply projects.

9.3 Methods and Procedures

In the South Central Texas Water Planning Area, there are 60 municipal water user groups (WUGs), and 7 wholesale water providers (WWPs) (6 of the wholesale water providers are also municipal retail water distributors, or WUGS) that have projected needs (shortages) during the planning period. Of the 60 WUGs and 7 WWPs, 18 WUGs and 6 WWPs have water management strategies with capital costs for which long term financing for implementation will be needed, with 42 WUGs and one wholesale provider having water management strategies that do not have capital costs which would require such financing, such as municipal water conservation, irrigation transfers, and/or purchase of water from a wholesale provider. All municipal water user groups having water needs and recommended water management strategies in the regional plan with an associated capital cost were surveyed using the questionnaire provided by the TWDB (Exhibit 9-A). For individual cities the survey was mailed to either the mayor or the city manager. Those WUGs with needs but for which water management strategies to meet the need do not have capital costs, such as purchase from wholesale provider, were not surveyed, since the capital costs for these strategies are included in the wholesale provider survey.

The surveys were mailed via first class U.S. Mail, along with supporting documentation that summarized the water management strategies included in the regional plan for that entity. Follow-up phone calls and emails were conducted with cities who did not respond by the initial deadline.

9.4 Survey Responses

The South Central Texas RWPG mailed survey packages to 24 municipal water user groups (18 WUGs and 6 WWPs) and received 17 responses, a 71 percent response rate. Copies of the completed surveys and related documentation are included in Exhibit 9-B. As shown in Table 9-1, the 17 responses represent about 99.5 percent of the estimated capital costs of water management strategies included in the Regional Water Plan. Of those responding, for which total capital costs are $5.01 billion, the survey shows that approximately $524.5 million (10.4 percent of the total capital costs) would be paid from local cash reserves. Approximately $3.1 billion (62.5 percent of the total capital costs) would be financed through bonds, $1.7 million (0.03 percent of the total capital costs) would be financed through bank loans, $137.5 million (2.7 percent of the total capital costs) would be paid with Federal Government programs, $763.8 million (15.2 percent of the total capital costs) would be financed through State Government programs, and $430.7 million (8.6 percent of the total capital costs) would be financed through other means. Some entities did not provide quantifiable responses to the survey due to concerns about data accuracy and the potential for the amounts given to be taken out of context. It is also important to note that it is unclear how the remaining 0.6 percent of the capital costs ($25.5 million for those entities not responding to the survey and $4.6 million for entities indicating that they would not implement the recommended plan) would be financed. Table 9-2 and Figure 9-1 provide a brief summary of responses from all utilities that provided written comments.

With respect to the role of the State in financing the recommended water supply projects, significant State participation is required in order to provide adequate funding for the implementation of water management strategies in the plan.

Table 9-1.
Summary of Survey Responses

Name of Political Subdivision	Recommended Project/Strategy	Implementation Date	Capital Cost to be paid by Political Subdivision)*	Plan to Implement the Recommended Strategy? (Y/N)	Cash Reserves	Bonds	Bank Loans	Government Programs - Federal	Government Programs - State	Other
Aqua WSC	Local Carrizo	2006	$ 1,448,000	Y	$724,000	$0	$724,000	$0	$0	$0
Benton City WSC	Local Carrizo	2015	$ 2,755,000	N	$0	$0	$0	$0	$0	$0
Bexar Metropolitan WD	Local Trinity	2006	$ 20,382,000	Y	$2,038,200	$10,191,000	$0	$1,019,100	$7,133,700	$0
Bexar Metropolitan WD	Local Carrizo	2010	$ 2,675,000	Y	$267,500	$1,337,500	$0	$133,750	$936,250	$0
Canyon Regional WA	Hays/Caldwell Carrizo Project	2030	$ 32,592,000	Y	$0	$11,407,200	$0	$1,629,600	$19,555,200	$0
Canyon Regional WA	CRWA Dunlap Project	2010	$ 44,837,000	Y	$0	$15,692,950	$0	$2,241,850	$26,902,200	$0
Canyon Regional WA	CRWA Siesta Project	2020	$ 34,544,000	Y	$0	$12,090,400	$0	$1,727,200	$20,726,400	$0
Canyon Regional WA	Wells Ranch Project	2010	$ 21,755,000	Y	$0	$7,614,250	$0	$1,087,750	$13,053,000	$0
City of Floresville	Local Carrizo	2045	$ 2,022,000	Y	$202,200	$202,200	$0	$1,617,600	$0	$0
City of Lockhart	Local Carrizo	2006	$ 4,806,000	Y	$0	$2,210,760	$0	$0	$2,595,240	$0
City of Lockhart	Hays/Caldwell Carrizo Project	2035	$ 13,036,800	Y	$0	$5,996,928	$0	$0	$7,039,872	$0
City of Luling	Local Carrizo	2006	$ 1,893,000	N	$0	$0	$0	$0	$0	$0
City of New Braunfels	Purchase from GBRA	2006	$ 23,322,000	Y	$4,990,908	$18,331,092	$0	$0	$0	$0
City of San Marcos	Hays/Caldwell Carrizo Project	2055	$ 45,628,800	Y	$4,562,880	$29,658,720	$0	$0	$11,407,200	$0
County Line WSC	Local Trinity	2006	$ 2,693,000	Y	$269,300	$0	$0	$0	$2,423,700	$0
GBRA**	LGSWP for Upstream GBRA Needs	2010	$ 656,822,000	Y	$0	$328,411,000	$0	$0	$328,411,000	$0
Gonzales County WSC	Local Carrizo	2015	$ 1,725,000	Y	$172,500	$0	$0	$0	$0	$1,552,500
Polonia WSC	Local Carrizo	2025	$ 2,193,000	Y	$0	$0	$0	$2,193,000	$0	$0
RWP for Bexar County	Edwards Aquifer Recharge	2015	$ 367,192,000	Y	$18,359,600	$238,674,800	$0	$36,719,200	$73,438,400	$0
RWP for Bexar County	Seawater Desalination	2055	$ 891,321,000	Y	$44,566,050	$579,358,650	$0	$89,132,100	$178,264,200	$0
SAWS	Regional Carrizo for Bexar County	2006	$ 486,604,000	Y	$80,776,264	$327,484,492	$0	$0	$0	$78,343,244
SAWS	Local Trinity	2006	$ 7,562,000	Y	$1,255,292	$5,089,226	$0	$0	$0	$1,217,482
SAWS	Brackish Groundwater Desalination	2006	$ 93,405,000	Y	$15,505,230	$62,861,565	$0	$0	$0	$15,038,205
SAWS	LCRA/SAWS Water Project	2045	$2,078,176,000	Y	$344,977,216	$1,398,612,448	$0	$0	$0	$334,586,336
Schertz-Seguin LGC	Regional Carrizo for SSLGC Expansion	2006	$ 26,649,000	Y	$4,263,840	$22,385,160	$0	$0	$0	$0
SS WSC	Local Carrizo	2006	$ 6,274,000	Y	$1,568,500	$0	$941,100	$0	$3,764,400	$0
		Total	**$5,008,562,600**		**$524,499,480**	**$3,145,735,341**	**$1,665,100**	**$137,501,150**	**$763,775,762**	**$430,737,767**
DID NOT RESPOND										
McCoy WSC	Local Carrizo	2006	$ 5,397,000							
Goforth WSC	Local Trinity	2006	$ 1,373,000							
City of Kyle	Hays/Caldwell Carrizo Project	2055	$ 6,518,400							
City of Kenedy	Local Gulf Coast Aquifer	2006	$ 4,822,000							
Sunko WSC	Local Carrizo	2035	$ 2,022,000							
Crystal Clear WSC	Local Carrizo	2015	$ 2,785,000							
Oak Hills WSC	Local Carrizo	2025	$ 2,595,000							
		Total	**$ 25,512,400**							

Note: For WUGs/WWPs with a new or changed Water Management Strategy from the Initially Prepared Plan, the same percentage sp its between the various funding sources, as were provided previously as part of the infrastructure financing survey, were used.

*In cases where two or more WUGs participate in the development of a water management strategy, the capital cost has been prorated at the 2060 sh are of the quantity of water produced by the strategy.

**No changes made to Exhibit 9-B.

Table 9-2.
Survey Responses — Comments and Proposed Options
South Central Texas Regional Water Planning Area

BENTON CITY WSC	We are currently funding and permitting 2 wells in the Carrizo to be drilled in early 2006. Funding w/TWBD $3.3 and $1.27 loans. May need high pressure pumps by 2015.
CITY OF LULING	The City of Luling does not have plans now nor in the future to drill wells to the Carrizo.
GONZALES COUNTY WSC	See Exhibit 9-B; letter attached to survey responses.
RWP FOR BEXAR COUNTY	More projects are listed above than is required to meet drought needs. Municipal Water Conservation and Edwards Aquifer Recharge – Type 2 projects will be implemented. Other projects will be implemented up to the amount of unmet need for Water User Groups relying upon the RWP for Bexar County. SAWS is only planning on participating in the following water management strategies: Edwards Aquifer Recharge – Type 2 Projects and Seawater Desalination.
SAWS	SAWS will not be participating in the following water management strategies: Simsboro Aquifer and purchase from WWP (RWPBC) – LGWSP.
SS WSC	These estimates for future water sources could increase by 600% if the planned well field in the Carrizo Aquifer dedicated to SAWS 11,000 acre feet requirements dewaters our existing wells. Funding for this requirement would be mitigated by Region L and SAWS.

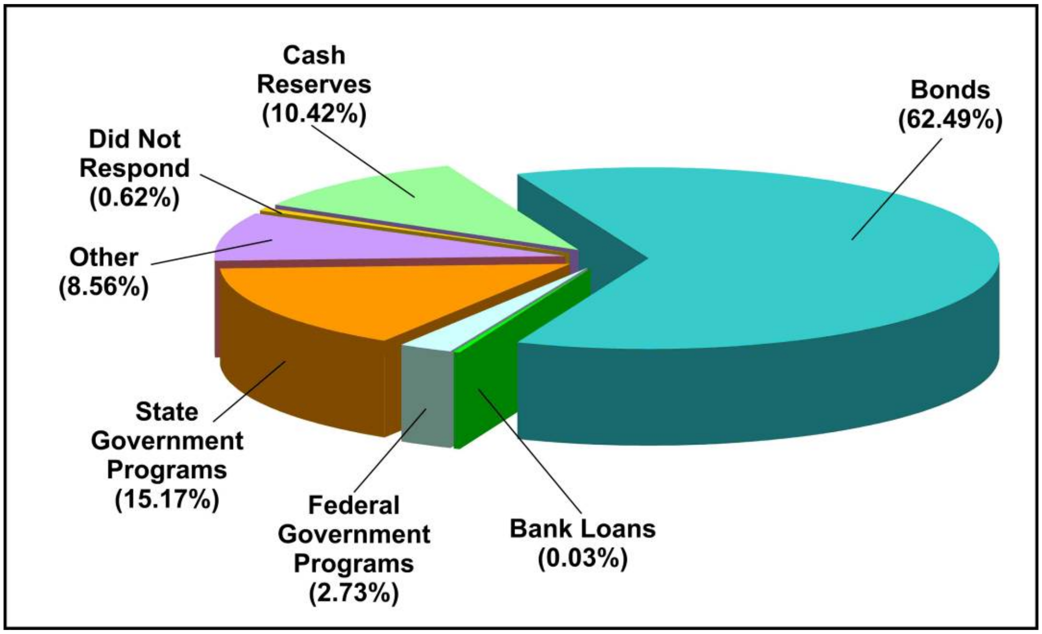

Figure 9-1. Summary of Survey Responses

Exhibit 9-A
TWDB IFR Survey Form

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP)

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Total Cost of Capital Improvements	$		

Are you planning to implement the recommended projects/strategies? Yes____ No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)		
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name ____________ Title ____________ Phone No. <>

Please return completed form to:

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

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Exhibit 9-B
IFR Survey Form Responses

Spreadsheet for Compiling Infrastructure Finance Data from Political Subdivision with Needs

RWPG	Name of Political Subdivision	Recommended Project/Strategy	Implementation Date	Capital Cost to be paid by Political Subdivision)	ID # from DB07	Planning on Implementing the recommended Strategy? (Y/N)	IF 'NO': If 'no' explanation of how they will meet future water needs.	IF 'YES'---->: % Cash Reserves	% Bonds	% Bank Loans	% Government Programs - Federal	% Government Programs - State	% Other	Other explanation	TOTAL % (should be 100%)	Name of Contact Person	Title	Phone
L	Aqua WSC	Local Carrizo	2006	$ 1,448,000	L12.1	Y		50%		50%					100%			
L	Benton City WSC	Local Carrizo	2015	$ 2,755,000	L12.1	N									0%	Linda Stewart	Office Manager	(830) 209-3254
L	Bexar Metropolitian WD	Local Trinity	2008	$ 20,382,000	L12.3	Y		10%	50%		5%	35%			100%	Michael J. Albach	Dir. Of Operations	(210) 327-5707
L	Bexar Metropolitian WD	Local Carrizo	2010	$ 2,675,000	L12.1	Y		10%	50%		5%	35%			100%	Michael J. Albach	Dir. Of Operations	(210) 327-5707
L	Canyon Regional WA	Hays/Caldwell Carrizo Project	2030	$ 32,592,000	L17	Y			35%		5%	60%			100%	David Davenport	General Manager	(830) 609-0543
L	Canyon Regional WA	CRWA Dunlap Project	2010	$ 44,837,000	L24	Y			35%		5%	60%			100%	David Davenport	General Manager	(830) 609-0543
L	Canyon Regional WA	CRWA Siesta Project	2020	$ 34,544,000	L25	Y			35%		5%	60%			100%	David Davenport	General Manager	(830) 609-0543
L	Canyon Regional WA	Wells Ranch Project	2010	$ 21,755,000	L16	Y			35%		5%	60%			100%	David Davenport	General Manager	(830) 609-0543
L	City of Floresville	Local Carrizo	2045	$ 2,022,000	L12.1	Y		10%	10%		80%				100%			
L	City of Lockhart	Local Carrizo	2006	$ 4,806,000	L12.1	Y			46%			54%			100%	Vance Rodgers	Assistant City Manager	(512) 398-6452
L	City of Lockhart	Hays/Caldwell Carrizo Project	2035	$ 13,036,800	L17	Y			46%			54%			100%	Vance Rodgers	Assistant City Manager	(512) 398-6452
L	City of Luling	Local Carrizo	2006	$ 1,893,000	L12.1	N									0%			
L	City of New Braunfels	Purchase from GBRA	2006	$ 23,322,000	L5	Y		21%	79%						100%	Roger R. Biggers	Executive Director	(830) 629-8470
L	City of San Marcos	Hays/Caldwell Carrizo Project	2055	$ 45,628,800	L17	Y		10%	65%			25%			100%	Laurae Anderson	Dir. Of Engineering	(512) 393-8130
L	County Line WSC	Local Trinity	2006	$ 2,693,000	L12.3	Y		10%				90%			100%	Daniel R. Heidemen	Manager	(512) 398-4748
L	GBRA	LGSWP for GBRA Needs	2010	$ 793,072,000	L8	Y			50%			50%			100%	Tommy Hill	Chief Engineer	(830) 379-5822
L	Gonzales County WSC	Local Carrizo	2015	$ 1,725,000	L12.1	Y		10%					90%		100%	Clarence Littlefield	Project Engineer	(830) 672-7546
L	Polonia WSC	Local Carrizo	2025	$ 2,193,000	L12.1	Y					100%				100%	Paul L. Pittman	Manager	(512) 398-4757
L	RWP for Bexar County	Edwards Aquifer Recharge	2015	$ 367,192,000	L20	Y		5%	65%		10%	20%			100%	Steven J. Raabe	Dir. Planning & Dev.	(210) 302-3614
L	RWP for Bexar County	Seawater Desalination	2055	$ 891,321,000	L22	Y		5%	65%		10%	20%			100%	Steven J. Raabe	Dir. Planning & Dev.	(210) 302-3614
L	SAWS	Regional Carrizo for Bexar County	2008	$ 486,604,000	L14	Y		17%	67%				16%		100%	Darren Thompson	Planner IV	(210) 233-3669
L	SAWS	Local Trinity	2008	$ 7,562,000	L12.3	Y		17%	67%				16%		100%	Darren Thompson	Planner IV	(210) 233-3669
L	SAWS	Brackish Groundwater Desalination	2006	$ 93,405,000	L21.1	Y		17%	67%				16%		100%	Darren Thompson	Planner IV	(210) 233-3669
L	SAWS	LCRA/SAWS Water Project	2045	$ 2,078,176,000	L9	Y		17%	67%				16%		100%	Darren Thompson	Planner IV	(210) 233-3669
L	Schertz-Seguin LGC	Regional Carrizo for SSLGC Expansion	2006	$ 26,649,000	L15	Y		16%	84%						100%	John Schraub	Water Utility Manager	(830) 401-2408
L	SS WSC	Local Carrizo	2006	$ 6,274,000	L12.1	Y		25%		15%		60%			100%	Herb Williams	General Manager	(830) 779-2837

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) AQUA WSC

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Local Carrizo	2006-2010	448,000	L12.1
Total Cost of Capital Improvements	$	448,000	

Are you planning to implement the recommended projects/strategies? Yes ✓ No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	$ 224,000	50%
Bonds (General Obligation and Contract Revenue)		
Bank Loans	$ 224,000	50%
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form: [signature] Name — Gen Manager Title — 512-303-3943 Phone No. <>

Please return completed form to:

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) BENTON CITY WSC

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L.1.1
Local Carrizo	2015-2020	2,755,000	L.12.1
Total Cost of Capital Improvements	$	2,755,000	

Are you planning to implement the recommended projects/strategies? Yes____ No X

If "no," please describe how you will meet your future water needs? (Use additional pages if needed). We are currently funding and permitting 2 wells in the Carrizo to be drilled in early 2006. Funding w/TWDB #3.3 and #1.27 loans May need high pressure pumps by 2015.

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?

Please indicate:

(1) Funding source(s)[1] by checking the corresponding row(s), and

(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)		
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.: TWDB Funding Sources (both)	TWDB	100%
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed) See TWDB web site www.twdb.state.tx.us/Assistance.)

#1.27 Taxable Water System Revenue Bonds Series 2003-A — 2003 DWSRF
#3.3 Water System Revenue Bonds, Proposed Series 2003 — RWAF

Person Completing this form:

Name	Title	Phone No.
Linda Stewart	Office Manager	830-209-3254

Please return completed form to:

~~Ms. Maggie Dalthorp~~
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

* Please see attached *

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **BEXAR METROPOLITAN WD**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Edwards Transfers	2006-2010	0	L2
Local Trinity	2006-2010	20,382,000	L12.3
Wells Ranch Project	2006-2010	To Be Determined	L16
Purchase from WWP (CRWA) - Siesta Project	2006-2010	0	L25
Purchase from WWP (CRWA) - Hays/Caldwell Project	2006-2010	0	L17
Purchase from WWP (RWPBC) - LGWSP	2010-2020	0	L7
Total Cost of Capital Improvements	$	20,382,000	

Are you planning to implement the recommended projects/strategies? Yes____ No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

* Please see attached *

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)		
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed) See TWDB web site www.twdb.state.tx.us/Assistance.) * please see attached *

Person Completing this form: Michael J. Ullrich (signature) — Name

Director of Operations — Title

(210) 357-5707 — Phone No.

Supplemental Page – Infrastructure Financing Survey
Bexar Metropolitan Water District

Project/Water Management Strategy	Capital Cost Estimate[1]
Local Trinity	$27,000,000
Wells Ranch	$13,977,000
Siesta	$20,349,000
Dunlap[2]	$23,030,000
LGWSP[3]	

Are you planning to implement the recommended projects/strategies? (Yes) No

Potential Funding Source	Source to be Used	Percent (%)
Cash Reserves	x	10%
Bonds (General Obligation & Contract Revenue)	x	50%
Bank Loans		
Federal Government Programs	x	5%
State Government Programs (TWDB)	x	35%
Other		

State Participation in Regional Water Facilities[4]
Drinking Water State Revolving Fund,[5] including the Federal Capitalization Grant

[1] These estimates are based on the estimated BMWD participation of costs identified in the HDR 8-26-05 drafts (Wells Ranch, Dunlap & Siesta) and current contract negotiations for local Trinity supplies.
[2] This project is in implementation. Had it been in the planning phase, state funding would have been appropriate. The listed capital is the sum of those shared with the Wells Ranch project.
[3] This project's fate, costs and BexarMet's anticipated participation are all currently unknown.
[4] The remaining portion of the Dunlap/Wells Ranch may be an appropriate candidate for this program
[5] BexarMet plans to participate in this program for Local Trinity supply projects. State and Federal funding will be sought for all eligible projects.

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **CANYON REGIONAL WA**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Dunlap/Wells Ranch Project	2006-2010	To Be Determined	L16
Siesta Project	2010-2020	To Be Determined	L25
Hays/Caldwell Carrizo Project	2030-2040	32,592,000	L17
Total Cost of Capital Improvements	$	32,592,000	

Are you planning to implement the recommended projects/strategies? **Yes** ✓ **No** ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)	✓	35%
Bank Loans		
Federal Government Programs	✓	5%
State Government Programs; i.e.; TWDB Funding Sources	✓	60%
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

State Participation, SRF Program

Person Completing this form:

David Davenport — General Manager — 830.609.0543

Name — Title — Phone No. <>

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) FLORESVILLE

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Local Carrizo	2045-2050	2,022,000	L12.1
Total Cost of Capital Improvements	$	2,022,000	

Are you planning to implement the recommended projects/strategies? Yes ✓ No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	General Fund	10%
Bonds (General Obligation and Contract Revenue)	Revenue	10%
Bank Loans		
Federal Government Programs	CDBG	80%
State Government Programs; i.e.; TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)		100%

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No.
[signature]	City Mgr	830-393-3105

Please return completed form to:

Ms. Maggie Dalthorp
Moorhead Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **LOCKHART**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Local Carrizo (city wells)	2006-2010	4,806,000	L12.1
Hays/Caldwell Carrizo Project	2035-2040	~~13,036,800~~ 6,000,000	L17
Luling-Lockhart Water Supply Agreement	2005-2030	5,200,000	
		16,006,000	
Total Cost of Capital Improvements $		~~17,842,800~~	

Are you planning to implement the recommended projects/strategies? **Yes** ✓ **No** ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If "yes", how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)* by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)		46
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources	TWDB	54
Other		
Total (Sum should equal 100 %)		100

* Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No.
Vance Rodgers	Asst City Mgr	512-398-4452

Please return completed form to:

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

City of Luling

509 E. Crockett • Luling, Texas 78648 • Phone: (830) 875-2481 • Fax: (830) 875-2038

FAX

To: Maggie Walthour

@Fax: 361-882-5625

@Ph: ______

From: Annie Gonzales
Asst. City Secretary

Date: 11-10-05 Time: ______

Re: Finance Survey

Pages: 1 (including this cover sheet)

______ URGENT ______ RESPOND A.S .A.P.

✓ FOR YOUR REVIEW ______ PLEASE COMMENT

Comments:
Maggie:
The City of Luling does not have plans now or in the future to drill wells to the Carrizo.
Annie

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) NEW BRAUNFELS

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Purchase from GBRA - Canyon Res Downstream Div			
(Build own Water Treatment Plant)	2006-2010	23,322,000	L5
Total Cost of Capital Improvements	$	23,322,000	

Are you planning to implement the recommended projects/strategies? Yes X No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	5,000,000	21.4
Bonds (General Obligation and Contract Revenue)	18,322,000	78.6
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.: TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)	23,322,000	100 %

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed) See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No.
Roger R. Biggers	Exec Director of Water Services	830-629-8470

Please return completed form to:

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

CITY OF SAN MARCOS

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **SAN MARCOS**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Purchase from WWP (GBRA) - Increased LGWSP Cap	2015-2060	0	L8
Additional Surface Water Rights	2025-2030	$ 3,800,000	L11
Recycled Water	2035-2040	$ 8,500,000	L1
Hays/Caldwell Carrizo Project	~~2055-2060~~	$ 33,000,000	L17
	2006	$	
Total Cost of Capital Improvements		$ 45,300,000	

Are you planning to implement the recommended projects/strategies? Yes ✓ No ___

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	✓	10
Bonds (General Obligation and Contract Revenue)	✓	40-90
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources	✓	0-50
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, and the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)
HAVE NOT BEEN DETERMINED

Person Completing this form:

Name	Title	Phone No.
LAURIE ANDERSON, P.E.	DIR. OF ENG.	(512) 393-8130

Please return completed form to:

Ms. Maggie Dalthorp
Moorhead Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) COUNTY LINE WSC

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Local Trinity	2006-2010	2,693,000	L12.3
Edwards Transfers (L-15)	2006-2010	0	L2
Purchase from WWP (GBRA) - Increased LGWSP Cap	2015-2020	0	L8
Purchase from WWP (CRWA) - Siesta Project	2015-2020	0	L25
Total Cost of Capital Improvements	$	2,693,000	

Are you planning to implement the recommended projects/strategies? Yes ✓ No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?

Please indicate:

(1) Funding source(s)[1] by checking the corresponding row(s), and

(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		10
Bonds (General Obligation and Contract Revenue)		
Bank Loans		
Federal Government Programs		
State Government Programs: i.e.: TWDB Funding Sources	TWDB-RWAF	90
Other		
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed) See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Daniel R. Heideman	Manager	512-398-4748
Name	Title	Phone No.

Please return completed form to:

Ms. Maggie Dalthorp
Moorhead Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) GBRA

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Lower Guadalupe Water Supply Project		Included in RWPTC	L7
Increased LGWSP Capacity for GBRA Needs	2010-2020	326,917,000	L8
Total Cost of Capital Improvements	$	326,917,000	

Are you planning to implement the recommended projects/strategies? Yes X No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?

Please indicate:

(1) Funding source(s)[1] by checking the corresponding row(s), and

(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)	X	50%
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources	X	50%
Other		
Total (Sum should equal 100 %)		100%

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form: [signature] (Name) Chief Engineer (Title) 830-379-5822 (Phone No.)

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **GONZALES COUNTY WSC**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Local Carrizo	2015-2020	1,725,000	L12.1
Local Carrizo	2006	300,000	
Local Carrizo	2020-2060	3,000,000	
Total Cost of Capital Improvements	$	5,025,000	

Are you planning to implement the recommended projects/strategies? Yes X No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	X	10
Bonds (General Obligation and Contract Revenue)		
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other - Guadalupe Valley Development Corp.	X	90
Total (Sum should equal 100 %)		

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No. <>
Clarence L. Littlefield, P.E.	Project Engineer	830-672-7546

Please return completed form to:

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

CLARENCE L. LITTLEFIELD, P.E.
PRESIDENT

SOUTHWEST ENGINEERS, INC.

ENGINEERS - PLANNERS
307 St. Lawrence Street
Gonzales, Texas 78629
Phone 830-672-7546
Fax 830-672-2034

August 29, 2005

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P. O. Box 6349
Corpus Christi, Texas 78466

RE: INFRASTRUCTURE FINANCING SURVEY
Gonzales County Water Supply Corporation
SEI Project No. 0018-000-00

Dear Ms. Dalthorp,

Returned herewith is the completed Infrastructure Financing Survey for the Gonzales County Water Supply Corporation. We offer the following comments:

1. Page 4B.2-105 of the Water Supply Plan – Gonzales County shows the GCWSC as projected to have a water shortage from 2020 to 2060.

2. GCWSC has 4 Carrizo wells and a surface water treatment plant. The wells are capable of producing 4,903 A.F. per year. The Treatment Plant has 700 A.F. of water rights.

3. 2004 production was 1516.118 A.F.

4. Based on the past 10 years of water pumpage, the GCWSC has projected the usage will increase to 1,682 A.F. in 2010, 1,960 A.F. in 2020 and 3,070 A.F. in 2060, therefore we see no shortages in the future.

5. GCWSC feels it has adequate existing water rights to carry through 2060, however with the system covering a very large area, additional wells may be necessary.

6. GCWSC is planning to develop a 5th well in the Wrightsboro Area in early 2006 with 660 A.F. of capacity. This well is being developed not necessarily for more capacity, but for location in a high use area.

7. GCWSC has adequate financial resources to continue developing wells in the Carrizo Aquifer within its CCN to meet its customers' demands.

8. GCWSC does not feel it has a projected water supply shortage in 2020, 2060 or any other time.

The GCWSC current projected growth rate could double and it would still have adequate water supply.

Respectfully responded,

Clarence L. Littlefield, P.E.

CLL/mh

ENCL.

cc: GCWSC

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **POLONIA WSC**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Local Carrizo	2025-2030	2,193,000	L12.1
Total Cost of Capital Improvements	$	2,193,000	

Are you planning to implement the recommended projects/strategies? Yes ✓ No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)* by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		
Bonds (General Obligation and Contract Revenue)		
Bank Loans		
Federal Government Programs ✓	USDA	100 %
State Government Programs; i.e.; TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)		

* Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No.
Paul L. Pittman	Manager	512-398-4757

Please return completed form to:

Ms. Maggie Dalthorp
Moorhouse Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **RWP for Bexar County**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Lower Guadalupe Water Supply Project	2015-2020	1,054,935,000	L7
Edwards Aquifer Recharge - Type 2 Projects	2015-2020	367,192,000	L20
Brackish Groundwater Desalination (Gulf Coast)	2035-2040	1,130,397,000	L21.2
Seawater Desalination	2055-2060	891,321,000	L22
Total Cost of Capital Improvements	$	3,443,845,000	

Are you planning to implement the recommended projects/strategies? **Yes** X **No** X

If "no," please describe how you will meet your future water needs? (Use additional pages if needed). More projects are listed above than is required to meet drought needs. Municipal Water Conservation and Edwards Aquifer Recharge-Type 2 projects will be implemented. Other projects will be implemented up to the amount of unmet need for Water User Groups relying upon the RWP for Bexar County.

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	x	5%
Bonds (General Obligation and Contract Revenue)	x	65%
Bank Loans		
Federal Government Programs	x	10%
State Government Programs; i.e.; TWDB Funding Sources	x	20%
Other		
Total (Sum should equal 100 %)		

[1] **Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.**

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

State Participation in Regional Water Facilities
Water and Wastewater Loan Program
Drinking Water State Revolving Fund

Person Completing this form:

Steven J. Raabe, P.E.	Director Planning & Development	210-302-3614
Name	**Title**	**Phone No. <>**

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **RWP for Bexar County**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Lower Guadalupe Water Supply Project	2015-2020	1,054,935,000	L7
Edwards Aquifer Recharge - Type 2 Projects	2015-2020	367,192,000	L20
Brackish Groundwater Desalination (Gulf Coast)	2035-2040	1,130,397,000	L21.2
Seawater Desalination	2055-2060	891,321,000	L22
Total Cost of Capital Improvements $		3,443,845,000	

Are you planning to implement the recommended projects/strategies? **Yes**____ **No** X

If "no," please describe how you will meet your future water needs? (Use additional pages if needed). SAWS is only planning on participating in the following water management strategies: Edwards Aquifer Recharge - Type 2 Projects (L20) and Seawater Desalination (L22).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	X	16.6%
Bonds (General Obligation and Contract Revenue)	X	67.3%
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other Commercial Paper	X	16.1%
Total (Sum should equal 100 %)		100%

[1] **Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.**

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Darren Thompson	Planner IV	233-3669
Name	**Title**	**Phone No.**

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **SAWS**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Edwards Transfers	2006-2010	0	L2
Recycled Water Program Expansion	2006-2010	0	L3
Regional Carrizo for Bexar County	2006-2010	486,604,000	L14
Local Trinity	2006-2010	7,562,000	L12.3
Brackish Groundwater Desalination (Wilcox)	2006-2010	32,545,000	L21.1
Simsboro Aquifer	2015-2020	510,321,000	L13
Purchase from WWP (RWPBC) - LGWSP	2015-2020	0	L7
LCRA/SAWS Water Project	2045-2050	1,704,473,000	L9
Total Cost of Capital Improvements	$	2,741,505,000	

Are you planning to implement the recommended projects/strategies? **Yes**____ **No** X

If "no," please describe how you will meet your future water needs? (Use additional pages if needed). SAWS will not be participating in the following water management strategies: Simsboro Aquifer (L13) and purchase from WWP (RWPBC) - LGWSP (L7).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	X	16.6%
Bonds (General Obligation and Contract Revenue)	X	67.3%
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other Commercial Paper	X	16.1%
Total (Sum should equal 100 %)		100%

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No. <>
Darren Thompson	Planner IV	233-3669

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) **SCHERTZ-SEGUIN LGC.**

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Regional Carrizo for SSLGC Project Expansion	2006-2010	26,649,000	L15
Total Cost of Capital Improvements	$	26,649,000	

Are you planning to implement the recommended projects/strategies? Yes X No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves	X	16%
Bonds (General Obligation and Contract Revenue)	X	84%
Bank Loans		
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		
Other		
Total (Sum should equal 100 %)		100%

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

Person Completing this form:

Name	Title	Phone No. <>
[signature]	Water Utility Manager	830.401.2408

INFRASTRUCTURE FINANCING SURVEY

To Obtain Financing Information from Political Subdivisions with Water Needs

South Central Texas Regional Water Planning Group (Region L)

Political Subdivision (WUG or WWP) SS WSC

Recommended Project/Water Management Strategy	Implementation Date	Capital Cost to be Paid by Political Subdivision	ID # from DB07
Municipal Water Conservation (L-10 Mun)	2006-2060	0	L1.1
Local Carrizo	2006-2010	6,274,000	L12.1
Purchase from WWP (CRWA) - Wells Ranch Project	2055-2060	0	L16
Total Cost of Capital Improvements	$	6,274,000	

Are you planning to implement the recommended projects/strategies? Yes X No ____

If "no," please describe how you will meet your future water needs? (Use additional pages if needed).

If 'yes', how do you plan to finance the proposed total cost of capital improvements identified by the South Central Texas Texas Regional Water Planning Group, as listed above?
Please indicate:
(1) Funding source(s)[1] by checking the corresponding row(s), and
(2) Percent share of the total cost to be met by each funding source.

Potential Funding Sources	Source to be Used	Percent (%)
Cash Reserves		30%
Bonds (General Obligation and Contract Revenue)		
Bank Loans		30%
Federal Government Programs		
State Government Programs; i.e.; TWDB Funding Sources		60%
Other		
Total (Sum should equal 100 %)		100%

[1] Funding source refers to the initial capital funds needed to construct or implement a project, not the means of paying off loans or bonds used for the construction or implementation.

If state government programs are to be utilized for funding, indicate the programs and the provisions (shares) of those programs. (Attach additional pages if needed)
See TWDB web site www.twdb.state.tx.us/Assistance.)

These estimates for future water sources could increase by 600% if the planned well field in the Carrizo Aquifer dedicated to SAWS 11,000 acre feet requirements, dewaters our existing wells. Funding for this requirement would be mitigated by Region L and SAWS.

Person Completing this form:

[signature]	General Manager	830-779-2837
Name	Title	Phone No.

Please return completed form to:

Ms. Maggie Dalthorp
Moorhead Associates, Inc.
P.O. Box 6349
Corpus Christi, Texas 78466

Phone: 361-877-3727
Fax: 361-882-5625

Section 10
Regional Water Plan Adoption
[31 TAC §357.11-12]

10.1 Overview

Facilitation and Public Participation played an integral part in the development of the 2001 Regional Water Plan. The discussion of the contributions of facilitation and public participation in the development of the 2001 Regional Water Plan remain in the 2006 Regional Water Plan because the current plan is a revision of the 2001 RWP and the summary of prior activities is necessary to provide the background and documentation of the process used to create the 2001 RWP. The facilitation process is presented in Section 10.1.1 and the public participation process is presented in Section 10.2, with responses to comments received on the Initially Prepared Plan (IPP) presented in Section 10.2.2.

10.1.1 Facilitation

From the outset of the planning process, the South Central Texas Regional Water Planning Group decided to emphasize a consensus approach to decision-making. That process has been facilitated first by the members' awareness of the need for cooperative and open attitudes when dealing with controversial issues. The group used an independent facilitator to assist with special meetings and workshops devoted to building consensus on specific elements of the planning process. This process has also drawn extensively on the public involvement effort that has kept the RWPG members informed at critical times of the full range of ideas, values and concerns of constituencies throughout the region. This is an on-going process that will continue through adoption of the final Regional Water Plan. The following is a brief summary of the key procedural steps undertaken by the Facilitation Team in helping the Chair and Members of the RWPG manage the process of developing the Initially Prepared Plan. In addition, the Technical Consultant supported the process of building consensus by providing the necessary tools and technical means for testing alternative approaches.

10.1.2 Facilitation Process for the 2001 Regional Water Plan

The RWPG held an initial workshop in January 1999, where planning group members begin discussions on substantive issues, revised the goal statement, initially adopted the evaluation criteria and began the process of identifying the water options and strategies they wished to have technically evaluated. Regarding the options and strategies, the RWPG had an original list of over 100 technical options for meeting water needs in the region which were reviewed and a limited number were selected for evaluation by the Technical Consultant.

In addition to structured discussions during the workshops, the Facilitation Team conducted individual interviews to identify the issues and concerns most important to members of the RWPG. The interviews brought out numerous issues, later summarized in a report, that needed to be addressed if consensus was to be achieved. The Facilitation Team consulted closely with the Chair and Administrator regarding the handling of issues in each of the monthly meetings, which were presided over by the Chair. Special workshops, small group meetings and individual interviews were used by the Facilitator to make additional progress to ensure movement toward the development of a consensus plan.

The Facilitation Team became especially active in the development of a series of alternative plans. A workshop was held for the purpose of identifying up to six major plan approaches. During the discussions, the Planning Group members coalesced their thinking about alternatives under four of the Evaluation Criteria they had previously adopted. The Group decided to structure alternatives around: 1) Economic – Cost-Effectiveness, 2) Environment, 3) Compatibility – Local Plans and 4) Compatibility – Other Regions. Following the workshop, small working groups developed a procedure for identifying water management strategies that could be applied by the Technical Consultant. They prepared descriptions of each approach, and the RWGP as a whole reviewed and approved each of the four approaches. The RWGP then assigned the Technical Consultant the task of developing each alternative approach into a regional plan capable of meeting the needs of the water user groups. Each of the four alternatives emphasized the Evaluation Criteria as follows:

- The Planning Unit Approach Alternative gave highest emphasis to the criterion of compatibility with local water plans.
- The Environment and Conservation Alternative emphasized nine elements, each of which was used to evaluate the list of available options and strategies. The nine elements, which differed from the sub-headings under the Environment Criteria previously adopted, were as follows:
- Endangered Species
- Unique Stream Segments
- Bays & Estuaries
- Instream Flows

- Riparian Forests
- Cultural Resources
- Size of Habitat Disturbance
- Water Quality
- Sustainability (Level of Groundwater Decline)
- The EREPA Alternative (the acronym stood for Economic, Reliability, Environmental and Public Acceptance – four of the Evaluation Criteria) came to emphasize cost per acre-foot of water produced by the options.
- The Inter-Regional Cooperation Alternative emphasized compatibility with other regions by developing a set of water supply options that necessitated joint planning with Corpus Christi and the Coastal Bend Region.

The Evaluation Criteria thus played an important role in shaping, and later evaluating, the alternatives, but were not applied to component management strategies. The purpose of the Evaluation Criteria was to guide the RWPG members in their assessment of each alternative as a whole. These Criteria were not expected to be applied by the Technical Consultant in the same way as the criteria detailed in the TWDB rules for preparation of regional water plans (though there is some overlap of the two sets of criteria). Rather the Technical Consultant responded to specific direction from the RWPG to apply those Evaluation Criteria that were relevant to each alternative. The RWPG members themselves applied the Evaluation Criteria during their deliberations in a subjective manner and recorded their rating of each alternative under each of these criteria by using a rating scale developed for this purpose, as noted below.

Following development of these alternatives, another approach, known as the Edwards Aquifer Recharge and Recirculation Alternative, was added, based on the ideas submitted by a member of the public.

Planning Group members suggested many additional ideas as the basis for alternatives, but it was the five listed above that moved on to the next stage of technical evaluation. When it became clear that some of the alternatives did not provide sufficient water from options and strategies chosen solely according to the rules and priorities of each plan, the RWPG authorized the Technical Consultant to add further options to meet water user group requirements. Thus, the alternatives departed, to some extent, from the original concept underlying each one.

In addition to reviewing the technical evaluations, the RWPG members individually used the Evaluation Criteria to assess the five alternative plans and also considered numerous public comments, RWPG member concerns and technical issues to create a 'hybrid alternative' water plan.

The Evaluation Criteria of economic impact relating to cost-effectiveness, environment, water quality, reliability, efficiency and flexibility all played a role in defining the "hybrid alternative." The key Evaluation Criteria at this stage, however, seemed to be *economic impact* (relating to minimizing negative socio-economic impacts), *efficiency* (relating to promoting conservation and conjunctive use), *fairness* (relating to efficient use in a water-importing area and distribution of costs and benefits), *feasibility* (relating to public acceptance and political feasibility, in particular) and *compatibility* (with local and regional plans as well as with property rights).

At a special workshop, the Planning Group members began with a list of water supply options and strategies that had appeared in each of the five alternatives reviewed up to that point. They then added options that had either generated near unanimous support or which had little in the way of opposition or technical obstacles. In addition, they included strategies that were promising for the long-term but which needed further study. The RWPG built consensus on this alternative relatively quickly because of the extensive technical evaluations and comparative discussions that had preceded this phase of the process. The group did not require or pursue step-by-step documentation of the detailed basis for agreement on the part of each member or the specific way in which each arrived at the decision that he or she decided that the hybrid alternative was acceptable. While the RWPG was considering and refining this alternative, two river authorities in adjoining planning regions proposed new options, one of which was added to the emerging regional water plan. The Technical Consultant reviewed the new plan, and the RWPG made a number of changes, culminating in acceptance of the Initially Prepared Regional Water Plan on August 17, 2000. This was the plan that was reviewed by the public and adopted with revisions after comment as the 2001 Regional Water Plan.

10.1.3 Facilitation Process for the 2006 Regional Water Plan

The facilitation process focused mainly on the transition from the 2006 Initially Prepared Plan to the adopted 2006 Regional Water Plan. During the comment period on the IPP, sixteen issues were identified that would require facilitation with the goal of reaching consensus among planning group members. John Folk-Williams, a professional facilitator with the Center for Collaborative Studies in Sacramento California, was contracted as part of the public participation scope of work to conduct three workshops and interviews of stakeholders. Mr. Folk-Williams facilitated the discussions and decision making process that provided the responses to the issues as presented in section 10.2.3.2.

10.2 Public Participation

Moorhouse Associates, Inc. was contracted by the SCTRWPG to provide Public Participation professional services. The public participation process for the SCTRWPG was designed to facilitate information out to the public about the work of the planning group, and to provide feedback from the public at key decision points. A summary of the extensive public participation effort involved in the development of the 2001 Regional Water Plan is presented in section 10.2.1 and a summary of the public participation process implemented as the 2001 Regional Water Plan was revised to create the 2006 Regional Water Plan is presented in section 10.2.2.

10.2.1 Public Participation - 2001 Regional Water Plan

Public participation for the 2001 Regional Water Plan was conducted in three phases including phase I project planning, phase II surveys, and phase III development of public involvement into the planning process. The project planning phase involved working with the planning group members, technical contractor, and the facilitator to define public participation roles and objectives. The planning phase also involved identifying the major planning components and issues for the region, as well as reviewing past public participation efforts. The Phase I Public Participation Report analyzes past public participation efforts and provides baseline information for performing the public participation process for the south Central Texas Regional Water Planning Group.

At the SCTRWPG workshop held in San Antonio on January 29-30, 1999, the planning group adopted a principle of public participation that was the guiding principle for the public participation process. Also at the workshop the group adopted the initial criteria for evaluation of water supply options.

Principle of Public Participation

The role of the Regional Water Planning Group is to create and implement a public participation plan that provides for meaningful participation in the development of an acceptable regional water plan. The public participation efforts should foster a relationship of mutual trust, honesty, respect, and interaction between the Planning Group and the public.

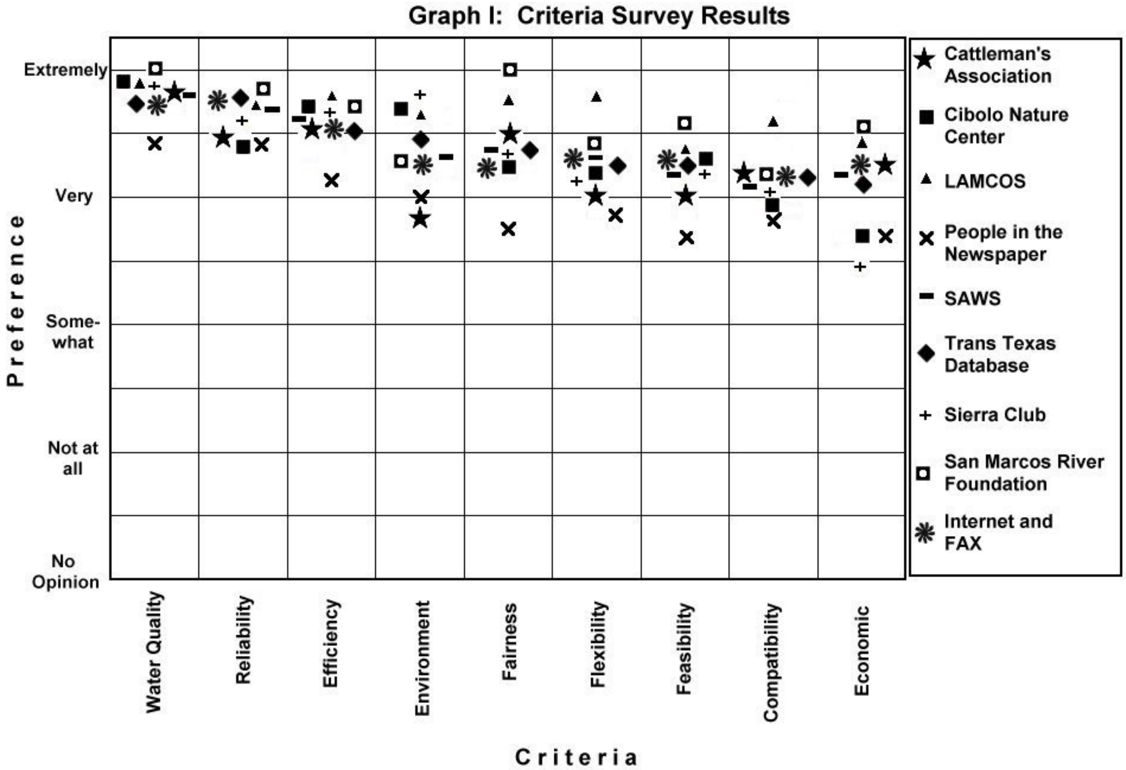
As part of the second phase of the public participation process, Moorhouse Associates, Inc. conducted two surveys for the SCTRWPG. The first survey asked the RWPG members to give their input regarding the public participation process and communication with the stakeholders in the process. Survey result highlights are presented in the Phase II Public Participation RWPG Survey and Targeted Audience Survey Results Report (May 6, 1999).

A second survey was conducted to receive input from the public during the early planning stages of water option review and criteria development. The target audience for the survey was persons or groups that were already familiar with water issues in the region and therefore, the survey is not a statistically valid random representation of the general public in the region. It is a targeted or focused survey of persons or groups active with water issues in the region.

The goal of the survey was to gather public input for guidance in three areas:

1. Rate water supply options.
2. Further develop evaluation criteria for water supply options.
3. Identify new water supply options.

The targeted audience public survey was sent to nine thousand four hundred twenty six (9,426) persons and seven hundred twenty (720) or eight percent (7.64%) of the surveys were returned. The responses indicated that all the evaluation criteria used by the planning group were considered to be extremely or very important by respondents. The water supply options were rated from extremely to somewhat important with conservation widely supported by all groups. The Phase II Public Participation RWPG Survey and Targeted Audience Survey Results Report (May 6, 1999) is available for viewing on the website.



The Phase III plan for public participation was developed with the goals of maximizing public involvement throughout the development of the regional water plan, and facilitating broad-based public understanding and support of the final plan. Public Information was provided throughout the region in the form of Public Information Dialogue (PID) meetings. A presentation about the regional water planning process was made at a total of seventy-one meetings. Approximately 3,634 persons attended these meetings, and 938 feedback cards were received from persons attending the meetings.

SCTRWPG meetings were well attended by the public and information was also gathered from input cards at the planning group meetings. A total of 286 input cards were collected from the SCTRWPG meetings. Questions from the public were collected and distributed with answers at the monthly meetings. The individuals submitting the questions received a written mailed response to their inquiry. A total of 196 questions and answers were generated from July 1999 to July of 2000.

Focus groups were used during key decision points. The focus groups were established by contacting the County Judges in each of the 21 counties of the region. Each Judge was offered an individual briefing by a planning group member and a representative from Moorhouse

Associates, Inc. The briefing provided an overview of the planning process, a discussion of the issues and a review of the upcoming schedule. The judges were asked to provide a list of persons from their county using the list of eleven interest categories represented on the planning groups. These persons were then invited to participate in a focus group that provided feedback on the criteria to the RWPG. Four hundred and one persons were invited to participate and two hundred thirty six were able to participate. The input is presented in the Phase III Public Participation Twenty-One County Focus Group Report.

A second group of Focus Groups was conducted in July of 2000. The original focus group participant lists provided by the County Judges were updated and supplemented by suggestions from area legislators. The legislators were provided the opportunity of a briefing and update on the plan process. They were then asked to suggest any additional names for focus group participation. Nine additional Focus Groups were included in the second round. Eight of these were Bexar County specific, one was for Trinity Aquifer representatives, and one was for the Bays and Estuaries or downstream interests. This second round of focus groups reviewed the 'Hybrid Draft Alternative Plan' as of July 2000. Three hundred and ninety nine persons participated in the second round of Focus Groups. A presentation of the results for the second round of focus groups is available in the Public Participation Focus Group II Report, Hybrid Draft Plan as of July 2000.

The Phase III plan included the development of a general brochure for use during the public process. The brochure was an introductory piece that explained the region, the process, the schedule, and provided information on how to participate in the process. A region specific website was developed that provided access to the technical documents, the calendar of events, meeting minutes, and several interactive map activities relative to the options under consideration. A newspaper insert detailing the water planning process and the draft water plan was also developed for distribution to a mass audience. The insert was for area papers and included a circulation of about 550,000. The insert was also designed for use during the public hearing process in September 2000.

The 2001 Initially Prepared Plan (IPP) was available for public review on August 25, 2000. Public hearings to receive comments on the IPP were scheduled in Victoria, Uvalde and San Antonio with approximately 650 persons attending the hearings. During the comment period the planning group received 270 written comments and heard 97 oral presentations at the public hearings.

10.2.2 Public Participation – 2006 Regional Water Plan

The 2006 Regional Water Plan is a revision of the 2001 Regional Water Plan and the process and principles used to develop the 2001 RWP were continued during the revision process. The website and general information brochure were revised to reflect the 2006 regional water planning process and calendar. Public input was gathered at each RWPG meeting and through direct communication with the public. The criteria used in the creation of the 2001 plan were informally applied by each planning group member during the revision process to develop the 2006 RWP.

The 2006 Initially Prepared Plan (IPP) was available for public review on May 26, 2005 and public comment closed on September 20, 2005. Public hearings to receive comments on the IPP were scheduled in Victoria, Seguin, Uvalde and San Antonio on July 18, 19, 20 and 21 respectively. At the public hearings an eight-page brochure summarizing the IPP was available to attendees. The sign-in sheets for all of the hearings indicate a total of 552 attendees, but the total attendance is more closely estimated to have been 675 because the hearing in Victoria had a surge of attendees that bypassed the sign-in table. Oral comments were recorded by court reporters that provided certified transcripts of the comments. During the comment period the planning group received 1101 written comments and heard 83 oral presentations at the public hearings. Several organizations submitted detailed written comments in report format including Sierra Club, D.M. O'Connor Interests, Wilson County Taxpayer Association, San Marcos River Foundation, Goliad County Groundwater Conservation District and Texas Wildlife Association.

Written comments were entered into a database, assigned a number and reviewed individually. The transcripts from the public hearing were provided on computer disk and these oral comments were also integrated into the database, assigned a number, and reviewed individually. During the review process, twenty five common comment categories were identified. The list of categories is presented in Table 10-1, however, the categories are not presented in any particular order. Whenever a commenter addressed one of the issue categories it was indicated in the database entry for that comment. Many of the comments covered more than one category; so multiple issue categories may have been assigned to one document or comment.

Table 10-1.
Public Comment Categories

1. The 340,000 acre-feet placeholder amount in the Edwards Aquifer. *
2. Potential for Carrizo Aquifer allowance. *
3. Demand/drought management as a water supply strategy. *
4. Management supply amount and distribution. *
5. The SCCS and TWDB GAM for Carrizo groundwater modeling. *
6. The Carrizo Aquifer in Gonzales County. *
7. The Carrizo Aquifer in Wilson County. *
8. Move Seawater Desalination for implementation earlier in RWP. *
9. The Wilcox brackish desalination project amount and location. *
10. Recharge and Recirculation and adding the SCTN 6a strategy to RWP. *
11. SAWS request to include the MESA project in RWP. *
12. Status of the Lower Guadalupe River Diversion Project. *
13. Status of Simsboro ALCOA project. *
14. The level and location of Edwards Aquifer transfers in the RWP. *
15. Continuation of the Environmental Studies for Lower Guadalupe project. *
16. The Canyon Regional Water projects and Amendment to 2001 SCTRWP. *
17. Water Policy Issues in the RWP.
18. Consideration of rural versus urban water needs.
19. Population and Water Demand Projection questions.
20. Spring Flow protection.
21. Downstream and Bay and Estuary concerns.
22. Groundwater general comments.
23. Growth Management.
24. Conservation comments.
25. Other Issues.
* Topic addressed through facilitated process

The planning group decided to develop responses to the comments by category groups. A notebook of public comment documents sorted by category was provided to each planning group member for review. Based on the public comment, the planning group developed a list of sixteen issues that would benefit from a facilitated process. A professional facilitator worked with the planning group to discuss these issues. The facilitator interviewed planning group members and several stakeholders in a process that resulted in three workshop sessions. At the workshops, the planning group developed responses by category for each of the sixteen issues needing facilitation. These facilitated responses are presented in Section 10.2.2.3.

The planning group developed responses for the remaining comments received through the regular staff work group review and planning group meeting process. The public comment responses developed through this process are presented in Section 10.2.2.4. HDR Engineering reviewed specific technical questions discussed in the comments and prepared draft responses for review by the planning group. The planning group responses to the technical comments are presented in Section 10.2.2.5. Changes were made to the IPP in response to the public comments. Many communities, agencies and interest groups had a decisive role in shaping the development and revision of the South Central Texas Regional Water Plan.

10.2.2.1 TWDB Comments on Initially Prepared 2006 South Central Texas Regional Water Plan and SCTRWPG Responses

TWDB Preliminary Staff Comments, Letter 1, Letter of October 12, 2005: Attachment -- South Central Texas Regional Water Plan – Region L

LEVEL 1. Comments and questions must be satisfactorily addressed in order to meet statutory, agency rule, and/or contract requirements.

General Comment

1. Population and demand figures in many tables are slightly different than the amounts in the planning database (DB07). These differences may be due to rounding or reallocation between river basins. Please revise or coordinate with TWDB staff to ensure that data in the plan is consistent with DB07. *[Title 31, TAC §357.5(d)(1)&(2)]*

   Response: The population values contained in DB07 have been checked against Table 2-3 and no differences were found. The demand projections contained in DB07 have been checked against Table 2-12 with most differences attributable to rounding (< 2 acft at the river basin/county level). No change was made to the report. There was a 44 acft difference in the river basin split for Livestock use in Gonzales County. The TWDB has agreed to revise DB07 to eliminate this difference.

Executive Summary

2. Include a summary of key findings and recommendations. *[Title 31, Texas Administrative Code(TAC) §357.10(a)(2)]*

   Response: The Executive Summary, includes summary statements of projected total needs (shortages), total quantities to be supplied by water management strategies included in the plan, total costs of strategies in the plan, unit costs, and range of unit

costs of strategies in the plan. For ease of reference, many of the key findings are presented in graphical format or bolded text. Summary information has been qualified to explain that all strategies included in the plan may not necessarily be implemented.

3. Page ES-20; Table ES-4, Ch 2.10.4 Page 2-49, 1st paragraph; Ch 2.10.4 Page 2-50, Table 2-16; Ch 4A.2, Page 4A-19, Table 4A-3: The water demand projections for a WWP, the Guadalupe-Blanco River Authority, are different than the amounts in the on-line planning database (DB07) as shown below. Reconcile the demand projections in the plan matches and DB07. *[Title 31, TAC §357.5(d)(1)&(2)]*

WWP	Source	2000	2010	2020	2030	2040	2050	2060
GBRA	IPP	134,460	225,126	233,904	233,283	215,736	230,819	216,548
	DB07	***68,772***	***221,866***	***230,645***	***230,024***	***212,478***	***227,561***	***213,290***

Response: The values contained in the IPP were correct until the SCTRWPG decided to eliminate the original LGWSP from the plan. The water demand projections for GBRA contained in the IPP include the projected demands for the Cities of Blanco and Buda (Region K). At the time of this response, Region K had not entered the demands for these entities. Also included are limited amounts of irrigation demand projected to occur in Region K. Additional changes have been made pursuant to the SCTRWPG decisions to eliminate the LGWSP and add the LGWSP for GBRA Needs.

4. Page ES-5, Figure ES-2: In this figure, the municipal demand and the total demand in 2060 are displayed as 673,235 ac-ft and 1,309,003 ac-ft. Revise to reflect the TWDB approved demands of 637,235 ac-ft and 1,273,003 ac-ft. *[Title 31, TAC §357.5(d)(1)&(2)]*

Response: This has been corrected.

5. Page ES-6, 1st Paragraph, Ch 2-7, Page 2-22, 1st paragraph, Ch 2-7, Page 2-23, Table 2-9: The livestock water use estimate for the region in 2000 is cited as 25,557 ac-ft, and the projected livestock demands for the region are cited as 25,851 ac-ft for the year 2010 through 2060 in the IPP. Please revise to reflect the approved demands of 25,660 ac-ft in 2000 and 25,954 ac-ft in 2010 through 2060. *[Title 31, TAC §357.5(d)(1)&(2)]*

Response: This has been corrected.

6. Page ES-20, Table ES-4: The demand projections for several water user groups shown in this summary table are different than the approved projections. Please revise to reflect the TWDB approved projections as listed below: *[Title 31, TAC §357.5(d)(1)&(2)]*

- **Table ES-4 Regional Water Supply Plan Summary (Demand)**

WUG	Source	2010	2030	2060
Bexar County				
Industrial	IPP	2,591	32,775	42,110
	TWDB	***25,951***	32,775	42,110
Steam-Electric	IPP	17,309	20,196	33,090
	TWDB	17,309	20,196	***33,390***
CALDWELL COUNTY				
Creedmoor-Maha WSC	IPP	234	431	560
	TWDB	234	***367***	560
GOLIAD COUNTY				
Mining	IPP	395	205	46
	TWDB	***398***	205	46
KARNES COUNTY				
El Oso WSC	IPP	495	561	6,017
	TWDB	***503***	***570***	***626***
REFUGIO COUNTY				
Rural	IPP	362	270	232
	TWDB	***321***	270	232

Response: This has been corrected.

Chapter 1

7. Provide information on the impacts of the plan on navigation. *[Title 31, TAC §357.5(e)(8)]*

Response: Neither the regional water plan nor any of the recommended water management strategies of the plan have any identifiable effect on navigation.

8. Page 1-30: Include the Yegua-Jackson aquifer as a water source, if applicable. *[Title 31, TAC §357.7(a)(1)(D)]*

Response: Although it is understood that the Yegua-Jackson aquifer is considered a minor aquifer by the TWDB, limited documentation is available to quantify the amount of water supplied from this aquifer to entities in Region L. It appears that very limited amounts from the aquifer may be used for livestock purposes; however, no change will be made to the plan.

Chapter 2

9. Page 2-23, Table 2-9: In the table, the projected livestock water demand totals for Bexar County in 2000 though 2060 shown as 1,216 ac-ft/yr. Revise to reflect the TWDB-approved demands of 1,319 in 2000 through 2060. *[Title 31, TAC §357.5(d)(1)&(2)]*

Response: This has been corrected.

10. Page 2-24, 1st paragraph: In the first paragraph, the total water demand projections for the region are cited as 896,250 ac-ft/yr in 2000, 1,101,655 ac-ft/yr in 2030 and 1,272,901 ac-

ft/yr in 2060. Revise the plan using the TWDB approved projections of 896,353 ac-ft/yr in 2000; 1,101,758 ac-ft/yr in 2030; and 1,273,003 ac-ft/yr in 2060. *[Title 31, TAC §357.5(d)(1)&(2)]*

Response: This has been corrected.

Chapter 3

11. Page 3-6, Table 3-2: Include groundwater supplies for all counties by river basin and category of use. *[Title 31, TAC §357.7(a)(3)(A)(iv)]*

    Response: This information is included in the detailed supply/demand analysis contained in Appendix C. This information is also included in the TWDB database (DB07).

12. Page 3-2, Section 3.1.1: Include an availability number for the Yegua-Jackson aquifer. Also, the availability number shown for the Edwards (BFZ) aquifer is ~4,000 acre-ft/yr less than the number in DB07. Revise to ensure consistency between the plan and DB07. *[Contract Exhibit "B," Section 3.1]*

    Response: Although is it understood that the Yegua-Jackson aquifer is considered a minor aquifer by the TWDB, limited documentation is available to quantify the amount of water supplied from this aquifer to entities in Region L, or the amount of water available from this source. It appears that very limited amounts from the aquifer may be used for livestock purposes; however, no change will be made to the plan.

    The availability value of 340,000 acft for the Edwards Aquifer contained in the plan is for the Balcones Fault Zone portion of the aquifer only. The values contained in DB07 for the "Edwards Aquifer" also include limited availability from the Barton Springs portion of the aquifer for use by entities in Caldwell and Hays Counties, and are included in Tables C-3 (795 acft/yr) and C-12 (2,363 acft/yr)(Total of 3,158 acft/yr). A footnote has been added to Table 3-2 explaining that these quantities have been included in Tables C-3 and C-12, but are not included in the totals shown in Table 3-2.

13. Report surface water supply by categories of water use for each county or portion of county in the region and by river basin, if the county is in more than one basin. Report surface water supply by categories of water use for Wholesale Water Providers by river basins. *[Title 31, TAC §357.7(a)(3)(A)(iv) and TAC §357.7(a)(3)(B)]*

    Response: For each WUG this information is included in the detailed supply/demand analysis contained in Appendix C. This information is also included in the TWDB database (DB07).

14. Report the Wholesale Water Providers' current contractual obligations to supply water in addition to any demands projected for the Wholesale Water Provider. *[Title 31, TAC §357.7(a)(3)(B)]*

    Response: This information is reported in Section 2.10.

<u>Chapter 4</u>

15. Describe the process used by the regional water planning group to identify all potentially feasible water management strategies. *[Title 31, TAC §357.5(e)(4)]*

    Response: A written description of the process used by the SCTRWPG has been added to the Plan in Section 4B on Page 4B.1-2.

16. Pages 4B.2-5 through 4B.2-204, tables 4B.1-4B.21: Identify the volume of groundwater supplies, by aquifer, for cities and retail public utilities and indicate whether shortages are predicted or not. *[Title 31, TAC §357.7(a)(3)(A)(i)]*.

    Response: This information is included in the detailed supply/demand analysis contained in Appendix C.

17. Provide documentation that the plan protects existing water rights, water contracts, and option agreements. *[Title 31, TAC §357.5(e)(3)]*

    Response: The following was added to the first paragraph of Section 4B.1.1, "The plan does not propose any changes to existing water contracts or option agreements. Further, the plan was created in close cooperation with each Wholesale Water Provider in the region, and no strategy contained in the plan would adversely affect any existing water contracts, option agreements, or special water resources."

18. Provide information on contractual or non-contractual obligations for wholesale water providers. *[Contract Exhibit "B," Section 5.1]*

    Response: See response to Number 17, above.

19. Pages 4B.2-115 through 4B.2-190, tables 4B.2.11-4 through 4B.2.19-7: Please verify if municipal conservation was considered as a water management strategy for each water user group with a need. *[Title 31, TAC §357.5(k)(2)(A), §357.5(k)(2)(B), and 357.5(k)(2)(C)]*

    Response: For each WUG with a projected need, water conservation has been included as a recommended water management strategy, with the exception of Irrigation in Kendall County (Table 4B.2.14-60), Livestock in Hays (Table 4B.2.12-28) and Kendall (4B.2.14-7) Counties, and Industrial in Victoria County (4B.2.19-7). In the case of Irrigation needs in Kendall County, irrigation water conservation was considered, but would not meet the projected needs (See table 4C.1-17). There is no clearly defined

water conservation strategy for livestock or industrial uses, thus no water conservation strategy could be considered to meet these needs. However, Industrial BMPs are listed in the plan in Section 4C.1.3) and are recommended for industrial water users. At the beginning of Section 4B.2 (Water User Group Plans by County), it is explained that the proposed plan to meet the projected needs of municipal, industrial, steam-electric power, and mining water user groups located within the region is to consider water conservation programs to meet water demands to the extent possible, and then develop additional groundwater and surface water supplies located as near as possible to each respective water user to the extent that supplies are available.

20. Ensure and reference that discounted present value costs were utilized for evaluation of the water management strategies. *[Contract Exhibit "B," Section 4.2.9]*

    Response: For each Water Management Strategy (WMS) included in the plan for each WUG having projected needs (shortages), total, annual, and unit costs were calculated. These costs, together with the projected implementation dates of WMSs were entered into the TWDB's DB07, which then calculated the discounted values on the web-based database application forms and are a part of the Region L Plan (See Region L; DB07).

21. Page 4C.21-12: The Wilcox aquifer (WW White) brackish groundwater desalination project shows a cost for the well field at $7.58 million and the Engineering & Legal Costs and Contingencies at $7 million. These costs appear to be high. Please review these project costs and revise as appropriate. *[Title 31, TAC §357.7(a)(8)(A(i))]*

    Response: The well field cost is consistent with the cost estimating methodology used for all strategies. The well field cost of $7.58 million for a well field with total firm capacity of 3,900 gpm (5.6 mgd) may appear high if compared to a well field in a more productive aquifer. However, the preliminary groundwater modeling of the Wilcox Aquifer in the target area indicates that, in order to keep the drawdown less than 100 feet in the vicinity of well field, the wells should be about 300 gpm each with about 4,000 feet of separation between wells. The cost of the wells and interconnecting piping yielded a well field cost of $7.58 million using standard pipe and well unit costs. The Engineering & Legal Costs and Contingencies (ELC&C) cost is consistent with the cost estimating methodology used for all strategies. The cost was calculated using the standard procedure based on 30% of capital cost for pipelines and 35% of capital cost for all other facilities. The total capital costs for the project are $20,986,000 and the ELC&C of $7 million is 33% of the total capital costs.

22. Page 4C.21-13: The Wilcox aquifer (Twin Oaks) brackish groundwater desalination project shows a unit cost of water at $685 per ac-ft. per year, which appears high for a brackish groundwater desalination plant. Please review these project costs and revise as appropriate. *[Title 31, TAC §357.7(a)(8)(A(i))]*

    Response: **The Wilcox Aquifer brackish groundwater desalination project cost estimate is consistent with the cost estimating methodology used for all strategies. The**

majority of the costs for this brackish groundwater desalination water supply are for the standard non-desalination components to produce the groundwater and transport the finished water to San Antonio. These standard components consist of the well field, pump station, transmission pipeline, and integration of the additional supply into San Antonio ($18.3 million of the total project capital costs of $25.2 million). The well field costs are consistent with the cost estimating methodology as detailed in the response to Question 21. The brackish groundwater desalination plant components consisting of the desalination plant ($4.7 million) and deep well injection of the concentrate ($2 million) contribute a total of $6.7 million to the capital costs. The capital and O&M costs for the desalination components are about $250 per ac-ft. per year ($0.77 per 1,000 gallons) of the total unit cost of water. These costs are consistent with the anticipated costs for a brackish groundwater desalination water supply based on the assumptions developed from the limited information available on the productivity and water quality of the Wilcox Aquifer in the project area.

23. Page 4C.21-23: The total capital cost for a 4.2 MGD brackish groundwater desalination project in the Gulf Coast aquifer is shown at $1.1 billion, resulting in a final cost $1,012 per ac. ft. of water. These costs appear high. Please review these project costs and revise as appropriate. *[Title 31, TAC §357.7(a)(8)(A(i))]*

    Response: The referenced project cost and annual unit cost are based on the entire Lower Guadalupe Water Supply Project (Section 4C.7) and a supplemental brackish groundwater component from the Gulf Coast Aquifer. The brackish groundwater component provides an additional firm yield of 10,176 acft/yr at an annual unit cost of $796/acft/yr.

Chapter 6

24. Include model conservation and drought contingency plans for industrial and irrigation water user groups. *[Title 31, TAC §357.7(d)]*

    Response: There are no readily available model water conservation plans for irrigation and industry. However, in Section 6.1 of the regional water plan, web links are given to the TCEQ water conservation planning forms for irrigation and industry/mining water conservation plan development.

Chapter 8

25. Verify that the regional water planning group considered recommendations for designation of Unique Stream Segments or Unique Reservoir Sites. *[Title 31, TAC §357.8 and §357.9]*

    Response: See Section 8.7, Environmental: Ecologically Unique Stream Segments and Unique Reservoir Sites, in which the SCTRWPG explains that, until the Legislature provides further clarification regarding the consequences of designating ecologically unique stream segments and unique reservoir sites, the SCTRWPG recommends that

there be no such designation in this round of planning. However, the SCTRWPG recognizes the great importance of protecting sites of "high ecological value."

Appendix C

26. Table C-3, C-10 & C-16: Demand figures for river basins are slightly different than the amounts in the planning database (DB07). These differences may be due to rounding or reallocation between river basins. Please revise or coordinate with TWDB staff to ensure that data in the plan is consistent with DB07. *[Title 31, TAC §357.5(d)(1)&(2)]*

    Response: These differences are due to rounding. No change has been made.

LEVEL 2. Comments and suggestions that might be considered to clarify or help enhance the plan.

Chapter 1

27. Page 1-30, Sec. 1.7.1: Consider mentioning the nitrate and gross alpha above maximum concentration levels in the Winter Garden District and the radon levels in the Catahoula and Goliad formations of the Gulf Coast aquifer near Bruni.

    Response: A sentence regarding nitrate and gross alpha concentration in the Winter Garden District has been integrated in Section 1.7.1.2. Bruni is located in southeastern Webb County, which is within Region M.

Chapter 2

28. Consider a consistent presentation of the water user group variously labeled Port O'Connor, Rural (Port O' Connor), or County-Other (Rural).

    Response: Comment is noted; however, the water user group is consistently labeled in Chapter 2. No change has been made.

29. Page 5-5, first paragraph, last sentence: IPP states that thirteen water management strategies did not receive any water quality impact scores. Consider clarifying whether no scoring was performed or if they all scored zero.

    Response: Sentence has been modified to read as follows: "Twelve of the recommended water management strategies received a score of zero (no impacts expected) and 23 received a score greater than zero in three or less of the key water quality parameters."

10.2.2.2 TPWD Comments on Initially Prepared 2006 South Central Texas Regional Water Plan and SCTRWPG Responses

Letter of September 19, 2005 -- South Central Texas Regional Water Plan Review

Thank you for the opportunity to review and comment on the 2005 Initially Prepared Regional Water Plan (IPP) for the South Central Texas Region L. Texas Parks and Wildlife Department (TPWD) acknowledges the time, money and effort required to produce the regional water plan as mandated by Senate Bill 1 of the 75th Legislature. A number of positive steps have been taken since the first planning cycle to advance the issue of environmental protection. For example, the regional water planning groups were faced with a new requirement under 31 TAG §357.7(a) (8) (A), to perform a "quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico" when evaluating water management strategies. TPWD recognizes that each region's unique natural resources, water management strategies and funding limitations dictated the level of quantitative analysis for each regional plan. Nonetheless. TPWD feels strongly that quantification of environmental impacts is a critical step in planning for our state's future water needs while also protecting environmental resources.

TPWD staff has reviewed the IPP to determine if the following questions were addressed:

- Does the plan include a quantitative reporting of environmental factors including the effects on environmental water needs, habitat?
- Does the plan include a description of natural resources and threats to natural resources due to water quantity or quality problems?
- Does the plan discuss how these threats will be addressed?
- Does the plan describe how it is consistent with long-term protection of natural resources?
- Does the plan include water conservation as a water management strategy? Reuse?
- Does the plan recommend any stream segments be nominated as ecologically unique?
- If the plan includes strategies identified in the 2000 regional water plan, does address concerns raised by TPWD at that time?

The Region L IPP includes a quantitative reporting of environmental factors. Volume II of the IPP discusses technical evaluations of strategies and presents Water Management Strategy Summary sheets that include numbers of acres impacted by each strategy. Where applicable, changes in environmental flows are predicted using Water Availability Models. Consensus Environmental Planning Criteria are used to approximate environmental flow needs except where site-specific information is available, as in the case of freshwater inflow needs to the Guadalupe Estuary. While the Region L IPP acknowledges environmental flow needs, it does not necessarily plan for future environmental flow needs.

Chapter 1.2.4 of the Region L IPP briefly describes natural resources including fish and wildlife resources. A detailed table listing threatened and endangered species by county with notations concerning their habitat preferences and protected status is presented in Appendix H. Major springs are described in Chapter 1.7.3.

Chapter 7.2 presents an environmental assessment for proposed water management strategies not only for the 2006 draft IPP but also for the 1984, 1990, 1997 and 2002 Water Plans. In general, potential cumulative environmental impacts have decreased with each new water plan but the 2006 IPP has the greatest potential for impact to threatened and endangered species. The IPP attributes this to proposed recharge sites that could impact karst cave communities.

The Region L IPP recommends water conservation for all water user groups. Region L is to be commended for including advanced water conservation as a water management strategy. According to the IPP, per capita water use in Region L is projected to decline over the planning period from 148 gallons per person per day in year 2000 to 132 gallons per person per day in 2060. The IPP also recommends the expansion of water recycling, or use of reclaimed wastewater, for non-potable purposes such as parkland irrigation and instream flow augmentation.

It is disappointing that the plan does not recommend nomination of any stream segments as ecologically unique, citing the need for further legislative clarification. Although the IPP states '...the SCTRWPG recognizes the great importance of the issue for the protection of sites *of* high ecological value.' I would encourage considering such action in future plans recommending stream segments as ecologically unique would give the regional water planning group.

The *2005* Region L IPP is a well written report that provides sufficient detail. Positive aspects include advanced conservation, aquifer recharge, aquifer storage and recovery, brush management, and seawater desalination. No major on-channel reservoirs are proposed at this time. While TPWD is pleased to see many of our earlier comments have been addressed, concerns remain regarding potential impacts associated with several strategies. New appropriations from the Guadalupe River and/or increased use of previously unused water rights from the Guadalupe River will impact freshwater inflows to San Antonio Bay. Inter-basin transfers from the Guadalupe and Colorado Rivers both pose potential impacts to fish and wildlife. The inter-basin transfer from the lower Colorado River could also potentially negatively impact the Matagorda Bay ecosystem. Increased reliance on groundwater may result in reduction or loss of spring habitats and instream flows. The reliance on the Guadalupe River and Edwards Aquifer will likely reduce the long-term inflows which will increase bay-water salinities. This will invoke a host of complex estuarine community changes. At this time seawater desalination offers a potentially low-impact long-term solution. Continued consultation with TPWD staff will help to assure that fish and wildlife impacts can be avoided or minimized.

Thank you for your consideration of these comments. It is clear that the region is looking for opportunities to address environmental issues. Please be assured that TPWD will continue to work with the region to explore all possibilities to meet future water supply needs and assure the ecological health of the region's aquatic resources. Please contact Cindy Loeffler at (512) 912-7015 or Norman Boyd at (361) 983-4425.

Response: The SCTRWPG acknowledges the comments of Texas Parks and Wildlife Department on the 2006 South Central Texas Regional Water Plan, and appreciates the offer to assist the SCTRWPG in its water planning efforts to meet future water needs of the region. With regard to the designation of ecologically unique stream segments and unique reservoir sites, in Section 8.7 of the plan, the SCTRWPG has explained that, until the Legislature provides further clarification regarding the consequences of designating ecologically unique stream segments and unique reservoir sites, the SCTRWPG recommends that there be no such designation in this round of planning. However, the SCTRWPG recognizes the great importance of protecting sites of "high ecological value."

10.2.2.3 Public Comments and South Central Texas Regional Water Planning Group Responses Developed through Facilitation

Sixteen issues raised during the Initially Prepared Plan Comment period were determined to be issues that would benefit from a facilitated process for the SCTRWPG to develop a consensus response. This list of sixteen issues and the responses developed through a series of facilitated meetings is presented below.

Issue 1. The <u>340,000 acre feet place holder amount for the Edward Aquifer</u> needs to be reaffirmed. How much of an allowance do we need in case the number changes?

Response: The 340,000 acre-feet place holder amount was discussed at November 17, 2005 meeting and reaffirmed as a valid pace holder amount for the Edwards Aquifer.

Issue 2. Do we need to have an allowance for the <u>Carrizo aquifer</u> as well until the managed available groundwater amounts are determined by the groundwater districts?

Response: Texas Water Code, Section 36.108 (b) requires that if two or more groundwater conservation districts are located within the boundaries of the same groundwater management area, each district shall prepare a comprehensive management plan as required by Section 36.1071 covering that district's respective territory. Upon completion and approval of the plan, each district shall forward a copy of the new or revised management plan to the other districts in the management area.

H.B. 1763 enacted by the Texas Legislature in 2005, requires groundwater conservation districts within the same groundwater management area to meet at least annually to conduct joint planning with the other districts in the management area (Section 36.108(c)). "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" (Section 36.108.(d)). H.B. 1763, Section 32.108 (f)(2) further directs that, "Each district in the management area shall ensure that its management plan contains goals and objectives consistent with achieving the desired future conditions for the relevant aquifers as adopted during the joint planning process."

Given these new requirements for determining desired future conditions for the relevant aquifers, and that individual groundwater conservation district management plans shall be consistent with achieving the desired future conditions of the relevant aquifers, the quantity of groundwater available for use by water users located within the respective parts of water planning regions is uncertain, and quite likely will change from the quantities now being used in regional planning. Therefore, water planning for water user groups whose future supplies are from groundwater should carefully consider broadening their strategies both in terms of quantities and sources to take this uncertainty into account.

Issue 3. Potential recommendation of <u>*demand/drought management*</u> *as a water management strategy to meet projected needs (and associated revision of current policy). This policy is of particular interest to the Sierra Club and is discussed further in their publication, "Alternative Water Management Strategies for the 2006 South Central Texas Regional Water Plan".*

Response: Drought Management/Drought Contingency Planning (DM/DCP) is not yet incorporated as a recommended water management strategy in the 2006 South Central Texas Regional Water Plan. Water user groups (specifically municipal water suppliers) are, however, required to articulate DM/DCP within their TWDB management plans.

Calculations for the 2006 plan, using the TWDB socioeconomic impact analysis of unmet water needs in the region – and assuming that none of these needs would otherwise be met – resulted in unacceptable high projections of business, personal income, and tax revenue losses. There are predictions of even greater costs outside these clearly defined categories, though they are acknowledged as being more difficult to measure. Experience does not, however, support this conclusion to the extent that is would either preclude the viability of DM/DCP as a strategy or dictate its exclusion from the plan.

Among principal impacts of DM/DCP's being incorporated as a water management strategy are the following:

- **that economic ramifications of stages one and two DM measures are considered to be minimal and should not be overstated in the analysis, i.e., each stage's impacts – one through four – should be evaluated independently; and**
- **that DM/DCP, in concert with anticipated user conservation responses to sever drought conditions, may obviate the necessity for developing water resources/supplies that carry very high unit costs.**

The SCTRWPG recommends that a more thorough analysis of DM/DCP as a water management strategy be conducted during the planning interim. The experience of water suppliers who have planned and implemented DM/DCP should prove of benefit in this analysis and lead to a practical DM strategy.

Issue 4. The <u>*Management Supply*</u> *in the Regional Water Plan seems excessive.*

Response: The SCTRWPG reviewed the Management Supply Policy and revised the policy as presented in Section 8 of the Regional Water Plan. (*The planning group also discussed the idea of providing a management supply for counties other than Bexar.*)

System management water supplies, i.e. supplies over and above those apparently needed to meet projected demands, may be included in the plan for the following reasons: 1) to recognize both the long lead times and the uncertainty associated with risk factors that may prevent implementation of water management strategies and necessitate replacement strategies; 2) to preserve flexibility for water user groups or wholesale water suppliers to select the most feasible projects among several consistent with the Regional Plan and therefore potentially eligible for permitting and funding; 3) to serve as additional supplies in the event rules, regulations or other restrictions limit use of any planned strategies, and 4) to ensure adequate supplies in the event of a drought more severe than that which occurred historically. The plan should specify those factors affecting reliability of the recommended options and strategies and indicate what alternatives are available as possible replacements.

The amount of the management supply should be limited by consideration of the following factors: 1) potential disruptive impacts of planning for projects that have low probability of implementation; and 2) citing of specific reasons for management supplies that exceed the projected needs of the region.

Issue 5. Using the SAWS SCCS model rather than the TWDB GAM for the Carrizo Aquifer modeling is a concern.

Response: Two groundwater models of the Carrizo Aquifer have been used by the South Central Texas Regional Water Planning Group in the development of the 2006 South Central Texas Regional Water Plan. These models are identified as the Southern Carrizo-Wilcox/ Queen City-Sparta Groundwater Availability Model (GAM) and the South Central Carrizo System (SCCS) model. Both of these models have been applied in the technical evaluation of water management strategies identified as Regional Carrizo for Bexar County Supply (Section 4C.16), and Hays/Caldwell Carrizo Project (Section 4C.17). For these parallel model applications, pumpage stresses are based on amounts provided by the sponsor of each water management strategy during and subsequent to a public meeting held October 13, 2004 in Seguin.

In the technical evaluation of the potential cumulative effects of implementation of the 2006 South Central Texas Regional Water Plan (Sections 4C.18 and 7.1), only the SCCS model has been applied and pumpage stresses are abased on projected demands (which are generally less that the amounts provided by the various sponsors). During its meeting of April 7, 2005, the SCTRWPG chose to proceed with use of only the SCCS model in the assessment of cumulative effects because the SCCS model was developed specifically for simulation of potential groundwater development projects in the Carrizo Aquifer in Gonzales and Wilson Counties and show substantially better calibration to historical water levels in wells within the model area (particularly those near the outcrop) than does the GAM. TWDB staff performed independent applications of each model, evaluated and compared results, presented their comparison the SCTRWPG and approved use of either model for regional water planning purposes by letter of September 7, 2005.

Concerns have been raised by members of the SCTRWPG and others regarding use of the SCCS model in regional water planning when it is the expressed intent of the Gonzales and Evergreen Underground Water Conservation Districts to use the GAM for such technical analysis as deemed necessary by the districts and/or required by state law for the determination of groundwater availability. The general manager of each district has stated that the SCCS model is a "good model", but cites concern that the SCCS model does not, while the GAM does, include the entire multi-county groundwater management area.

Upon due consideration of available information, it is the consensus of the SCTRWPG to affirm its previous decision to use the SCCS model for the evaluation of cumulative effects of regional water plan implementation and present the results of such evaluation in the 2006 South Central Texas Regional Water Plan. It is explicitly recognized by the SCTRWPG that this decision is in no way binding upon groundwater conservation districts and/or the TWDB as to their selection of appropriate modeling tools for assessment of groundwater availability pursuant to HB 1763 as enacted by the 89th Texas Legislature, signed by the Governor, and effective September 1, 2005. Similarly, it is explicitly recognized by the SCTRWPG that this decision is in no way binding upon groundwater conservation districts as to their selection of appropriate modeling tools for technical evaluation of applications for groundwater production permits.

Issue 6. The Carrizo Pumping amounts from Gonzales County do not seem to comply with the Gonzales Groundwater District's Management Plan numbers.

The public comment process received letters from the Gonzales County Commissioners Court and the City of Smiley requesting that the 45,200 acre feet of Carrizo ground water in Gonzales County be removed from the Plan and three hundred and twenty one written comments with the following message:

> *"The Gonzales County Underground Water District Management Plan states the amount of Carrizo water available for use. All of this water in western Gonzales County is now committed to various users. This is also stated in a footnote to the present Region L Plan. There is no Carrizo water available for SAWS in western Gonzales County. The SAWS Water Resource Plan 2005 update also clearly indicates that this water is in excess of the stated needs.*
>
> *Please Remove the SAWS Regional Carrizo Plan from the Region L Plan. This request is backed by many citizens of western Gonzales County and supported by the Nixon and Smiley City Councils as well as the Gonzales County Commissioner Court."*

Response: At the December 1, 2005 planning group meeting, the SCTRWPG agreed to the following conditions for continued inclusion of the Gonzales County Carrizo Projects in the Regional Water Plan, subject to changing yields to meet needs when the desired future condition of the aquifer has been determined. The request from the Gonzales County Underground Water Conservation District Board to add language recommending a delay in filing permit applications until the desired future condition had been determined was

regarded as problematic by the group, and members indicated that the Board could use its own powers to manage the permit process.

Procedural Steps

1) **Utilize the groundwater conservation district (GCD) estimates of availability as included in the GCD management plan. Estimates of availability may change and are subject to permitting by the GCD.**
2) **Reference model simulations included in the initially prepared regional water plan to illustrate that presently some of the recommended water management strategies (WMSs), in their presently recommended amounts, are potentially feasible and that the associated simulation is for regional planning purposes only. Implementation of these WMSs must be in compliance with GCD rules.**
3) **The SCTRWPG recognizes that modeling assumptions with respect to geographic distribution of pumpage among counties and/or GCDs is for regional water planning purposes only and is subject to future decisions by either the sponsor of the WMS of the GCD.**
4) **Develop language appropriately qualifying SCTRWPG recommendation of WMSs, acknowledging uncertainty in the availability estimate in the GCD management plan pursuant to the process defined under new law (HB 1763), and explicitly recognizing that only the local GCD has authority to issue the necessary groundwater production permits for implementation of WMSs. It is noted that a substantial portion of the language explaining this concept was agreed upon by technical representatives of the GCDs and water suppliers most directly affected and that such language is present at numerous locations throughout the initially prepared regional water plan.**
5) **Recommended WMSs in amounts exceeding GCD management plan estimate of availability introduces an added element of uncertainty to reliance upon these WMSs and, therefore, additional management supplies may be needed.**

Advantages of Concept

1) **Recognizes that only the local GCD has the authority to issue groundwater production permits and in no way constrains the GCD from granting or denying such permits in accordance with GCD rues.**
2) **In no way discourages willing buyers and willing sellers from negotiating water supply agreements and seeking production permits in accordance with local GCD rules.**
3) **Ensures that the regional water plan recognizes the plans of many water user groups (WUGs) and wholesale water providers (WWPs) to develop and beneficially use limited supplies from the Carrizo Aquifer.**
4) **SCTRWPG need neither choose which specific WMSs to recommend and reject, nor prorate supplies associated with all WMSs to recommend and reject, nor prorate supplies associated with al WMSs, in order to comply with a GCD management plan availability number that will almost certainly be changing in the next few years.**
5) **SCTRWPG need not necessarily go through the process of identifying and recommending "replacement" WMSs to meet projected needs for WUGs and**

WWPs who have very clearly expressed a preference for seeking Carrizo Aquifer supplies.

6) Allows for timely completion and adoption of the regional water plan.

Issue 7. Request to remove the 11,000 acre-feet of Carrizo groundwater to be pumped out of Wilson County from the plan.

The public comment process received letters from the Wilson County Commissioners Court, the Evergreen Underground Water Conservation District, the City of Stockdale, the City of LaVernia, and the City of Floresville requesting that the 11,000 acre feet of Carrizo ground water in Wilson County be removed from the Plan. The group received seven hundred and twenty seven oral and written comments requesting that the 11,000 acre feet be removed from the plan, including six hundred and eighty written comments with the following message:

> *"Please remove the 11,000 acre feet of Carrizo Aquifer Groundwater in Wilson County from the Water Plan."*

Response: The Wilson County well-field is one of four in the water management strategy known as Regional Carrizo to Bexar County in the Regional Water Plan, a strategy designed to meet near-term needs of SAWS. The group could not reach consensus in response to the extensive public comment on this project. At the December 1, 2005 meeting a motion was made to remove the 11,000 acre-feet from the plan. The vote was thirteen in favor of the motion to remove the 11,000 acre feet and seven for leaving the amount in the plan. The motion did not receive the required two-thirds majority of the voting members present for a motion to pass and the 11,000 acre-feet of Carrizo groundwater remains in the 2006 Regional Water Plan.

Issue 8. Seawater Desalination seems to be a logical long term solution to the water needs of the region. Please shift the timing of the seawater desalination plant to an earlier time in the regional plan. There were seventeen speakers at the Victoria public hearing that specifically requested Desalination be implemented sooner.

Response: The Initially Prepared 2006 South Central Texas Regional Water Plan includes Seawater Desalination as a recommended water management strategy to meet projected water supply needs for a Wholesale Water Provider (WWP) identified as the Regional Water Provider for Bexar County. Recognizing both the relatively high estimated unit cost of water developed by this strategy ($1390/acft/yr for 84,000 acft/yr) and the steadily advancing desalination process and treatment technologies that may reduce this unit cost in the future; the SCTRWPG chose to show implementation of this strategy between the years of 2050 and 2060. Review of recent updated cost information for seawater desalination facilities provided by the TWDB, including relevant information regarding the near-operational installation ear Tampa Bay, Florida, indicates that the cost estimates in the regional water plan are reasonably accurate with respect to current technology.

Subsequent to issuance of the Initially Prepared 2006 South Central Texas Regional Water Plan for public review and comment, members of the SCTRWPG and the public have produced written and/or verbal comments suggesting that the SCTRWPG recommend rescheduled implementation of the Seawater Desalination strategy to meet projected water supply needs in the Bexar County area. In mid-June, the San Antonio Water System (SAWS) issued its Water Resource Plan 2005 Update which recommends that SAWS continue evaluations of Coastal Desalination among Other Potential Projects. However, neither SAWS nor any other water user group or WWP serving Bexar County has indicated that it is prepared to establish a more definitive schedule for implementation of a major seawater desalination facility at this time.

Upon consideration of available information, it is the consensus of the SCTRWPG to expand its current statement regarding Desalination in Section 8.6 of the regional water plan as follows:

The SCTRWPG supports the funding of a state and/or federal program for research and potential incentives to make desalination more affordable. This includes both brackish groundwater and seawater desalination. Should such incentives, technical advances, and/or other factors make a seawater desalination strategy similar to that described in Section 4C.22 sufficiently attractive to a water user group or WWP that implementation prior to year 2050 is desired, it is explicitly recognized by the SCTRWPG that such rescheduled implementation is consistent with the 2006 South Central Texas Regional Water Plan.

Issue 9. The Brackish Groundwater Desalination – Wilcox Aquifer supply strategy in the Regional Water Plan does not match the amount and timing in the SAWS plan. What is status of Edwards brackish water evaluation?

Response: The Regional Water Planning Group agreed to a modification of this strategy to allow maximum pumping capacity of 20 MGD, but kept within the limits of an annual yield of 5,662 acre-feet. The planning group also agreed to include the Brackish Groundwater Desalination - Edwards Aquifer project as an option recommended for further research and evaluation.

Issue 10. The Recharge and Recirculation water supply potential is very interesting. Please include water supply option SCTN 6a as identified in the previous round of planning.

Response: Proposed for inclusion in the 2006 Regional Water Plan, this water management strategy was evaluated in 2001. TWDB has indicated that it needs updating, particularly with reference to the new WAM for the Guadalupe system, before it can be included as a strategy for implementation to meet identified water needs in the 2006 Plan. Recharge and Recirculation and option SCTN 6a are included in the 2006 Plan only as an option recommended for further research and evaluation.

Issue 11. The recent SAWS plan included the MESA water supply project and this project is not included in the Regional Water Plan. SAWS has requested that this project be included in the 2006 Regional Water Plan.

Response: The MESA water supply project is included in the 2006 Plan as an option recommended for further research and evaluation.

Issue 12. The <u>*Lower Guadalupe Water Supply Project*</u> *received a great deal of public comment and SAWS has requested that the project be removed from their list of water supply projects. There were other user groups receiving water from the project and these needs will need to be reconsidered relative to the status of this project. This project may need to be reevaluated in a format that reflects the removal of SAWS as a project sponsor.*

The public meeting in Victoria was attended by over 500 persons and the general message from the attendees was a request that this project be removed from the RWP in its entirety. The forty-eight written and oral comments relative to this water supply strategy expressed an aversion to a pipeline for ground and surface water, concerns over groundwater availability and modeling results, and concerns over surface water availability as well as the impacts to bay and estuaries.

Response: At the December 1, 2005 meeting, the planning group reviewed a reconfiguration of the Lower Guadalupe Water Supply Project for GBRA needs that removed the groundwater component and delivered water to user groups within the GBRA statutory district. The reconfigured project would utilize existing senior water rights with a new appropriation to deliver approximately 60,000 acre-feet of water to upper Guadalupe basin water user groups. The project would remove the interbasin transfer feature, and the Bexar Met needs would be met by another water option, as is explained below. The group could not reach consensus in response to the extensive public comment on this project. At the December 1, 2005, meeting a motion was made to include the reconfigured Lower Guadalupe Water Supply Project for GBRA needs in the plan. The motion passed by a vote of eighteen in favor and two against. The reconfigured Lower Guadalupe Water Supply Project for GBRA needs is included in the 2006 Regional Water Plan. A second motion was made and passed unanimously to remove the existing Lower Guadalupe Water Supply project as presented in the IPP from the plan

By letter of November 30, 2005 to the SCTRWPG, BexarMet informed the SCTRWPG that, in order to meet the BexarMet needs referenced in the paragraph above, BexarMet, requested the following revisions to BexarMet's recommended water supply plan:

- **"Edwards Transfers to be implemented prior to 2010. This strategy can provide an additional 6,000 acft/yr of supply for the years 2010 through 2060;**
- **Local Carrizo to be implemented prior to 2010. This strategy, which is already in the construction phase, can provide an additional 4,000 acft/yr of supply for the years 2010 through 2060; and**
- **Purchase from WW (RWPBC) to be implemented prior to 2020. This strategy can provide an additional 4,000 acft/yr from Edwards Aquifer Recharge – Type 2 Projects for the years 2020 through 2060."**

Explanations were given for each of the Water Management Strategies listed above, BexarMet explained that wells had been drilled in 1997 in southern Bexar County to implement the Local Carrizo source, that BexarMet plans to increase permanent transfers

of Edwards Aquifer Permits to 6,000 acft/yr by converting existing leases to permanent acquisitions, and to support the Regional Water Provider for Bexar County in developing Type 2 Edwards Aquifer Recharge Projects. SAWS inquired about the potential effects of the Carizzo wells upon the SAWS ASR project in Southern Bexar County and BexarMet agreed to work cooperatively with SAWS to assess and address potential impacts. BexarMet's proposal was considered by the SCTRWPG and approved for inclusion in the 2006 regional Water Plan by a vote of 18 for and 2 against.

Issue 13. The Simsboro Alcoa project is included in the IPP, and SAWS has dropped it from their list of projects. Is there another sponsor for the project or should it be removed from the Regional Water Plan?

Response: At the December 1, 2005 meeting, the planning group reviewed a reconfigured Simsboro Water Supply Project. The reconfigured strategy required identification of a new well-field location, destination, pipeline route and yield together with revised cost analysis. An additional issue is to determine whether or not there would be a conflict with any other regional plan. The planning group agreed to remove the Simsboro Alcoa project from the Regional Water Plan and include the reconfigured project in the 2006 Plan only as an option recommended for further research and evaluation.

Issue 14. The SAWS plan seems to have a different set of Edwards Aquifer Transfers than what is in the IPP. What demand pattern changes are associated with the anticipated SAWS plan?

Response: At the December 1, 2005 meeting, the planning group agreed to include the additional Edwards transfers subject to the controls and regulations established by the Edwards Aquifer Authority.

Issue 15. Create a policy to allow for the continuation of funding for Environmental Studies, regardless of the Lower Guadalupe project status.

Response: The following policy was adopted by consensus at the December 1, 2005 planning group meeting and is also included in the policy section of the 2006 Regional Water Plan:

Environmental Studies Policy

The SCTRWPG recognizes that significant needs exist in Bexar and the surrounding counties and that new supplies need to be developed in the Guadalupe River and San Antonio River watersheds. There are issues related to environmental impacts that need further study to determine feasibility of reuse of wastewater effluent, Edwards Aquifer recharge dams, the proposed Dunlap and Siesta water supply projects, and the resulting groundwater-surface water interaction from the existing and proposed Carrizo projects. Therefore, the SCTRWPG recommends that additional environmental studies be undertaken to be able to evaluate the effects of such projects on the ecosystems that rely on inflow to San Antonio Bay and flows of the Guadalupe River and San Antonio River watersheds.

Issue 16. The Canyon Regional Water Authority has requested the 2001 Regional Water Plan be amended to include three new water supply strategies and included in the 2006 Regional Water Plan. What was the public input regarding these strategies? What was the outcome of the amendment process?

Response: The public comment period ended November 15, 2005. The amendments were discussed at the December 1, 2005 Regional Water Planning Group meeting. The Wells Ranch project is a Carrizo groundwater project and is considered in the context of the other projects located in Gonzales County. Its yield is subject to change depending on determination of desired future conditions. This amendment was recommended for inclusion in the 2001 and 2006 Regional Water Plans by consensus of the planning group members.

The CRWA Lake Dunlap project would use a new appropriation of water from Lake Dunlap, firmed up with groundwater from the Wells Ranch well-field, to meet needs of CRWA customers. The Siesta project received the most of the public comment with concerns focusing around the use of treated wastewater as a firming supply, the timing of availability of the wastewater and the downstream impact of an increased surface water appropriation. The group could not reach consensus regarding this project. At the December 1, 2005 meeting, a motion was made and passed to include both the Lake Dunlap and Siesta projects in the 2001 and 2006 Regional Water Plans. The vote was sixteen in favor and four against the motion. The summary and public comments regarding the Amendment process is presented in the Amendment to the 2001 South Central Texas Regional Water Plan report by HDR.

10.2.2.4 Public Comments and South Central Texas Regional Water Planning Group Responses

Public comments were received on 15 additional issue areas that did not require facilitation to develop responses. These responses were developed through consensus after review by the staff work group and planning group members. Responses to issues that specifically referenced a technical question were developed by HDR and are presented in the section 10.2.2.5.

Issue 17. Water Policy Issues*. Comments on policy issues included concerns over the amount of management supply in the plan and requested that the plan include a management supply for parts of the region other than Bexar County. This topic was covered previously in the facilitated issue section. Using drought management as a water supply strategy is also a policy issue that was covered in the facilitated responses. There were several comments supporting conservation and the efforts of the planning group to include conservation as the first option to implement. A more aggressive approach was suggested by "having San Antonio implement Stage 1 water restrictions year round". Another policy of concern was "the absence of surface water development projects in the Region continues the practice of over dependence on ground water resources." The use of the term "recommended" water strategies was also requested to be changed to "potential" water strategies.*

Response: The implementation of stage 1 water restrictions as a year round water use amount would essentially be a water conservation strategy that the City of San Antonio has available for implementation. A full discussion of Water Conservation as a Water Supply Strategy is provided in Section 4C.1 of the RWP. As indicted in that section, the Planning Group has established a target goal of water use of 140 gpcd for municipal water user groups. The methods to achieve the target goal are up to the discretion of the water user group. A list of BMPs for water conservation as developed by the Water Conservation Implementation Task Force is available and can help water users determine which methods may best apply to their situation.

SCTRWPG does not have authority to require any level of water restrictions in the region. The apparent over dependence on ground water resources in the current RWP reflects the overwhelming negative response received in regard to several reservoir sites considered during preparation of the 2001 RWP.

The term "recommended" water supply strategy is used because the strategy has been identified by the SCTRWPG as an available source to meet the needs of the water user group. Whether the strategy is implemented to meet those needs will ultimately be determined by the water user group, and therefore the SCTRWPG only has the authority to "recommend" a strategy to meet needs.

Issue 18. Rural versus Urban needs. *This topic relates to the management of groundwater and the ability of Groundwater Districts that were established to manage irrigation and rural water uses to respond to the idea of well fields and pipelines that move water out of the district. The specific policy statement in the RWP regarding the inability of the planning group to identify any "new economically feasible water available for irrigation in the region" is of particular concern when the plan includes water supply strategies that move groundwater from the counties in need of irrigation water. The city water users are viewed as "wasteful" because they are worried about watering lawns, while rural populations are concerned with maintaining their livelihood (cattle and crops). The comments were passionate and often reflected a belief that the water is connected to the land and should be respected as such. One commenter also expressed the frustration of feeling like a "flea versus Goliath" when considering the power and money behind the large metropolitan areas.*

Response: It is important to differentiate between a need and a shortage. The needs of the region as presented in Tables 4A-5 and 4A-6 can for the most part be met by existing water

supply strategies. A shortage only occurs when a need exists in an area where existing water supplies are not available to meet the needs. If you are a farmer, you can dig another well to meet your needs, as long as you are complying with the rules of the groundwater district for your area. The planning group has endorsed conservation as the first water management strategy for all water user groups and has adopted an aggressive per capita user goal for municipal water users and recommended conservation strategies for irrigators. The intention of this conservation policy is to provide for the equitable management of the water resources in the region. The planning group has also followed a policy to honor the management plans of the underground water conservation districts. The next round of regional water planning will include the process established through H.B. 1763 which requires groundwater conservation districts of the same groundwater management area to meet at least annually to conduct joint planning with the other districts in the management area. The districts in each management areas will establish management plans that contain goals and objectives consistent with achieving the desired future conditions of the relevant aquifers. It is anticipated that this groundwater management process will provide the rural interests with the ability to manage the use of the aquifers in both rural and urban areas.

Issue 19. Population/Water Demand Projections. There were five comments received that expressed concerns with water demand projections. Two comments expressed the concern that the population projections for Wilson County were too low and two comments expressed a similar concern for Goliad county steam electric and municipal water demand projections. One comment was received regarding the municipal supply in the plan for Uvalde County (2,657 acre feet) not matching the permitted (5,300 acre feet) and peak usage (5,100 acre feet).

Response: Population and water demand projections were revised based on the 2000 census. The Planning Group is required to use TWDB population and water demand data. The data for each county was circulated to county and municipal officials, as well as water user groups for comment on August 2, 2002, and proposed revisions for this region were considered and accepted by the TWDB on March 19, 2002. Similarly, the water demand projections were sent out for review by county and municipal officials as well as water user groups for comment on March 18, 2003 and the proposed revisions for this region were considered and accepted by the TWDB on September 5, 2003.

The Planning Group has adopted a recommendation for earlier and more active involvement of the RWPG's in TWDB's process of developing its population and water demand data, and has urged counties and water user groups to become more active in reviewing the data and requesting modifications. Questions regarding specific numbers are addressed in the Technical Questions section responses.

Issue 20. Wilson County Spring Flow Issues. Eight comments were received relative to the Cibolo Creek and Sutherland Springs in Wilson County. Concerns were expressed that the creek and associated springs would go dry with increased groundwater pumping. Comments described the rich history of the springs, how the area is named for Dr. John Sutherland who was the physician at the Alamo and that in earlier times the springs were used by different Native American groups who considered the springs sacred ground.

Response: The SCTRWPG recognizes that the groundwater models and the surface water models would benefit from some additional conjunctive use analysis. According to the TWDB, this type of analysis could be a focus area to be included in the next round of planning. The Cibolo Creek and the Carrizo Aquifer are recognized as an area that may benefit from additional evaluation to determine the effects of groundwater pumping on spring flows.

Issue 21. Downstream Bays and Estuaries. Several comments mentioned concern about adverse impacts on bays & estuaries that could result from one or more of the proposed management strategies in the RWP. Specific concerns included the whooping cranes, shrimp, crab, and oyster populations that all depend on the fresh water inflows from the Guadalupe River.

Response: Impacts are considered in the RWP according to the State Consensus Environmental Criteria on instream flows and freshwater inflows to bays and estuaries. The State's Consensus Environmental Criteria were developed jointly by the Texas Water Development Board, the TCEQ, and the Texas Parks and Wildlife Department. When the relevant strategies are presented for permitting by TCEQ, they will be subject to further and extensive review with regard to associated impacts. Should any of these projects fail to meet both State and Federal criteria, they will either have to be modified or mitigated or will not be permitted.

Issue 22. Groundwater – General Concerns. Why and how are the Edwards Aquifer water levels determined? Where is the environmental impact statement for "joining the Edwards Aquifer and the Carrizo Aquifer", because that is essentially what you are doing with the Regional Carrizo pumping project? Suggestions for managing ground water resources include limiting pumping to acres owned, or tie pumping levels to recharge amounts, or establish drawdown limits for aquifers. Comments were expressed in support of Aquifer Storage and Recovery as well as concerns over pumping levels associated with ASR. One speaker requested pilot projects be implemented to test the validity of the GAMS.

Response: The Edwards Aquifer pumping levels are under the jurisdiction of the Edwards Aquifer Authority. A thorough discussion of the permits and pumping levels included in this Plan are described in Section 4C.2 in Volume II of the RWP.

The RWP incorporates a policy of groundwater sustainability and respect for regulatory rules limiting withdrawals under permits issued by groundwater districts. The SCTRWPG has adopted a goal of groundwater sustainability as described in Section 8.3 of Volume I of the RWP.

The groundwater districts have the authority to issue permits and will consider possible restrictions and conditions during the permit review process. Recent legislation has determined that "Each district in the management area shall ensure that its management plan contains goals and objectives consistent with achieving the desired future conditions

for the relevant aquifers as adopted during the joint planning process." This legislation designates the groundwater districts as the authority to determine the desired future conditions for the aquifers.

Issue 23. <u>Growth Management</u> was expressed by a few speakers as a recommended method for San Antonio to employ to help reduce future demand.

Response: Growth Management as a water supply strategy is evaluated in Section 4C.31of Volume II of the RWP.

Issue 24. <u>Conservation</u> was identified by several speakers and written comments as a method to efficiently reduce demand. The Sierra Club publication "Alternative Water Management Strategies for the 2006 South Central Texas Regional Water Plan" included a section specific to conservation which recommended that the plumbing retrofits be accelerated, that other cities adopt Conservation Ordinances similar to the City of San Antonio ordinance, implementing water audits, replacing residential turf with non-irrigated landscape materials, use of grey water systems, using more efficient clothes washers and the use of increased price to reduce demand.

Response: The Conservation Water Supply Strategy presented in Section 4C.1 of Volume II, references the Best Management Strategies guidelines prepared by the Water Conservation Task Force as possible methods to achieve higher levels of conservation.

Issue 25. <u>Other Issues</u> presented during the public comment process:

- *A request to include the Environment as a user group.*
- *Concerns over the benefits of Brush Management.*

Response: Environmental needs are currently considered in the RWP through the State Consensus Environmental Criteria on instream flows and freshwater inflows to bays and estuaries. Each Water supply strategy includes an analysis of environmental impacts should the strategy be implemented. In addition, the TCEQ considers environmental flow criteria when evaluating permit applications.

The use of Brush Management as a water supply strategy is included in the RWP in Section 4C.28 of Volume II. In this analysis the strategy is recognized as a water management strategy that may not be cost efficient in some applications.

10.2.2.5 Public Comments with a Technical Question and South Central Texas Regional Water Planning Group Responses

A. Oil & Gas Operations Relating to Groundwater Pumping

One commentor is concerned that potential groundwater projects in Wilson County will cause contamination of developed water supply by oil and gas floating on top of the groundwater being drawn into the production wells.

Response: Wells are designed and constructed such that the piezometric surface of the groundwater does not drop to the screened segments through which water enters the well and is pumped to the surface.

B. Goliad County Steam-Electric Water Demand Projections

One commentor seeks assurance that supplies are available to meet projected water needs for steam-electric power generation at the Coleto Creek Power facility in Goliad County should an additional generation unit be added sooner than the TWDB demand projections indicate. The commentor further asks for references as to separation of groundwater and surface water supplies and use of surface water rights by Coleto Creek Power.

Response: (1) Sufficient reliable water supplies are available from Coleto Creek Power's own water rights on Coleto Creek and the Guadalupe River, Guadalupe-Blanco River Authority (GBRA) run-of-river water rights on the Guadalupe River, and/or GBRA stored water from Canyon Reservoir to provide any additional water supplies needed by Coleto Creek Power when a second unit is added; (2) Groundwater and surface water supplies are separated in Appendix C of Volume I; and (3) Coleto Creek Power's rights to 20,000 acft/yr from Coleto Creek and the Guadalupe River are included in the Guadalupe – San Antonio River Basin Water Availability Model (GSA WAM) used to assess reliable water supplies and are noted in Table 3-3 in Volume I.

C. Seawater Desalination

Several commentors urge the SCTRWPG to recommend implementation of seawater desalination much sooner than 2050 and in place of other recommended water management strategies.

Response: Commentors are referred to the Policies and Recommendations of the SCTRWPG in Section 8.6.

D. South Texas Regional Groundwater Alliance Model Prepared by TAMU-Kingsville

Commentor suggests SCTRWPG consideration of results of applications of a new groundwater availability model prepared by TAMU-Kingsville, particularly with respect to potential drawdowns in the Chicot Aquifer. On the basis of these results, commentor requests deletion of the Lower Guadalupe Water Supply Project (LGWSP) from the Regional Water Plan.

Response: (1)The SCTRWPG has considered detailed simulation results obtained from versions of the Gulf Coast Aquifer Groundwater Availability Model (GCGAM) approved by the TWDB and required to be used for regional water planning. These simulations include the groundwater components of the LGWSP and a comprehensive summary of

modeling procedures, assumptions, and results is provided in Section 4C.19; and (2) The SCTRWPG has consulted with the sponsors of the LGWSP, considered public comment, and is recommending an alternative formulation of the LGWSP excluding the use of groundwater to firm-up surface water supplies.

E. Economics – Cost for Electricity

Commentor is concerned that lower groundwater levels and increasing energy costs will economically impact people.

Response: Calculations indicate that annual power costs for a typical domestic well owner to pump water an additional 100 ft at $0.06/kwhr (standard rate for technical evaluation of water management strategies) would be less than $5/yr.

F. Gulf Coast Aquifer Groundwater Modeling Results

Commentor questions groundwater modeling procedures and tools employed in the technical evaluation of the LGWSP and suggests consideration of simulation results obtained using an alternative model prepared by TAMU-Kingsville.

Response: (1)See responses to technical comment D; and (2)The TAMU-Kingsville GAM has not gone through a formal peer review process and, if the groundwater districts in the area would like for the regional water planning group to consider using the TAMU-Kingsville GAM, then the districts should submit the GAM to the TWDB for peer and public review and request a formal approval for use in the TWDB water planning process.

G. Economics – Consideration of Agricultural Property Value Decline in Cost Estimates

Commentor is concerned that groundwater production poses risks to the value of agricultural property in Goliad County.

Response: Data are not available at this time to quantify effects, if any, of groundwater production in compliance with groundwater conservation district rules and management plans upon the assessed valuation of agricultural property in Goliad County.

H. Economics – Pumping Costs Associated with Long Pipelines

Several commentors noted significance of costs associated with operations of lengthy transmission systems.

Response: Annual costs of pumping are included as part of Operation and Maintenance in the cost estimates for all water management strategies in accordance with TWDB guidelines for regional water planning. For planning purposes, it is assumed that sufficient quantities of energy will be available when needed.

I. Groundwater Pumping and Saltwater Intrusion

Several commentors expressed concerns that groundwater production from the Gulf Coast Aquifer may result in saltwater intrusion into areas from which fresh groundwater is presently withdrawn.

Response: Any significant groundwater production from the Gulf Coast Aquifer is expected to be obtained from the Evangeline formation at depths and in quantities such that saltwater intrusion would be extremely unlikely based on GCGAM simulations and engineering judgment.

J. More Details on Shallow Storage Reservoirs

One or more commentors seek more information regarding shallow storage reservoirs.

Response: For additional information regarding off-channel storage reservoirs associated with the LGWSP or the LCRA / SAWS Water Project, commentor is encouraged to review the following documents: (a) URS & R.J. Brandes Company, "Lower Guadalupe Water Supply Project Conceptual Delivery Study," San Antonio River Authority, October 2004. (b) CH2M HILL, et al., "LCRA-SAWS Water Project 2005 Project Viability Assessment," Lower Colorado River Authority, October 7, 2005.

K. Status of Applewhite Reservoir

Commentor suggests that the Applewhite Reservoir project be revived in order to provide for storage of floods and additional water supplies closer to San Antonio.

Response: (1) Large mainstem reservoirs have not been recommended in either the 2001 or the 2006 South Central Texas Regional Water Plans primarily because of local opposition and environmental concerns; and (2)Water rights permits obtained for Applewhite Reservoir were abandoned by the City of San Antonio in the mid-1990s.

M. Impacts of Groundwater Pumping upon Water Levels of Aquifers

Commentors are concerned that pumping from the well fields associated with recommended water management strategies will lower water tables and adversely affect those who depend upon the Gulf Coast and Carrizo Aquifers through increased costs to lift water from lower levels, and potentially from having to drill new wells to lower depths.

Response: (1)Commentors concerned with the Carrizo Aquifer are encouraged to contact sponsors of the water management strategies in the plan for information regarding mitigation programs; (2) Calculations indicate that annual power costs for a typical domestic well owner to pump water an additional 100 ft at $0.06/kwhr (standard rate for technical evaluation of water management strategies) would be less than $5/yr; and (3) Commentor concerned with the Gulf Coast Aquifer is advised that the Lower Guadalupe Water Supply Project for GBRA Needs to be included in the regional plan does not include a groundwater component.

N. Economics

O. Gulf Coast Aquifer Availability

Commentor questions estimates of water available from the Gulf Coast Aquifer used in the regional plan.

Response: Estimates of Gulf Aquifer groundwater availability were obtained from groundwater conservation district management plans, if available, and from the TWDB, if such plans were not available.

P. Mitigation Plan for Agricultural Impacts.

Commentor suggests that Groundwater Conservation Districts be given opportunity to estimate number of shallow wells potentially affected by aquifer drawdown and costs to replace affected wells.

Response: (1)The SCTRWPG encourages groundwater conservation districts to develop such estimates for consideration during the processes of updating their management plans, refining their rules, and evaluating applications for well permits; and (2) In the evaluations of strategies using groundwater, estimates are made of drawdown of water levels. In most cases, where groundwater is pumped for either local or distant uses, water levels decline, and pump lifts increase. In regional water planning, costs of estimated increased pumping lifts and modifications to existing or potential future wells are not made explicitly. Cost estimates for groundwater-based strategies involving export in the regional plan typically include a line item for mitigation reserve.

Q. Gonzales County Groundwater Availability Calculation
R. Status of SSLGC Water Supply Project from the 2001 Regional Water Plan.

Commentors questioned the quantities of water considered to be available from aquifers of Gonzales County in view of the SSLGC project, as included in the 2001 South Central Texas Regional Water Plan.

Response: The South Central Texas Regional Water Plan recognizes the SSLGC project, and has included quantities of existing supply in accordance with TWDB rules, which specify that quantities of existing supply are those available from facilities in place and in operation at the present time. The remainder of the SSLGC project (e.g., additional wells and production capacity) is considered to be a water management strategy to meet projected future needs, and is included in the plan, along with other such water management strategies.

S. Edwards Aquifer Recharge and Recirculation (R&R)
T. Include a Strategy (L23A) Evaluated in the Trans-Texas Water Program
U. Include a Strategy (SCTN-6a) Evaluated in Development of the 2001 Regional Plan

Commentors reference previous studies of Edwards Aquifer Recharge and Recirculation, and request that results of these R&R evaluations be put into proper format and included in the 2006 Region Plan in order for such projects to qualify for surface water permits.

Response: (1) Edwards Aquifer R&R has been recommended in the 2006 Regional Plan for further evaluation; and (2) Previous evaluations specifically referenced above were not performed in accordance with current TWDB rules and/or hydrologic assumptions consistent with those applied to other water management strategies recommended to meet projected needs.

V. Canal Improvements on BMA Irrigation Main Canal

Commentor recommends that the 1997 Natural Resource Conservation Service recommendation to renovate the BMA irrigation canal system be included as a water management strategy in the 2006 Regional Water Plan.

Response: Renovation or lining of the BMA canal system, while a promising conservation measure, does not create a firm yield from the Medina Lake System when it is operated in accordance with its water rights. Pursuant to TWDB rules for regional water planning, the SCTRWPG is focused upon water management strategies that provide firm supplies available during a repeat of the drought of record.

Y. Quantities of Groundwater Available as Expressed in Tables and Figures

Commentor states that data of Page ES8 and Figure ES4 are not in agreement.

Response; Figure ES-4 is not a graphic of the data of Page ES-8. The data in the Initially Prepared Plan on Page ES-8 show quantities of water obtained from aquifers in year 2000, and give projections of quantities of water available from aquifers at future projection dates to 2060. Figure ES-4 shows projected Drought Demand for water in the Region, and current supplies available, and the difference between demand and supply, or the projected shortage (need) for the region. Supply, as shown in Figure ES-4, is the quantity available from existing sources (ground and surface) with existing permits and equipment in place. The groundwater available, as shown on Page ES-8 includes both that which has been developed into existing supply, and that which can potentially be developed through implementation of water management strategies.

Z. Brush Control as a Water Management Strategy

Commentor recommends brush control as a water management strategy to benefit recharge to the Edwards Aquifer.

Response: **Brush Management was evaluated as a potential water management strategy to increase recharge to the Edwards Aquifer in the Nueces and Blanco Recharge Basins. The analyses of available data for 284,000 acres in the Nueces Basin, showed a potential**

estimated increase in yield of the Edwards Aquifer of 1,728 acft/yr at a cost of $2,080/acft/yr. In the Blanco Basin, the land area considered was 83,000 acres, with a yield of 540 acft/yr at a cost of $1,952/acft/yr. The estimates of increased yield are for the Edwards Aquifer, and at the present time cannot be specifically controlled in a manner such that an individual water user can implement the strategy and obtain the water produced, even if the costs were to be considered competitive with other sources of water, which, in this instance does not appear to be the case. Therefore, Brush Management could not be recommended as a specific water management to meet projected water needs (shortages) of individual water user groups. It is recommended for further evaluation.

BB. Access to Groundwater Models

Commentor requests documentation of the Gulf Coast Groundwater model used in evaluating water management strategies included in the Plan.

Response: Gulf Coast Aquifer Groundwater Availability Model (GCGAM), input data files, and supporting documentation was provided to a consult for the D.M. O'Connor Ranches in April 2005 at the request of a member of the SCTRWPG. Modeling assumptions and procedures used by the Technical Consultant to the SCTRWPG are consistent with those employed by TWDB staff. Supplemental information may be requested from the TWDB.

CC. Reconsider the 340,000 acft/yr of Water Available from the Edwards Aquifer

Commentor expresses concern that the Planning Group has accepted 340,000 acft/yr as the quantity of water available from the Edwards Aquifer during times of severe drought without adequately considering the effects of this level of pumping from the Edwards upon downstream water users in the Victoria area.

Response: As described in the Executive Summary and Section 3 of the Regional Plan, 340,000 acft/yr has been adopted as a placeholder number for reliable Edwards Aquifer supply until such time as an Habitat Conservation Plan that more specifically defines requirements for springflow protection is approved. Evaluations of the reliability of downstream water rights subject to alternative assumptions regarding Edwards Aquifer pumpage was not included in the scope of work for development of the 2006 Regional Water Plan.

DD. Water from Air Technology

Commentor suggests that Region L contract for research and pilot studies of developing "water from air."

Response: Background information about the potentials for such an activity are not adequate to allow the Regional Planning Group to give technical consideration to this suggestion. However, the RWPG encourages increased funding to assist water planning regions and local entities in developing demonstration projects for alternative water supply

strategies and technologies, such as, but not limited to, desalination (See Section 8.6 of the Plan).

EE. Carrizo Aquifer Drawdown

Commentor requests that drawdown maps be included for all projects obtaining water from the Carrizo Aquifer.

Response: In Section 7.1, the cumulative effects of regional water plan implementation are presented, using both maps and graphics.

FF. Evaluate Building a Lake in the Hill Country

Commentors recommend that water supplies for San Antonio be obtained from lakes in the Hill Country instead of from groundwater sources in Wilson County.

Response: In development of the 2001 Regional Plan, several potential reservoirs located on tributaries of streams of the region, including in the "Hill Country" were described and evaluated. Based upon cost, lengthy development times, and environmental effects, the SCTRWPG did not recommend any of these in the 2001 Regional Plan. Based upon information obtained from the 2001 planning effort, the SCTRWPG did not consider these potential strategies for the 2006 revision and update of the 2001 Regional Plan.

GG. Alternative Water Management Strategies for City of Elmendorf

The City of Elmendorf request reference in the regional plan to alternative water management strategies including purchase from a wholesale water provider and/or development of its own supplies from the Carrizo Aquifer.

Response: Appropriate text has been added to Section 4B.2.2.10 of the plan.

HH. Misunderstanding of Selma's water supplies and calculation of needs (shortages) in the IPP.

A representative of the City of Selma explained that the quantities of water supply for the city from the Edwards Aquifer and from the Schertz-Seguin Local Government Corporation (SSLGC), as presented in the water demand, water supply and needs calculations used in Table C-2 are in error, and that in comparison to projected demands, the city does not have a need (shortage) during the planning period.

Response: The City of Selma is located in 3 counties (Bexar, Comal, and Guadalupe)(Tables C-2, C-5, and C-11). A check of the entries for Selma's supply from the SSLGC shows 800 acft/yr, which equals the quantity reported in the comment letter of August 19, 2005. However, the quantity of EAA supply included in the Tables mentioned is only 110 acft/yr (185.5 adjusted to 59.3 percent of the Edwards Aquifer firm supply of 340,000 acft/yr being used in the plan), and is lower than the 1,000 acft/yr reported by

Selma in the comment letter of August 19, 2005. The quantities of Edwards Aquifer supplies included in the plan for all Edwards Permit holders, including Selma, were obtained from records of the EAA at the time of the analysis, and were the best available information at the time. Subsequent Edwards transfers and/or errors in the original source of data may explain differences, such as those mentioned in the comment. In the case of Selma, language has been included in the Bexar County Water Supply Plan (Section 4B.2.2.21) to explain that current supply for the City of Selma is obtained from the Edwards and Carrizo Aquifers and may be adequate to meet a part or all of the projected needs (shortages) to about 2040, especially if the water conservation water management strategy is implemented, and that only those water management strategies included in the plan that are needed after 2040 need to be considered for implementation by the City. However, it is important for Edwards Permit holders, including the City of Selma, to be aware that the Edwards Initial Regular Permits (IRPs) may not be firm supplies; i.e.; for purposes of the regional water plan IRPs have been included as firm supplies at 59.3 percent of the permit quantity.

II. By letter of September 20, 2005, a representative of the San Antonio Water System (SAWS) requested the changes to the Region L Plan, as presented below.

Increase the yield of brackish groundwater desalination from 5 MGD to 20 MGD.

Response: This request was discussed during the facilitation process and was included in the 2006 Plan, as requested.

Increase total Edwards Aquifer transfers to 48,000 acft/yr for SAWS at the 340,000 acft/yr cap.

Response: This request was discussed during the facilitation process and was included in the 2006 Plan, as requested.

Remove the Simsboro Project.

Response: This request was discussed during the facilitation process and was included in the 2006 Plan, as requested.

Remove the Lower Guadalupe Water Supply Project.

Response: This request was discussed during the facilitation process and was included in the 2006 Plan, as requested.

Include Coastal Desalination, Recharge and Recirculation, and the Mesa Water Supply Project in the plan for further consideration.

Response: This request was discussed during the facilitation process and was included in the 2006 Plan, as requested.

JJ. Concerns were expressed to the Regional Water Planning Group by leaders of organizations of Comal, Kendall, and Kerr Counties regarding increased Edwards irrigation transfers, and the associated increased reliance upon the Edwards and Trinity Aquifers to meet projected municipal needs, and anticipated adverse effects upon streamflow of the Guadalupe River and communities of these counties that depend upon the Edwards and Trinity Aquifers and the Guadalupe River for water supplies.

Response: The issue of increased Edwards irrigation transfers as a water management strategy to meet projected municipal needs within the Edwards Aquifer area was considered by the SCTRWPG in facilitated discussion sessions and the potential effects upon springflows and downstream Guadalupe river flows are reflected in the evaluations of cumulative effects of implementing the plan (Section 7.1). Effects of additional Trinity Aquifer pumpage have not been technically evaluated by the SCTRWPG. The TWDB has recently undertaken studies to better define surface water – groundwater interactions associated with the Trinity Aquifer.

Page-Specific Comments received in joint letter from National Wildlife Federation, Environmental Defense, and Sierra Club, with SCTRWPG Responses

Comments Numbered [1] through [141] from National Wildlife Federation, Environmental Defense, and Sierra Club are presented below, together with SCTRWPG responses. References in the responses to numbered comments are to the numbers of this grouping; i.e.; [1] through [141], and do not refer to other numbering sequences of Section 10.

ES Executive Summary

[1] Figure ES-2, on page ES-5, and the accompanying discussion about demands for steam-electric power generation seem to incorporate an unduly high demand projection. These demands match those projected in "Texas Water Development Board: Power Generation Water Use in Texas for the Years 2000 through 2060 Final Report, prepared for the Texas Water Development Board by Representatives of Investor-Owned Utility Companies of Texas, January 2003." From a review of that document, we understand it to include an assumption of a continuing increase in per-capita electrical power usage through 2060 at a rate of .5% per year. It does assume that new power plant capacity will be more efficient in its use of water. However, we do not believe that it is appropriate to assume that efficiency advances in use of electricity overall will not at least slow the rate of growth in per capita use of electricity. As a result, the projected 2060 demand of 109,776 acre-feet of water for steam-electric power production seems excessive.

Response: It is important to note that all water demand projections were prepared by the TWDB and issued to the Regional Planning Groups for review, and use. In the case of Region L, all projections were released to the public for review and comment early in the regional planning process. In the case of steam-electric power projected water demands, the RWPG received no formal comments regarding the projected demands for steam-electric power generation. Even though some members of the SCTRWPG questioned the geographical locations to which projected increases in water demand for steam-electric power were assigned and the SCTRWPG encourages the TWDB to further consider the technical procedures by which such demands are assigned in the development of future

projections, the TWDB projections were used in the development of the Regional Water Plan.

[2] (Page ES-8, fn.1). General information about levels of springflows anticipated in conjunction with the assumed Edwards Aquifer pumping levels should be provided. It should be noted that according to BIO-WEST (Sept 2003), 340,000 acft/yr per year of pumping results in zero discharge from Comal Springs 6.2% of the time, and Comal Spring discharge below the 60 cubic feet per second (cfs) level 14.0% percent of the time. According to that document, a pumping level of 225,000 acft/yr per year is predicted to maintain some flow in Comal Springs through a recurrence of critical drought conditions and to produce a discharge below 60 cfs 3.7% of the time.

Response: The following text has been appended to the footnote on page ES-8 of the Executive Summary. "Independent studies by the TWDB, HDR Engineering, Inc., and Bio-West indicate that annual Edwards Aquifer pumpage would have to be limited to about 225,000 acft/yr to maintain uninterrupted discharge of at least 60 cfs from Comal Springs during a repeat of the drought of record."

[3] (Page ES-12). Social and Economic Impacts of Not Meeting Projected Water Needs. Although we understand that this information is provided by the Texas Water Development Board (TWDB), we find the presentation somewhat misleading. These are extreme, worst-case calculations. They represent the impacts projected if no efforts are made to mitigate water shortages. That simply is not a realistic portrayal of reality. If water shortages do develop, available water will be shifted from non-essential uses to the most important uses. In order to present a more balanced message, we urge the planning group to include language acknowledging the potential to mitigate the predicted impacts, even in the absence of water management strategies to augment supplies.

Response: The TWDB analyses of Social and Economic Impacts of Not Meeting Projected Water Needs provides an estimate of the business value, number of jobs, and numbers of school enrollment associated with the quantities of water projected to be needed above the quantities available from existing supplies, as opposed to short term shortages, as the comment seems to imply. As some have commented during public discussion of the Social and Economic Impact Analyses results, the TWDB analyses do not take into account the economic values or losses to property and other capital assets due to not meeting projected water needs. In any event, the regional planning group has included the Social and Economic Impacts of Not Meeting Projected Water Needs, as calculated by the TWDB, and as required by TWDB rules.

[4] (Page ES-13). The initially prepared plan includes strategies that would be expected to provide over 800,000 acre-feet/year. However, the projected 2060 drought need is about 417,000 acre-feet. As explained further below, we believe the plan should recommend specific projects for meeting only the projected need. At minimum, even if the planning group chooses to recommend projects greatly in excess of projected needs, the group should make clear on each page on which the full list appears that the intent is not to suggest that all of the projects actually

should be implemented. The casual reader could be led to believe that the planning group is recommending development of all of the projects included in Figure ES-8.

We do not believe that inclusion of projects significantly in excess of projected need comports with the requirements of SB1 and the TWDB rules governing the planning process. This issue is not unique to the South Central Texas Regional Planning Group. Some other regions developed a list of recommended projects but also included a list of alternative projects that might be added if the recommended projects prove to be unworkable. At least that way, it is clear what specific projects the group is recommending as the preferred approach. One of the key charges of regional water planning, as set out in the TWDB rules, is to "provide specific recommendations of water management strategies based upon identification, analysis, and comparison of all water management strategies the regional water planning group determines to be feasible so that the cost effective water management strategies which are environmentally sensitive are considered and adopted …." 31 TAC § 357.5 (e)(4). Simply including the various strategies identified does not accomplish the key task of making specific recommendations to meet established needs using the most cost effective and least environmentally damaging strategies.

Response: This issue has been discussed in detail by the planning group and their policy has been refined accordingly since distribution of the Initially Prepared Plan IPP) and upon consideration of comments received. The refined policy regarding System Management Supplies is reflected in the Executive Summary and Sections 4B and 8 of the Regional Plan.

[5] (Page ES-16). Expanded use of aquifer storage and recharge is a strategy that is proven and that we believe should be included as a recommended water management strategy.

Response: Aquifer storage and recovery has been included in the 2006 Plan for further study as part of the water management strategy identified as Additional Storage (ASR and/or Surface).

[6] (Page ES-17). Here, the planning group provides its rationale for including water management strategies greatly in excess of needs. Three reasons are listed: identifying strategies to replace any that may fail to develop; serving as additional supplies if any of the strategies are not able to produce the projected amounts; or providing adequate supplies in the event of a drought worse than the drought of record. The very reason that plans are updated every 5 years is to allow for adjustments on an incremental basis. If recommended projects aren't moving forward when a future plan is adopted, recommendation of different strategies may be appropriate at that time. Similarly, if project yields have changed at that point, appropriate adjustments in recommendations should be made. It is important that each region's planning be based upon common planning assumptions to avoid undermining the value of the planning process. If all regions plan consistently, then no one region should end up using state money or permits to develop or implement a plan that calls for laying claim to an undue portion of the state's limited water resources. Water is a limited resource in the state. It must be shared equitably. Using common assumptions for planning across all planning regions is one way to help achieve that equity.

Response: The SCTRWPG has included the concept of System Management Supply as a part of its effort to provide adequate water supplies to meet projected needs during the drought of record and its policy on this issue is found in the Executive Summary and Sections 4B and 8 of the Regional Plan. As a result of SAWS decision to terminate its participation in the Lower Guadalupe Water Supply Project and the Simsboro Aquifer strategy, system management supplies for Bexar County have been substantially reduced since distribution of the IPP.

[7] Nor does a possible future drought worse than the drought of record justify planning for such a large excess supply. In fact, SB1 is quite specific in directing the use of the "drought of record" as the appropriate target for planning. See Tex. Water Code Ann. § 16.053 (e)(4). In addition, the planning group has not chosen to include drought management as a water management strategy. As a result, savings from drought management measures would be fully available in the event of an occurrence of a drought worse than the drought of record.

Response: See responses to comment numbers 4 and 6. As a result of facilitated discussions regarding issues raised through public comment, the SCTRWPG has modified its policy and now recommends that a more thorough analysis of drought management as a water management strategy be conducted during the planning interim. Text in Sections 4B and 8 has been modified accordingly.

[8] (Pages ES-10 and ES-15). The projected drought needs line on Figure ES-8, particularly for 2060, does not appear to match the 2060 needs shown in Figure ES-4.

Response: Figure ES-4 shows projected total needs (including those for irrigation and livestock) and ES-8 shows projected municipal, industrial, steam-electric, and mining needs.

[9] (Page ES-18). One of the claimed environmental benefits is that the regional plan makes greatest use of existing surface water rights thereby minimizing the development of new supply sources "and associated environmental impacts." The environmental benefits of that approach are not ensured. That statement would be accurate with respect to new reservoir construction, but that issue is addressed in a separate statement of benefits. Depending on the regulatory controls imposed upon the use of existing rights, increased use of rights that were issued without environmental flow protections actually may have significant adverse effects. In some situations those adverse effects could be greater than those from relying on new rights that would be issued with environmental flow protections. Of course, that would not be true if the existing rights were likely to be fully used anyway. Moreover, choosing the less damaging of two options does not really result in a net environmental benefit, but rather only a lessened level of detriment.

Response: It is required that the planning group honor existing water rights in the development of the regional plan. Lawful use of existing water rights to meet projected water needs clearly does minimize the development of new water supply sources and the environmental impacts associated with such new sources.

[10] (Page ES-19). Because it is not clear that the regional plan actually recommends implementation of seawater desalination as a water management strategy to meet projected water needs, it seems inappropriate to claim it as an environmental benefit. Because the draft plan includes strategies providing supplies that are about double the projected needs, it is not possible to determine which strategies actually are being recommended.

Response: Seawater Desalination is a recommended water management strategy in the plan for implementation prior to 2060.

[11] (Page ES-19). Environmental concerns about freshwater inflows relate to changes in overall flow patterns, including the timing, duration, and frequency of various flow levels, not just to changes in absolute flow quantities.

Response: In the technical evaluations of water management strategies that affect stream flows, timing and frequency parameters are presented, including comparisons of monthly medians and flow frequency with and without the water management strategy.

[12] (Page ES-19). We appreciate the acknowledgement of the potential for groundwater development adversely to affect springs. By extension, we would urge acknowledgement of the potential loss of surface flows associated with such springs and with seeps.

Response: The cumulative effects analyses recognize the affects of groundwater development upon surface flows, including effects upon springs and seeps, within the degree of accuracy of the groundwater models. Language has been modified to reflect potential associated effects on streamflows.

[13] (Page ES-19). Large demands for electrical power and the associated adverse environmental impacts should be acknowledged as additional environmental “concerns” for seawater desalination, if the strategy remains in the plan.

Response: The SCTRWPG has expressed concerns with the substantial demands for electrical power associated with seawater desalination, primarily with regard to elevated long-term annual costs for operations as compared to other water management strategies.

[14] (Page ES-19). “Environmental Concerns” suggests a much more qualified nature than “Environmental Benefits.” A more even-handed approach would be to label the two lists as “Beneficial Environmental Impacts” and “Negative Environmental Impacts.”

Response: Noted.

Description of the South Central Texas Region

[15] (Page 1-10). Section 1.2.4.2 Fish and Wildlife Resources. Some discussion of the fish and wildlife resources associated with the region’s bay and estuary systems should be included. Those resources are important both ecologically and economically.

Response: Information has been added to the text of the section mentioned.

[16] (Page 1-18). Section 1.4 Economy – Major Sectors and Industries. Information is lacking about "businesses dependent on natural water resources." That information is expressly required pursuant to Section 357.7 (a)(1)(G) of TWDB rules. Obvious examples of such businesses include commercial fisheries associated with the San Antonio Bay system, businesses dependent on recreational fishing, and river-based recreational businesses located on the Comal and Guadalupe Rivers. This information is required to respond to a new requirement added to the rules since the first round of planning.

Response: To some degree, data regarding such "businesses dependent on natural water resources" is included in the economic sector identified as Trades and Services (Section 1.4.8), but the source of information does not break such businesses out specifically. Data are not readily available regarding river-based recreation along the Guadalupe River. Limited data are available regarding the statewide economic impacts of bay and estuary related recreational activities and commercial fishing for the Guadalupe Estuary (Jones & Tanyeri-Abur, "Impacts of Recreational and Commercial Fishing and Coastal Resource-Based Tourism on Regional and State Economies," TR-184, Texas A&M University, May 2001). In approximate 2002 dollars, the 1995 statewide economic output impact of bay and estuary related recreational activities for the Guadalupe Estuary is estimated at $15.3 million which represents less than 0.8 percent of that for the Texas Gulf Coast. The 1995 statewide economic output impact (also in 2002 dollars) of commercial fishing for the Guadalupe Estuary is estimated at $27.1 million which represents about 8.3 percent of that for the Texas Gulf Coast. While these two economic sectors are locally significant, they represent less than one-tenth of one percent of the regional economy and only about 16 percent of the smallest regional economic sector presented in Section 1.4 (agricultural production). Hence, the SCTRWPG has not presented "businesses dependent on natural water resources" as a major sector of the regional economy.

[17] (Page 1-18). Agricultural Production. Information is lacking about the estimated number of jobs supported by agricultural production and livestock production. The other categories include such estimates.

Response: There is no readily available information pertaining to the activities listed, and the planning scope and budget do not include tasks or funds with which to collect such information.

[18] (Page 1-22). Section 1.4.6 Trades and Services. It is not clear where the water demands for this sector are represented in subsequent discussions. Clarification of that issue would be helpful.

Response: Trades and services are included in the municipal water demands, and are include in the general reference to "commercial uses" as stated at the beginning of Section 2.2.

[19] (Page 1-25). Water Uses. Environmental uses of water are not acknowledged in this section. A discussion of that issue should be included.

Response: The TWDB does not list Environmental as a specific type of water use for which projected demands, supplies, and needs must be evaluated for regional water planning purposes. Instead, for purposes of evaluating water management strategies, the Consensus Criteria for Environmental Flow Needs have been developed, and are used in the evaluation of water management strategies of the regional plan when appropriate.

[20] (Page 1-32). The last sentence of the first full paragraph refers to "hundreds" of wells in the Edwards. We understand there to be thousands of such wells.

Response: Noted.

[21] (Page 1-32). In the last sentence of the last full paragraph, the discussion of springflow impacts refers to environmental impacts and water rights impacts as being "unacceptable to both environmental and downstream water rights concerns." That language suggests a very subjective aspect for these issues. Although perhaps not intended, it also suggests that these "concerns" are limited only to small groups and may be less important than other issues. In reality, these are legally protected interests. It would seem preferable simply to substitute language similar to the following: "unacceptable because of adverse impacts to environmental needs and downstream water rights."

Response: Noted.

[22] (Page 1-33). The first sentence of the second full paragraph on that page states that the severe drought of the 1950s lowered water levels to record lows and caused Comal Springs to go dry for several months. Unquestionably, the drought was a major factor in those impacts. However, it was the combination of increased pumping and low recharge that caused the extreme impacts. Including that information is important so that readers get an accurate impression of that historical event.

Response: In the paragraph preceding the paragraph reference here, aquifer recharge and pumpage are cited as having effects upon streamflows and spring flows, and are not repeated in the discussion mentioned in comment Number 22.

[23] (Page 1-34). The carry-over paragraph from page 1-33 contains the only mention of water quality issues related to the Edwards Aquifer. That mention is limited to discussion of the bad water line. Discussion of additional water quality issues is merited.

Response: Additional information regarding Edwards Aquifer water quality and potential impacts of recommended water management strategies on key parameters of water quality identified by the SCTRWPG may be found in Section 5.

[24] (Page 1-44). Section 1.7.3 Major Springs. The discussion of the listed springs would be more useful if general information were added about the relative frequency with which the various springs flowed. In addition, some general discussion should be added about the ecological resources supported by each of the springs. The rules governing the planning process

have been revised since the first round of planning to acknowledge the need to address the role of springs in natural resource protection. See 31 TAC § 357.7 (a)(1)(D).

Response: Substantial information regarding the major (and many other) springs is available from the documents referenced in Section 1.7.3.

[25] (Page 1-46). In the discussion of threats to natural resources, it would be useful to specifically note the importance of freshwater inflows to estuary systems as a subset of the issue of the quantity and/or quality of fresh water available to fish and wildlife. Given the revisions to the governing statutes and TWDB rules to place increased emphasis on consideration of natural resources in the planning process, more development of this issue is warranted. TWDB may not approve a regional plan unless it is able to make an affirmative finding that the regional plan is consistent with long-term protection of the state's natural resources. See Texas Water Code Section 16.053 (h)(7)(C). Section 7 of the initially prepared plan provides careful analysis of anticipated flow changes, although looking only at comparisons between two hypothetical future scenarios. However, the absence of a listing of significant natural resources here makes it difficult to assess the adequacy of the Section 7 analysis. In addition, as discussed further below, the Section 7 analysis suffers from the failure to include an assessment of the biological significance of the predicted changes in flows. That type of analysis is needed in order to evaluate long-term consistency with protection of natural resources.

Response: The SCTRWPG has met their requirement to identify perceived "threats to natural resources" and is not required to enumerate a virtually endless list of significant natural resources. Further, the SCTRWPG trusts that the TWDB will make an appropriate decision regarding approval of the regional plan on the bases of state law and TWDB rules and guidance for regional water planning. In the evaluation of water management strategies which could potentially affect streamflows, including freshwater inflows to the estuaries of the region, Consensus Criteria for Environmental Flow Needs (CCEFN) have been applied and the firm yields of such strategies are net of CCEFN flow requirements. Thus the planning process has appropriately taken into account the needs of water to protect natural resources pursuant to TWDB rules and guidance.

[26] (Page 1-46). We were not able to locate information about significant wetland complexes that might be affected by changes in surface flows, including springs and seeps, or by changes in aquifer water levels. Those types of wetlands would have the greatest potential to be affected by water management decisions. Again, it constitutes information needed to assess the implications of the plan for consistency with long-term protection of natural resources and to provide a meaningful quantitative evaluation of potentially feasible water management strategies.

Response: Compilation and/or development of such site-specific information, while certainly of interest, is beyond the approved scope and budget for the regional planning process.

Population and Water Demand Projections

[27] (Page 2-16). 2.4 Steam-Electric Power Water Demand Projections. We understand that these projections are based on a report: "Texas Water Development Board: Power Generation

Water Use in Texas for the Years 2000 through 2060 Final Report, prepared for the Texas Water Development Board by Representatives of Investor-Owned Utility Companies of Texas, January 2003." As we understand that report, it assumes a continuing .5% increase in per capita electrical usage for each year through 2060. We believe that assumption is highly questionable. As energy costs, both monetary and others, continue to rise, progress in energy efficiency measures will result in reduced per capita usage of electricity and in demands below the projected levels. About a 210 % increase in water demand is projected for this category. By contrast, a projected population increase of around 2,250,000 people, or about 110%, is expected to result in an 87% increase in municipal water demand and about a 79% increase in industrial demand. Thus, the projected increase in water demand for steam-electric power generation seems to be disproportionate to the sectors that are most likely to drive that demand.

Response: See response to Comment Number 1.

[28] (Page 2-24). Environmental water demands are a water use category that should be included. This is a true water demand. Instream flows and bay and estuary inflows provide valuable services. Many jobs are dependent on meeting those water needs. Regardless of how environmental water demands are characterized, SB 1 directs that, in addition to other directives, regional water plans must provide sufficient water to protect the natural resources of the region. Tex. Water Code Ann. § 16.053 (a).

Response: Environmental water demands are not included in TWDB projections. Instead, the Consensus Criteria for Environmental Flow Needs (CCEFN) have been developed to address environmental water needs (for the purposes of regional water planning) in cases where water management strategies involve the use of surface water and groundwater that potentially affects streamflow. In the regional plan, the CCEFN have been applied where appropriate.

Section 3. Water Supply Analyses

[29] (Page 3-3). Section 3.1.1 Groundwater Availability

The text, along with Table 3-1, indicates that the groundwater availability determinations from the 2001 regional plan were carried forward in several instances. It would be very helpful to have a brief description in the current document of the approach used in the 2001 plan in determining overall water availability for those aquifers.

Response: With the exception of the Edwards Aquifer, groundwater availability used in the 2001 regional plan was provided by the TWDB and is identical to that used in Water For Texas, A Consensus-Based Update to the State Water Plan (August 1997). There is limited available documentation of the TWDB's methods used in the early 1990s to estimate quantities of groundwater available, except that the estimates were based upon estimates of recharge and of mining of quantities in storage over the ensuing 50 year period of time.

[30] (Page 3-10). In light of modifications to the dam and floodgates at Medina Lake, and in light of the recent USGS study showing reduced recharge from the Lake, the assumption that firm yield during drought is zero may need to be re-evaluated. At minimum, the existence of a

significant question about the amount of recharge and, by extension, the potential firm yield of the system should be acknowledged.

Response: The recent USGS study (Slattery & Miller, 2004) compares recharge estimates based on its findings for a seven year period (October 1995 – September 2002) only with estimates derived using the traditional method (Lowry, 1953) adopted by the USGS for annual reporting of Edwards Aquifer recharge. This comparison concludes that the average monthly recharge rate is about 47 percent less than that computed by the traditional USGS method. Recharge estimates based on the recent USGS study are not compared with those based on the methodology developed for the Edwards Underground Water District (Espey, Huston & Associates, 1989) and used in the Guadalupe – San Antonio River Basin Water Availability Model (GSA WAM). The GSA WAM methodology results in long-term average historical recharge estimates that are more than 30 percent less than those obtained using the traditional USGS method. In summary, the recharge calculation procedures of the recent USGS study may not result in recharge estimates significantly different from those obtained from the methodology in the GSA WAM. While further comparison and refinement of recharge calculation procedures is warranted, there is no clear indication that the firm yield of the Medina Lake System, operated in accordance with Certificate of Adjudication #19-2130, is likely to be greater than zero. No change has been made to the relevant text of Section 3.

[31] (Page 3-14). Paragraph 8 indicates that the IPP assumes the operation of the Choke Canyon/Lake Corpus Christi system (located in the Coastal Bend Region) at "firm yield." Our understanding from the Coastal Bend IPP is that for their analysis the system was assumed to be operated on a "safe yield" basis. It would be helpful to note the two different assumptions and address the significance, if any, of the differences in terms of impact on this plan.

Response: The choice of the SCTRWPG to perform surface water availability analyses on the basis of firm, rather than safe, yield operations of the Choke Canyon Reservoir / Lake Corpus Christi (CCR/LCC) System was made in order to avoid potential overestimation of the reliability of junior water rights located upstream and within Region L. It is likely that the Coastal Bend (Region N) RWPG chose to estimate water supply from the CCR/LCC System on a safe yield basis because they have recently experienced a third new drought of record since the 1940s.

Section 4A. Comparison of Supply and Demand Projections to Determine Needs

[32] (Page 4A-23). Social and Economic Impacts of Not Meeting Projected Water Needs.

As noted above, although we recognize that the planning group relied on TWDB to provide this information, we believe the information in this portion of the draft paints an exaggerated picture. These are extreme, worst-case calculations. They represent the impacts projected if no efforts are made to mitigate water shortages. That simply is not a realistic portrayal of reality. If water shortages do develop, water will be devoted to the most important uses. In order to present a more balanced message, we urge the planning group to include language that acknowledges the potential to mitigate the predicted impacts, even in the absence of water management strategies to augment supplies.

Response: See response to comment Number 3.

Section 4B.1 Water Management Strategies

[33] (Page 4B.1-3). As noted above, we believe the regional plan should recommend a specific suite of strategies to meet the actual projected needs. We recognize the desire to identify alternative strategies. However, as drafted, there simply is no way to tell which strategies are actually recommended for meeting projected water supply needs. At minimum, if this extensive list of strategies is retained, language should be added to the list specifically noting that 800,000 acft./yr is far in excess of projected demands and that implementation is being recommended only for water management strategies sufficient to meet projected demands. We believe the better approach (and the one required by TWDB rules) is to identify actual recommended strategies and to note the alternative strategies that are most likely to be recommended if the recommended strategies prove to be inadequate for any one of various reasons.

Response: See response to comment Number 4.

[34] (Page 4B.1-3). Figure 4B.1-2, as drafted, does not really present an accurate picture of how demands would be met because it reflects the full 800,000 acft of supply. As a result, the percentages assigned to the various groupings of strategies do not reflect the actual mix of strategies that would be needed to meet projected needs.

Response: Figure 4B.1-2 presents a summary of the sources of new supply in 2060, and shows a summary of the composition of types of water management strategies included in the plan. Figure 4B.1-2 has been modified to reflect water management strategies ultimately recommended in the 2006 regional plan (e.g., deletion of the SAWS Simsboro Aquifer strategy, changes to the Lower Guadalupe Water Supply Project, addition of the Wells Ranch, Dunlap, and Siesta Projects, etc.)

[35] (Page 4B.1-8). Here the initially prepared plan does note that the implementation of all recommended water management strategies is not likely to be necessary in order to meet projected needs within the planning period. In order to constitute an actual plan, the document should recommend specific strategies to meet projected needs. Alternative strategies also can be listed for future consideration, but they should be listed separately.

Response: After a period of facilitated discussions, the planning group designated several strategies for the category of "further study," and these strategies are so designated in the plan.

[36] (Page 4B.1-8). The plan lists three reasons for recommending strategies greatly in excess of needs: (1) to have strategies to replace those that fail to develop, (2) to serve as additional supplies if some strategies can't be fully implemented, and (3) to provide additional supplies in the event of a drought worse than the drought of record. The very reason that plans are updated every 5 years is to allow for adjustments on an incremental basis. If recommended projects aren't moving forward or have been down-sized when a future plan is adopted, recommendation of different strategies may be appropriate at that time.

Response: See response to comment Number 4.

[37] Nor does a possible future drought worse than the drought of record justify planning for such a large excess supply. In fact, SB1 is quite specific in directing the use of the "drought of record" as the appropriate target for planning. See Tex. Water Code Ann. § 16.053 (e)(4).
In addition, the Planning Group chose not to consider drought management and emergency response as a way to help meet drought-of-record demands. At minimum, the plan should include language here acknowledging that drought management measures do represent a way to respond to temporary drought conditions, including conditions worse than a drought of record. Indeed, in the Policies and Recommendations Section (page 8-5) the IPP plan indicates that the SCTRWPG "intends to look to 'drought management' as a safety net to respond to a drought greater than the drought of record…." The discussion on page 4B.1-8 is inconsistent with that statement.

Response: In keeping with the Planning Group's Policies and Recommendations mentioned in the comment, in Section 6.2 Drought Management, the SCTRWPG presents general recommendations regarding identification and initiation of drought responses for current water supply sources. In addition, the Planning Group recognizes that local public and private water suppliers and water districts have been required by TCEQ to adopt a Drought Contingency Plan that contains drought triggers and responses unique to each specific entity. Furthermore, these entities have the authority and responsibility to manage their particular water supply within the bounds created by applicable law. Therefore, the SCTRWPG encourages these entities to implement their respective plans with due consideration of the recommendations summarized in Section 6 of the Plan.

Section 4B.1.2 Water Management Strategy Descriptions
[38] (Page 4B.1-12) Recycled Water Programs. The last paragraph of this section purports to find that any expansion of wastewater reuse programs, whether direct or indirect, is consistent with the regional plan. That attempt is impermissibly overbroad. The plan does not include a quantitative assessment, nor could it, that is adequate to evaluate the effects of an unlimited program. Similarly, it is not possible to undertake a meaningful assessment of consistency of the plan with long-term protection of the state's natural resources without putting some limits on the amount of reuse that would be considered to be included in to the plan. Nor does such an unlimited finding appear necessary. The regional planning process provides for periodic updates of regional water plans. If reuse levels begin to increase in the future, there will be ample time to include an expanded reuse strategy in the plan when it can be meaningfully considered and assessed.

Response: The SCTRWPG supports and encourages the lawful reuse of treated wastewater associated with <u>increased</u> municipal water use (growth), particularly reuse of treated wastewater volumes associated with privately owned groundwater and interbasin transfer of surface water, as each of these represents flows that would not otherwise have been introduced to the streams and rivers of the region. A meaningful assessment of consistency with the long-term protection of natural resources is presented in Section 7. Accounting for increased effluent only from Bexar County (net of planned expansion of

SAWS direct reuse programs) and neglecting any potential future increases in effluent elsewhere, it is clear in Section 7 that instream flows and freshwater inflows to the Guadalupe Estuary are expected to increase with implementation of the regional plan.

[39] (Page 4B.1-16) Simsboro Aquifer (SCTN-3c)
Because SAWS has decided not to pursue this project it should be removed from the regional plan. If not removed, the discussion should be expanded to address issues about consistency with applicable groundwater district management plans.

Response: The Simsboro Aquifer strategy has been removed from the plan.

[40] (Page 4B.1-19 through 1-20). Edwards Recharge-Type 2 Projects
The second-to-last sentence of this section purports to find that any expansion or relocation of recharge projects is consistent with the regional plan. That attempt is impermissibly overbroad. The plan does not include a quantitative assessment, nor could it, that is adequate to evaluate the effects of an unlimited program. Similarly, it is not possible to undertake a meaningful assessment of consistency of the plan with long-term protection of the state's natural resources without putting some limits on the amount and location of recharge projects that would be considered to be included in the plan. Nor does such an unlimited finding appear necessary. The regional planning process provides for periodic updates of regional water plans. If recharge projects begin to increase in the future, there will be ample time to include an expanded strategy in the plan when it can be meaningfully considered and assessed.

Response: The referenced language provides only for expansion in size and storage capacity and does not provide for relocation of the recommended recharge enhancement facilities. Furthermore, the referenced language resulted from extended discussions by the SCTRWPG and is deemed appropriate by the SCTRWPG.

[41] (Page 4B.1-20). Brackish Groundwater Desalination (Gulf Coast)
This project seems to be dependent on inclusion in the Lower Guadalupe Water Supply Plan (LGWSP). Because SAWS has decided not to pursue the LGWSP, this project also should be removed unless it is reconfigured and assessed as a separate project.

Response: The strategy has been removed from the plan.

[42] (Page 4B.1-21) CRWA Lake Dunlap Project
As noted in the text, this project has not yet been adequately evaluated. Accordingly, it should not be included in the plan. If evaluations are completed and the project is proposed for inclusion in the plan, reasonable opportunities for public review and comment on the project should be provided. Without the completed evaluation, it is not possible to comment meaningful on the project.

Response: The strategy has been technically evaluated in the same manner as other strategies, a public hearing was held on October 13, 2005 in New Braunfels, public comment has been received, SCTRWPG responses to public comment have been

considered, and the SCTRWPG acted on December 1, 2005 to include this strategy in both 2001 and 2006 regional plans.

[43] (Page 4B.1-22) CRWA Siesta Project
As noted in the text, this project has not yet been adequately evaluated. Accordingly, it should not be included in the plan. If evaluations are completed and the project is proposed for inclusion in the plan, reasonable opportunities for public review and comment on the project should be provided. Without the completed evaluation, it is not possible to comment meaningful on the project.

Response: The strategy has been technically evaluated in the same manner as other strategies, a public hearing was held on October 13, 2005 in New Braunfels, public comment has been received, SCTRWPG responses to public comment have been considered, and the SCTRWPG acted on December 1, 2005 to include this strategy in both 2001 and 2006 regional plans.

[44] (Page 4B.1-26) Drought Management
The use of the TWDB socioeconomic impact analysis in an attempt to demonstrate that drought management is not an economically feasible strategy is seriously flawed. This analysis produces a very rough estimate of the economic impacts of doing absolutely nothing to meet any water needs. That analysis assumes no attempt to mitigate impacts by directing available supplies from nonessential uses to more critical uses. As a result, the per acre-foot dollar amounts predicted cannot reasonably be represented as reflecting the costs of not meeting a limited amount of non-essential water uses. It simply is not reasonable to assume, for example, that the economic impacts of having water unavailable temporarily to run a manufacturing line are the same as having water temporarily unavailable to fill a fountain, keep a lawn green, or wash a car. The underlying TWDB analysis does not, and does not purport to, reflect the short-term impacts associated with drought management measures aimed at non-essential uses of water. Such a flawed analysis cannot reasonably be relied upon by the SCTRWPG in an attempt to meet the TWDB requirement to document the reason for not selecting drought management strategies for each identified need.

Response: See response to comment Number 7. The regional planning group considered drought management, and explained that "drought management" was not selected as a water management strategy because by definition drought management is only implemented during times of crisis. The SCTRWPG further explained that the SCTRWPG looks to "drought management" as a safety net to respond to a drought greater than the drought of record and/or to respond to system failures (Section 8.6). In addition, the analyses showed the potential economic impacts of not meeting needs, and concluded that the cost of water to meet projected needs is only a fraction of the potential economic impacts of not providing water to meet the projected needs.

[45] Drought management is a required water management strategy at least for those entities required, pursuant to Section 11.1272 of the Water Code, to develop drought contingency plans. See 31 TAC § 357.7 (a)(7)(B). In addition, more stringent drought management measures must be considered. Thus, water management strategies must be included at least equal to the levels

required pursuant to Section 11.1272. If the planning group chooses not to include additional drought management measures beyond those levels, it must provide a valid reason for doing so. The existing analysis does not provide a valid basis for such a choice.

Response: See responses to comment Numbers 7, 37, and 44. Based on TWDB assessment of the economic impacts of not meeting projected water needs, the SCTRWPG questions the economic feasibility of recommending a water management strategy that, by definition, does not meet projected water needs.

[46] We urge the planning group to give further consideration to drought management as a water management strategy. The regional planning process is focused on water availability during critical drought conditions. Those conditions are extremely rare, but it is only prudent to plan for them. On the other hand, there is a serious question of whether developing new water supplies that would always be available but would be needed only during the recurrence of a critical drought is always the best approach. One alternative is to identify some water needs that are nonessential and not plan to meet those needs during a recurrence of critical drought conditions. Thus, for example, a municipal drought contingency plan might call for cutting back on lawn watering (allowing watering only at a frequency adequate to keep plants alive rather than green and thriving), car washing, or filling of swimming pools. That reduced demand then can be calculated and accounted for as a water management strategy for meeting part of the "need" for water during drought periods.

Response: See responses to comment Numbers 7, 37, 44, and 45.

[47] The "dry-year option" is another type of drought management approach. An irrigator can enter into an agreement not to irrigate during identified drought conditions in exchange for a cash payment. The water not used for irrigation can be applied to another use, such as municipal or industrial, during that period. The money saved by not having to develop a new water supply source to meet both the irrigation need and the municipal need during critical drought years likely would be more than sufficient to compensate the irrigator for lost production.

Response: Noted, but this particular water management strategy has not been explicitly considered in the regional plan. Due consideration must be given to the reliability of the source for such irrigation water. For example, dry year option agreements with irrigators dependent upon junior run-of-river water rights and/or the Medina Lake System may not be at all reliable during a repeat of the drought of record. Commentor is also referred to Section 6.2.2.1 regarding emergency transfers of surface water.

[48] (Page 4B.1-28) Other Relevant Factors per SCTRWPG
The first bullet point seems to suggest that the effect of implementation of the plan would always be an increase in spring flows. From our understanding of Section 7.1, especially Figure 7.1-2, implementation of the plan actually would result in decreased flows at Comal Springs during a recurrence of critical drought conditions. This is an important point that should be expressly acknowledged here.

Response: The bullet point mentioned is a summary overview which pertains to long-term average spring flows with the plan, as compared to the baseline pumpage of 400,000 acft/yr subject to Critical Period Management rules plus domestic and livestock pumpage, and is correctly stated. The exceptions and qualifications for each spring are presented in the text of the plan in Section 7.1.1.

[49] (Page 4B.2-9) Section 4B.2.1.4 City of Lytle
In Table 4B.2.1-8, municipal water conservation is listed as a recommended water management strategy and projected to result in 108 acft/yr of savings by 2060. We commend the planning group for including strong conservation measures. However, by recommending a second strategy (Edwards Transfers) in an amount exactly equal to the total 2060 projected demand, the IPP suggests that water conservation is not a reliable water conservation strategy. This pattern is repeated fairly consistently for municipal demands throughout the listings of supply plans for WUGs. See, for example, Table 4B.2.2-4 (City of Alamo Heights), Table 4B.2.2-12 (City of Castle Hills), Table 4B.2.2-26 (City of Hill Country Village), Table 4B.2.5-6 (City of Garden Ridge), Table 4B.2.11-12 (City of Schertz), Table 4B.2.16-2 (City of Castroville), Table 4B.2.16-14 (Yancey WSC), Table 4B.2.16-16 (Medina County Rural), Table 4B.2.18-2 (City of Sabinal), Table 4B.2.18-4 (City of Uvalde). That is very disappointing, especially coming from this planning group, which has established itself as the leader in the state on water conservation issues. We recognize that the timing of conservation savings is a factor. We also recognize that the plan generally includes some redundancy of supply. However, the pattern of consistently recommending other strategies to supply enough water to meet projected needs without any reliance on conservation seems to suggest water conservation somehow is less than a real water management strategy.

We urge the planning group to reconsider this approach. At minimum, if there is an alternative explanation, besides a reluctance to treat water conservation as a real water management strategy, we urge the planning group clearly to state that explanation in the plan.

Response: The SCTRWPG can only recommend water conservation as a primary water management strategy for water user groups throughout the region and does so quite pro-actively. Responsibility remains with each water user group to define and enforce conservation measures as they deem appropriate in compliance with state law. Recommendation of additional water management strategies for water user groups with projected needs has been done in accordance with input from the user groups and with the policies of the SCTRWPG.

[50] (Page 4B.2.2.1) Regional Water Provider for Bexar County.
Now that SAWS has decided to drop the Lower Guadalupe Water Supply Project (LGWSP), it doesn't make sense to keep it in the regional plan. The Project, as envisioned in the plan, is not viable. If some new version of the project is developed that might be viable without the participation of SAWS, that new version of the project should be considered for inclusion at that time on its own merits.

Response: The LGWSP has been downsized by eliminating the groundwater components, and has been included at the smaller size to meet projected needs within the GBRA statutory district.

[51] (Page 4B.3-2) Section 4B.3.1 Regional Water Provider for Bexar County
Now that SAWS has decided to drop the Lower Guadalupe Water Supply Project (LGWSP), it doesn't make sense to keep it in the regional plan. The Project, as envisioned in the plan, is not viable. If some new version of the project is developed that might be viable without the participation of SAWS, that new version of the project should be considered for inclusion at that time on its own merits.

Response: See response to comment Number 50.

[52] (Pages 4B.3-3 through 3-15). Water Supply Plans for Wholesale Water Providers (generally)
In considering water conservation, the tables simply note that municipal water conservation is assigned by WUG and no totals are given. However, as a result, the quantities of water supply represented by municipal water conservation, and other categories of water conservation, are not reflected in these totals. Accordingly, the recommended strategies actually exceed projected needs by an amount even greater than the amounts currently reflected in these pages. The totals for water conservation supply should be added to reflect those water management strategies. An appropriate footnote could be added to note where ultimate responsibility lies for achieving the projected levels of water conservation.

Response: The SCTRWPG can only recommend water conservation as a primary water management strategy for water user groups throughout the region and does so quite pro-actively. Responsibility remains with each water user group to define and enforce conservation measures as they deem appropriate in compliance with state law. Recommendation of additional water management strategies for wholesale water providers with projected needs has been done in accordance with input from the wholesale water providers and their customers and with the policies of the SCTRWPG.

[53] (Page 4B.3-6) Section 4B.3.2 San Antonio Water System (SAWS)
Because SAWS has decided not to pursue the Simsboro Aquifer project, that project should be eliminated from the plan. In addition, the proposed purchase of water from the Regional Water Provider Bexar County (RWPBC) will need to be reconfigured to account for the LGWSP not being a viable option, at least in its current configuration.

Response: See response to comment Number 39. Appropriate adjustments have been made in the plan as a result of these changes.

[54] (Page 4B.3-8) Section 4B.3.3 Bexar Metropolitan Water District (BMWD)
The proposed purchase of water from the Regional Water Provider Bexar County (RWPBC) will need to be reconfigured to account for the LGWSP not being a viable option, at least in its current configuration.

Response: Appropriate adjustments have been made in the plan.

Section 4C Technical Evaluations of Water Management Strategies

Section 4C.1.1 Municipal Water Conservation (L-10 Mun)
[55] (Page 4C.1-1). Both the information presented and the method of presentation in this section are very good. The assumptions and goals generally are clearly stated.

Response: The SCTRWPG appreciates your compliment and thanks you.

[56] However, it is not clear if, or how, the calculations consider the effect of recently enacted federal energy efficiency standards for clothes washers, both residential and commercial. We request clarification on this issue. At minimum, those new requirements likely would reduce the cost of water conservation measures through clothes washer retrofit programs because of passive replacement of non-efficient machines.

Response: The data used for evaluation of this strategy relied entirely upon information from the TWDB report entitled "Quantifying the Effectiveness of Various Water Conservation Techniques in Texas," GDS Associates, Inc. May 2002, Austin, Texas, and is cited and referenced in the documentation of the Municipal Water Conservation Water Management Strategy.

Section 4C.1.2. Irrigation Water Conservation (L-10 Irr)
[57] (Page 4C.1-40). The evaluation of irrigation water conservation addresses the use of low-pressure sprinklers, low-energy precision application systems, and irrigation scheduling. Many additional types of irrigation efficiency measures are noted, but not discussed in any substantive way. Some additional explanation should be provided for the decision to assess only those three irrigation water conservation approaches. The text, at page 4C.1-44, notes that current practices appear to be close to achieving technological limits of those three approaches so that irrigation conservation potential is limited. However, other best management practices recommended by the Water Conservation Implementation Task Force would appear to offer the potential for additional savings.

Response: The statement alluded to above is in Section 4C.1.2, and pertains to irrigation water conservation in general, and does not pertain only to the three methods mentioned. The methods included in the irrigation water conservation water management strategy have been shown to achieve efficiency in irrigation application, and are recommended because of their efficiencies.

(Page 4C.2-1) Section 4C.2 Edwards Transfers (L-15)
[58] Some discussion and explanation is needed about how the amounts identified as being available for transfer (72,795 acft/yr from unrestricted permits and 76,228 acft/yr from restricted permits) translate to the 45,375 acft/yr firm supply noted as being available from this strategy in the summary sheet and in the discussion on page 4B.1-11. The text on page 4C.2-2 indicates that adjustments already have been made to calculate a "drought supply equivalent" in developing the 72,795 and 76,228 figures.

Response: The unrestricted and restricted transfer potentials do not translate to the firm supply noted, as this figure is derived by summing the recommended Edwards Transfers for each water user group and/or wholesale water provider throughout the region. Furthermore, the firm supply figure represents a pro-rata share of the placeholder value of 340,000 acft/yr as the firm supply from the Edwards Aquifer adopted for planning purposes. The unrestricted and restricted transfer potentials simply provide a frame of reference indicative of supplies potentially available. Note that the strategy has been modified to include larger quantities of Edwards transfers to meet SAWS and BMWD needs, given that the LGWSP and Simsboro strategies have been removed from the plan.

[59] (Page 4C.2-8). The following implementation issue is noted: "An additional concern involves potential reductions in discharge at Comal and San Marcos Springs associated with increased pumpage from municipal wells closer to the springs." This statement needs to be included in the Summary Sheet for this strategy in order to note it as an environmental factor.

Response: This concern is noted under Impacts on Water Resources in the Summary Sheet.

[60] The summary sheet for this strategy seems internally inconsistent. In discussing Impacts on Agriculture and Natural Resources, it indicates that no impacts are anticipated because only quantities in excess of demand are projected for transfer. By contrast, in the discussion of Third-Party Impacts of Voluntary Transfers economic impacts are estimated for each acre-foot proposed for transfer. The calculation of impacts suggests that quantities other than excess quantities would be transferred. Similarly, the economic effects, discussed on page 4C.2-7, focus only on those lands taken out of production through the lease of 50% of the irrigation rights. Again, that suggests a transfer of quantities other than those that are excess to demands. Also, the economic impacts from transfers resulting from the installation of water-conservation equipment would be expected to be much less than for the straight leases and an estimate of those impacts also should be presented in this discussion.

Response: See response to comment Number 58. In addition, it is important to note that the increased Edwards transfers to meet SAWS projected needs results in a transfer of irrigation supplies to municipal and industrial uses, as is explained in the revised Section 4C.2.

(Page 4C.3-1) Section 4C.3 Recycled Water Programs

[61] The Summary Sheet discussion under the Environmental Factors heading is too cryptic in its reference to "similar environmental issues and concerns to those of the existing system." Some summary information about those issues and concerns should be provided in the plan itself.

Response: Available information is provided in Section 4C.3.3.

[62] (Page 4C.3-5). The consideration of impacts to environmental flows turns largely on assumptions about "increasing water use and development of new water supplies from

downstream, out-of-basin, and/or groundwater sources." It is far from clear how return flows from increased development of downstream water supplies would result in additional freshwater inflows to the Guadalupe Estuary. Indeed, with an assumed 50 percent return as effluent, the increased development of downstream supplies would decrease those inflows. That decrease could be completely or partially offset by the potential increase of return flows from imports and from non-tributary groundwater supplies, depending on how downstream diversions are operated and on the relative quantities of the water sources. However, because the relative contributions from the various source categories are not provided here, the conclusion is quite uncertain, particularly as it relates to quantities of freshwater inflows. We believe additional analysis is needed. However, if the LGWSP is removed from the plan, the analysis of potential impacts on freshwater inflows may be somewhat simplified because of the reduced downstream diversions. At any rate, revision to this discussion will be needed.

Response: As SAWS has withdrawn from the LGWSP, the largest new sources of supply for SAWS will be non-tributary groundwater supplies and interbasin transfer of surface water. As shown in Section 7, instream flows in the San Antonio River and freshwater inflows to the Guadalupe Estuary are expected to increase above baseline levels with implementation of the regional water plan.

[63] Quantities of projected supply for this strategy are not shown in the Bexar County Summary Table included in Appendix D.

We believe reuse has merit as a potential water supply option but the amount of reuse, if any, appropriate in any particular location requires careful assessment and consideration of the site-specific impacts.

Response: In Appendix D of the IPP, recycle water was included in "Purchase from WWP (SAWS);" Reference Footnote 3, and Table 4B.3.2-1). Quantities of water included in the plan from recycle programs are included in the tables, as appropriate.

(Page 4C.4-6) Section 4C.4.4 Aquifer Storage and Recovery – Expansion of South Bexar County Facility

[64] This project is listed as a project under construction. Therefore, as noted, the quantity of water associated with this project is to be included in the existing supply. However, it is not clear from the discussion on page 4C.4-7 how or why the ASR project is constrained to the 6,400 acft/yr associated with the Regional Carrizo well field.

Response: The ASR project is not constrained to 6,400 acft/yr. Only the production well field is limited to 6,400 acft/yr pursuant to an agreement between SAWS and the Evergreen Underground Water Conservation District. Language has been added in the text to further explain this existing supply.

[65] The ASR project has significantly greater potential as noted in the discussion on pages 4C.4-8 through 4-9. There is also no discussion of ASR in the Regional Carrizo for Bexar County discussion (4C14-1). It seems that the quantity of water supply available from further expansion of ASR is not adequately considered in the Plan.

Response: The purpose of the Water Management Strategy (4C.4.4) is to increase ASR. The potentials of ASR are limited to that included in the Plan for a number of reasons, including potential sources of supply for recharge and costs.

(Page 4C.5-1) Section 4C.5 Canyon Reservoir

[66] (Page 4C.5-3). Discussion of environmental issues regarding this strategy should not be glossed over by saying that the issues have been "sufficiently addressed through the inclusion of special conditions in the certificate." Those conditions do not eliminate impacts. The purpose of the required discussion is to acknowledge the impacts that can be expected in order to allow for informed decisions. TWDB rules require a quantitative analysis of impacts for all water management strategies, regardless of whether permits have been issued or are still needed. See 31 TAC § 357.7 (a)(8)(ii). Similarly, the summary sheet statement listing the only environmental factors as positive impacts is a bit inaccurate. There would be increased flows in a portion of the river downstream. Those increased flows may, or may not, be beneficial.

As summarized by the Science Advisory Committee to the Study Commission on Water for Environmental Flows: "The principal goal of providing environmental flows is to assure that sufficient quantities of water, reflecting seasonal and yearly fluctuations, as well as the frequency, timing, and volume of high-flow events, are made available to adequately protect the state's aquatic resources." Science Advisory Committee Report on Water for Environmental Flows (Oct. 26, 2004) at p. 1-7 (emphasis added). The complete loss of low flow events would adversely affect some species. In addition, as water is removed from storage, there is greater potential for moderately sized high-flow events to be captured. It simply is not accurate to portray the impacts of this strategy on environmental flows as uniformly positive. While the impacts may not be particularly large, they should be characterized accurately.

The discussion notes that Canyon Reservoir is expected to be full (above 909 ft-msl) more than 40% of the time. That is useful to know. However, some information about the percentage of time that the Reservoir would be expected to be below key recreational levels also should be provided. That information is important for understanding the potential impacts on businesses dependent on recreational activities in and around the Reservoir.

Response: The SCTRWPG has chosen to focus efforts and limited available funding for detailed technical evaluations, including evaluations of environmental effects, on water management strategies requiring new permits and/or major regional facility construction, rather than upon the expanded use of existing water rights.

(Page 4C.7-1) Section 4C.7 Lower Guadalupe Water Supply Project

[67] As noted above, it seems that SAWS was a key player in this strategy. Now that SAWS has chosen not to pursue the strategy, it does not seem appropriate to include it in the plan. At minimum, the strategy may not be included as a strategy for providing water to SAWS. See 31 TAC § 357.7 (b). If another version of the project is developed in the future that would be viable without participation by SAWS, it could be considered for inclusion at that time. However, a version of a project that is not viable should not be included.

Response: See responses to comments Numbers 50 and 62.

[68] On the Summary Sheet labeled as "In-basin Use," the language discussing "Interbasin Transfer Issues" should be revised to present an accurate picture. The issue is one of revision of the current status, not clarification. The text should simply note that in order for the project to be treated as "In-basin use," the current classification of the two basins as separate must be changed. The Summary Sheet labeled as "Interbasin Transfer" also needs revision. The current text, which reads "TWDB and/or Legislative clarification of the interbasin transfer status of this project is necessary," is not accurate for this scenario. No "clarification" is needed if the project is treated as an interbasin transfer. It probably should read more like: "Under the current legal classification, use of water from the project in the San Antonio River basin would be treated as an interbasin transfer and subject to additional permitting requirements." Alternatively, it could be revised to read more consistently with the language under that same heading for the Summary Sheets for the LCRA-SAWS water project. Those Summary Sheets precede page 4C.9-1.

Response: The SCTRWPG has evaluated the LGWSP under both In-Basin Use and Interbasin Transfer assumptions in recognition of the respective facts that: 1) the Guadalupe and San Antonio Rivers confluence above the diversion point thereby allowing the rights forming the basis of the LGWSP to make priority calls up both rivers; and 2) the TWDB has specified basin boundaries indicating that the diversion point is in the Guadalupe River Basin and that Bexar County is in the San Antonio (and Nueces) River Basins. The inconsistency is obvious and the need for clarification would remain if the LGWSP had not been modified, as a result of SAWS withdrawal, to serve only customers within the GBRA statutory district.

[69] (Page 4C.7-9) Figure 4C.7-5. The result depicted on this graphic illustrates the issues inherent in choice of a baseline for comparison. The baseline, or without project, inflow results reflect inflows that would be expected if all existing water rights were fully used. That has not occurred historically. Specifically, much of the surface water for the project would come from previously unused water rights. Thus, this comparison presents an unrealistic under prediction of the actual effects of the project. Without the project, those diversions under the existing rights would not be expected to occur and the difference between the two lines would be greater. Basically, this graphic compares two different future scenarios, neither of which provides any basis for considering the ecological implications of the change in inflows. This general issue is discussed further in our comments on Chapter 7.

Response: The SCTRWPG considered its choice of baseline for quantitative assessment of effects of water management strategy and/or region plan implementation carefully and chose to focus upon the effects of new appropriations rather than presently authorized uses of existing water rights.

[70] More fundamentally, however, Figure 4C.7-5 does not depict a quantitative analysis of the impacts of the full water management strategy as required by Section 357.7 (a)(8)(A)(ii). The strategy is described on page 4C.7-1 as obtaining water from "70,000 acft/yr of presently underutilized surface water rights from the Guadalupe-Blanco River Authority (GBRA), a new surface water right appropriation, and groundwater from the Gulf Coast Aquifer." Thus, each of

the water sources must be considered in the analysis. Figure 4C.7-5 does not acknowledge, as project impacts, the effect of the use of the 70,000 acft/yr of existing surface water rights. Compare, for example, the quantitative estimate of costs for this project, Table 4C.7-3, which includes a specific line-item listing for the cost of the purchase of the existing water. The goal should be to fully depict the potential impacts of the project, both in terms of environment and cost, so that a fully informed decision can be made. By contrast, the Summary Sheets for this project do acknowledge, under the Impacts on Water Resources Heading, that "greater utilization of existing water rights" would be expected to reduce freshwater inflows.

Response: See response to comment Number 69.

[71] (Page 4C.7-10). The discussion includes the following sentence: "Although bay volumes, inflows, and tidal exchanges with the Gulf of Mexico are so large relative to this alternative that substantial impacts to overall salinity, nutrient, and sediment levels are not likely, an assessment of changes in freshwater inflows to bays and estuaries will be necessary for permitting." This is a generalization that unfairly trivializes the complex issues surrounding flows and their significance to bay and estuary ecology. It suggests that inflow issues are significant only in the context of "overall salinity, nutrient, and sediment levels" in the entire bay system. The concept of salinity gradients within an estuary system is a fundamental aspect of estuarine ecology and is expressly recognized in the Texas Surface Water Quality Standards. See 30 TAC § 307.4 (g)(3). The quoted statement simply ignores that concept and the value of low salinity areas near river mouths as refugia for salinity-sensitive species during dry conditions. It also suggests that the two project studies regarding freshwater inflows are pointless exercises. It does not reflect an objective consideration of the potential impacts of the project and should be deleted.

Response: Referenced sentence has been modified to read as follows: "An assessment of changes in freshwater inflows to bays and estuaries will be necessary for permitting."

(Page 4C.9-1) Section 4C.9 LCRA-SAWS Water Project (LSWP)

[72] The initial statement in this section is confusing. It states that the Lower Colorado River Authority (LCRA) has reserved approximately 330,000 acft/yr of water rights in three lower basin counties for development of projects. We are not aware of any such reservation. The 330,000 acft/yr figure is the amount generally used in describing the combined target to be achieved through a combination of agricultural conservation, increased groundwater production, and surface water diversions for the LSWP.

Response: The initial statement has been revised to read as follows: "The Lower Colorado River Authority – San Antonio Water System (LCRA-SAWS) Water Project (LSWP) involves the conservation and development of approximately 330,000 acft/yr in the Lower Colorado River Basin Counties of Matagorda, Wharton, and Colorado."

[73] No quantitative analysis of impacts on environmental water needs is provided. That analysis is required pursuant to Section 357.7 (a)(8)(A)(ii) of the Board's rules. Instead of including any analysis, the discussion states that a Project Viability Analysis (PVA) for the Project "concluded that diversion of previously existing surface water from the Lower Colorado River Basin would not significantly alter the existing freshwater inflow regime of Matagorda Bay…." IPP at p.

4C.9-10. First, that statement references only diversions of "previously existing surface water," which we assume is intended to refer to existing surface water rights, and so apparently doesn't consider proposed new diversions. Second, the PVA was intended only to identify obvious fatal flaws to the project and was not intended to, nor was it adequate to, characterize the extent of potential impacts. In fact, in its conclusion section regarding Matagorda Bay, the PVA states: "The preliminary analysis indicates that increased flows to the Bay will not prevent delivery of water for the LSWP. Additional studies are necessary to further characterize the relationship between freshwater inflows and bay health and productivity." PVA at page 10-3. The PVA does not support the characterization included in the IPP about the absence of significance adverse impacts as a result of the alteration of inflows that may result from this project.

The potential for impacts to freshwater inflows is acknowledged in the Summary Sheets under the "Impacts on Water Resources" hearing and, at minimum, should be acknowledged in the discussion.

Response: The following quote from the LSWP 2005 Project Viability Assessment has been added to Section 4C.9.3:

> ***The results of the environmental studies (water quality, river habitat, and bay health) have not revealed any "show stoppers" for the LSWP although the studies are in their early stages. It is expected that the ongoing studies will identify methods for designing and operating the Project to meet environmental needs as determined by legislative requirements, agency guidance, and/or permit conditions.***

[74] Bastrop to Hays County Summary Sheet: This aspect of the project is no longer discussed in the PVA for the LCRA-SAWS Project. Our understanding is that the strategy, if pursued, would be separate from the LCRA-SAWS Project.

Response: Noted.

[75] Page 4C.9-11: The discussion appears to be somewhat internally inconsistent. In attempting to support the conclusion that freshwater inflows would not be significantly altered, the IPP states: "Unappropriated water and existing irrigation rights that have been historically unused (about 200,000 acft/yr) are run-of-river rights that are not available except during periods of high flow when diversion rates are small compared with total streamflow." IPP at p. 4C.9-10 (emphasis added). However, in discussing project operation of the intakes for off-channel storage and for the pipeline diversion, the IPP states: "The diversion facilities for the off-channel reservoirs would allow average flows to pass to the transmission intake and [sic] while withdrawing excess flows for storage." IPP at p. 4C.9-113[1]. Average flows cannot both be unavailable to the project and be diverted for the project at the pipeline intake.

Response: The referenced sentence on IPP page 4C.9-10 has been deleted. The referenced sentence on IPP page 4C.9-11 has been corrected by removal of the word "and." The

[1] The project often is characterized by project proponents as an excess flows or flood flows project. Such a project likely could be operated to avoid major impacts to the Matagorda Bay system. However, particularly because of cost impacts, it is not clear that the project would be operated solely in that way.

following sentence has been added to the second paragraph of Section 4C.9.4: "Additional information regarding operations of facilities may be found in the PVA."

[76] (Page 4C.9-13). There does not appear to be an entry for annual costs for agricultural conservation in Table 4C.9-2. At least some of the conservation measures, such as canal improvements, likely would require ongoing maintenance.

Response: A line item for annual operations and maintenance associated with agricultural conservation has been added to the cost estimate.

[77] Summary Sheet: Depending on impacts to freshwater inflows, there could be third-party impacts to businesses related to commercial and recreational fishing and tourism in the Matagorda Bay system.

Response: The summary sheet states that there would be reductions in freshwater inflows to Matagorda Bay associated with greater utilization of existing water rights and new appropriation, and further states that, "Potential effects of these reductions are being studied by LCRA & SAWS."

(Page 4C.11-1) Section 4C.11 Surface Water Rights

[78] Generally, we support the development of existing water rights as opposed to new water supply projects. However, the impacts of the use of existing rights can vary dramatically depending on the size and location of the underlying right and on whether the right has been used historically. For example, the transfer, by sale or lease, of an existing right that has historically been fully used for irrigation to another user for downstream diversion and municipal use likely would have positive environmental impacts. On the other hand, a transfer of a historically unused right to an upstream location in a river segment that is fully appropriated could have significant adverse impacts. We do not believe that such a broad array of potential transfers can properly be grouped and evaluated.

Response: Noted.

[79] While we understand the desire of the planning group to ensure that the failure to include projects in the regional plan does not create an inappropriate obstacle for minor sales or leases of water rights, we believe the proposed scope of this "project" is much too broad. There are no limits on the size of a transfer. There are no limits on locations. Even sales that would constitute an interbasin transfer could be argued as fitting with this description. As a result of the unduly broad categorization, it simply is not possible meaningfully to perform the assessments required by TWDB rules for this "water management strategy."

Response: Noted.

[80] The discussion of environmental impacts apparently seeks to avoid this problem by noting the extent of TCEQ review of water rights permit amendments. However, the scope of that review, which is currently under litigation, is not a reflection of the potential for actual adverse

impacts. Nor is the scope of review required by TWDB rules coequal with the scope of TCEQ review. The purpose of review in planning is to ensure an informed decision, regardless of legal constraints on TCEQ review.

Response: Noted.

[81] Similar problems exist in attempting to assess the potential for third-party impacts, impacts on agricultural resources, and impacts on water quality. We urge the planning group to narrow the scope of potential sales or leases covered by this strategy so that a quantitative evaluation can be performed in compliance with TWDB requirements and so that the potential for unanticipated consequences is minimized.

Response: The planning group has characterized and specified the strategy to the extent possible.

(Page 4C.12-1) Section 4C.12 Local Groundwater Supplies
This section deals with a collection of different groundwater strategies involving different aquifers and vastly different project sizes.

[82] (Page 4C.12-8). Section 4C.12.3 Trinity Aquifer. Although up to 15,000 acre-feet/yr of withdrawals are noted, there is no substantive information about the potential impacts of those withdrawals on existing users, agricultural interests, springs, or on aquifer levels. Given the potential size of the withdrawals, more information is needed.

Response: Planned withdrawals from the Trinity Aquifer in Bexar County are in conformance with the Groundwater Management Plan of the Trinity – Glen Rose Groundwater Conservation District. Additional information is not available to the planning group at this time.

[83] (Page 4C.12-8). Section 4C.12.4 Barton Springs Edwards Aquifer. Various endangered species are associated with pumping from this Aquifer. Although the total proposed pumping is small, some information is needed about consistency with groundwater district rules and about location of pumping and potential impact on aquifer levels and springflows.

Response: The SCTRWPG is of the opinion that rights to pump 150 to 200 acft/yr from the Barton Springs Edwards Aquifer can be obtained under the rules of the Barton Springs / Edwards Aquifer Conservation District.

[84] (Page 4C.12-9). 4C.12.6 Environmental Issues. Most of this discussion is not linked to any particular project. Generally, it simply is not sufficient to allow informed decisions about the potential impacts of the proposed pumping.

Response: This discussion of environmental issues pertains to local use (small sized public suppliers and individual households and business establishments) of groundwater from the region's aquifers. It is intended to indicate the nature of the trends of the water levels of the aquifers, and since the Local Groundwater Strategy is widespread through out the

region, involving literally thousands of wells, a more specific project type of analysis is simply not possible.

(Page 4C.13-1) Section 4C.13 Simsboro Aquifer

[85] Because SAWS has decided not to pursue this project it should be removed from the regional plan. If not removed, the discussion should be expanded to address issues about consistency with applicable groundwater district management plans.

Response: The strategy has been removed from the plan (See response to comment Number 39).

(Page 4C.14-1) Section 4C.14 Regional Carrizo-Wilcox Aquifer for Bexar County Supply

[86] As the planning group is very aware, this is a highly controversial strategy. That controversy should be acknowledged along with a summary of the issues raised and the region's response to those issues. We recognize that the comment process provides an opportunity to acknowledge those concerns and respond to the issues. However, given the level of participation throughout the planning process, particularly by folks from Wilson County, discussion of those issues within the project-specific portions of the document would be appropriate.

Response: The issue was discussed at length during facilitated workshops, the results of which are expressed and explained in the regional plan.

[87] (Page 4C.14-14). The analysis of overall groundwater level declines and potential impacts of these on surface water flows is very helpful. However, it is difficult to appreciate the significance of the predicted flow impacts without information about key flow levels of the affected surface streams. In particular, flow data for those streams during low flow periods should be provided so that the significance of the impacts can be considered.

Response: The referenced changes in flux from the aquifer to the streams may be considered in the context of streamflow frequency curves presented in Section 7.

[88] (Page 4C.14-15). Environmental Impacts. This section is written more as an evaluation of potential impediments to permitting and required approvals than as an evaluation of the actual environmental impacts of the project. For example, no discussion of potential impacts to springs or the environmental implications of reduced contributions to flow in surface streams is provided.

Response: The effects upon surface flows are presented and discussed in the preceding section (Section 4C.14-2) and are not repeated in Section 4C.14-3, Environmental Issues.

[89] (Page 4C.14-25). Additional information should be provided regarding the extent to which the project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. As we understand the initially prepared plan, the project would not be pursued to the extent of exceeding availability under the Gonzales County UWCD management plan. However, the extent of the reduction in supply is not discussed. That information is needed for a reasonable understanding of the project's yield and unit cost.

Response: This issue has been discussed at length in facilitated workshops, and has been addressed as described in Section 10.

[90] (Page 4C.14-27). Mitigation reserves for possible impacts to local wells are estimated at $12 million. We commend the consideration of economic mitigation for impacts to existing wells. It would be useful to have a brief summary of the methodology used to determine this estimate. Information about the assumptions used in preparing the mitigation estimate also would be useful in providing an understanding of the predicted impacts on rural areas and agricultural users if mitigation turns out not to be available.

Response: The value included in the Cost Estimate is listed as "Mitigation Reserve" and is an estimate based upon experience in a neighboring area where such mitigation has been in practice over the past several years.

(Page 4C.15-1) Section 4C.15 Regional Carrizo for SSLGC Project Expansion

[91] Summary Sheet. Additional information should be provided regarding the extent to which the project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. As we understand the initially prepared plan, the project would not be pursued to the extent of exceeding availability under the Gonzales County UWCD management plan. However, the extent of the reduction in supply is not discussed. That information is needed for a reasonable understanding of the project's yield and unit cost.

Response: See response to comment Number 89.

[92] (Page 4C15-2). According to our understanding of projected demands listed in Chapter 4, the amounts to be supplied this project are Shertz, 5,621 ac-ft; Selma, 700 ac-ft; Green Valley, 500 ac-ft; Crystal Clear, 900 ac-ft; and Garden Ridge, 644 ac-ft. The sum of these projected uses is 8,365 ac-ft. However, the project is described as providing 12,800 ac-ft/yr. Where is the rest of the additional water to be used?

Response: Seguin; the Schertz partner.

[93] (Page 4C15-6). The use of the USFWS National Wetlands Inventory as a starting point to identify potentially affected wetlands is appreciated. Indeed, we believe it would be a good resource for use in all project evaluations

Response: Noted.

[94] (Page 4C15-11). Mitigation reserves for possible impacts to local wells are estimated at $2,734,000. We commend the consideration of economic mitigation for impacts to existing wells. It would be useful to have a brief summary of the methodology used to determine this estimate. Information about the assumptions used in preparing the mitigation estimate also would be useful in providing an understanding of the predicted impacts on rural areas and agricultural users if mitigation turns out not to be available.

Response: See response to comment Number 90.

(Page 4C.16-1) Section 4C.16 Wells Ranch Project

[95] As noted in the text, this project has not yet been adequately evaluated. Accordingly, it should not be included in the plan. If evaluations are completed and the project is proposed for inclusion in the plan, reasonable opportunities for public review and comment on the project should be provided. Without the completed evaluation, it is not possible to comment meaningful on the project.

Response: The project was evaluated, a public hearing was held, and the SCTRWPG approved an amendment to include the project in the 2001 plan and approved the inclusion of the project in the 2006 plan.

(Page 4C.17-1) Section 4C.17 Hays/Caldwell Carrizo Project

[96] (Page 4C.17-1) The quantity of water developed by this project is 15,000 ac-ft/yr, scheduled to come on-line in 2030. However, according to the Water Supply Plans in Chapter 4 of this plan, the total demands on this WMS by the listed participants in 2030 is 0 ac-ft. The projected demands do not reach 15,000 ac-ft until 2060. It is unclear why this strategy needs to be implemented in 2030.

Response: Supplies from this strategy are recommended to meet needs in 2040, hence it is assumed that the project will become operational between 2030 and 2040, as indicated on the Summary Sheet.

[97] (Page 4C.17-10) Mitigation reserves for possible impacts to local wells are estimated at $3.2 million. We commend the consideration of economic mitigation for impacts to existing wells. It would be useful to have a brief summary of the methodology used to determine this estimate. Information about the assumptions used in preparing the mitigation estimate also would be useful in providing an understanding of the predicted impacts on rural areas and agricultural users if mitigation turns out not to be available.

Response: See responses to comments Numbers 90 and 94.

[98] (Page 4C.17-11) Additional information should be provided regarding the extent to which the project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. As we understand the initially prepared plan, the project would not be pursued to the extent of exceeding availability under the Gonzales County UWCD management plan. However, the extent of the reduction in supply is not discussed. That information is needed for a reasonable understanding of the project’s yield and unit cost.

Response: See responses to comments Numbers 89 and 91.

(Page 4C.18-1) Section 4C.18 Cumulative Effects of Carrizo Aquifer Development Strategies

[99] We commend the planning group for undertaking this review.

Response: Noted.

[100] The SCTRWPG uses the South Central Carrizo system model (SCCS) to evaluate the impacts of water management strategies in the Carrizo. Although the use of this model, rather the TWDB GAM, has been approved by TWDB, TWDB has expressed some concern. A discussion about the selection of the SCCS model over the GAM would be beneficial.

Response: During its meeting of April 7, 2005, the SCTRWPG chose to proceed with use of only the SCCS model in the assessment of cumulative effects because the SCCS model was developed specifically for simulation of potential groundwater development projects in the Carrizo Aquifer in Gonzales and Wilson Counties and shows substantially better calibration to historical water levels in wells within the model area (particularly those near the outcrop) than does the GAM. In accordance with TWDB rules and guidance for regional water planning, the SCTRWPG solicited approval from the TWDB for use of the SCCS model as an alternative or supplement to the GAM. TWDB staff performed independent applications of each model, evaluated and compared results, presented their comparison to the SCTRWPG, and approved use of either model for regional water planning purposes by letter of September 7, 2005. The regional planning group takes exception to the statement that, "TWDB has expressed some concern."

[101] (Page 4C.18-1). We support the decision of the planning group to model projected pumping based on projected needs.

Response: Noted.

[102] (Page 4C.18-5) We appreciate the discussion of changes in streamflow associated with this pumping. While it is understood that these results represent changes over the entire length of the stream channel, a graphic showing the location of each modeled stream segment would be helpful.

Response: Noted.

[103] Particularly for smaller streams, some information about flow magnitudes would be helpful in interpreting the potential significance of the predicted impacts. The numbers presented in Table 4C.18-1 are more meaningful when they are compared to the flow conditions of the rivers during the drought of record and other low-flow periods. For example, during 1954, a reduction of 11.7 cfs in the San Antonio River would have resulted in a 40% reduction in low-flow discharge at the Falls City gage and a reduction of 8.5 cfs in the San Marcos River would have resulted in a 13% reduction (15% in 1984) in low-flow discharge at the Luling gage. For 1984, a 4.9 cfs reduction in the Guadalupe River would have resulted in a 10% reduction in low-flow discharge at the Cuero gage. Low-flow discharge, as used in this example, is the lowest 7-day moving average during the year.

Response: The referenced changes in flux from the aquifer to the streams may be considered in the context of streamflow frequency curves presented in Section 7.

(Page 4C.19-1) Section 4C.19 Cumulative Effects of Gulf Coast Aquifer Development Strategies
[104] We commend the planning group for undertaking this review.

Response: Noted.

[105] (Page 4C.19-8) It is impossible to know when the next drought of record will occur. As a result multiple portrayals are needed to assess the potential effects of pumping during such a drought period, unless the effects of the drought will be the same regardless of when it is assumed to occur. For this project, it does not seem plausible to assume that the effects would be the same regardless of when drought conditions occurred. Pumping is predicted to result in increasing groundwater declines over time. When assessing the transient effects of water level declines associated with temporary drought conditions, the assumed period when those maximum pumping levels occur is critical in predicting the extent of the water level declines.

Response: The simulations are intended to include approximations of "worst case conditions," as opposed to predictions of when such conditions will occur.

[106] (Page 4C.19-45) The analysis of overall groundwater level declines and potential impacts of these on surface water flows is very helpful. However, it is difficult to appreciate the significance of the predicted flow impacts without information about key flow levels of the affected surface streams. In particular, flow data for those streams during low flow periods should be provided so that the significance of the impacts can be considered.

Response: See response to comment Numbers 87 and 103.

(Page 4C.20-1) Section 4C.20 Edwards Aquifer Recharge
[107] (Page 4C.20-5) Table 4C.20-1 provides useful information about potential impacts. However, the potential significance of the indicated changes in estuary inflow could be better appreciated if information where provided in the table about the magnitude of the overall inflows being affected. We do acknowledge that some limited information about percentage reductions is provided on page 4C.20-7. Is information about drought inflow impacts to the Nueces Estuary available? We also would appreciate seeing information about the amount of reduction during the year with lowest projected inflow.

Response: Effects of Edwards Aquifer recharge enhancement projects (with the possible exception of the Indian Creek Project planned at year 2060) on Nueces Estuary inflow during the driest years are essentially non-existent. In the driest of years, these projects contribute almost no recharge enhancement to the Edwards Aquifer because of limited (if any) inflow. Note also that more that 75 percent of any flows passing the downstream edge of the Edwards outcrop are lost in natural transit to the Nueces Estuary.

[108] (Page 4C.20-5) At the top of this page it is noted "…in which case impacts were not mitigated by releases, but were assumed to be mitigated by remuneration and/or development of additional water supply for the Corpus Christi service area." Some information about the calculation of the assumed mitigation costs, as presented in Table 4C.20-9, would be helpful. In

particular, some explanation is needed regarding if, or how, impacts to freshwater inflows are included in the mitigation calculation.

Response: Actual mitigation costs would be subject to negotiations with the owners of the CCR/LCC System and others. Mitigation costs have been estimated based on replacement cost for reductions to the firm yield of the CCR/LCC System and an "interruptible" water cost (about five percent of that for firm water) for reductions in freshwater inflow to the Nueces Estuary.

[109] (Page 4C.20-7). It would be beneficial to have some explanation of how increased recharge was calculated in order to better understand how adjustments were made to account for the loss of naturally occurring (or baseline) Edwards recharge that otherwise would have been expected downstream of the recharge dam.

Response: Detailed presentations of methods used for the calculation of enhanced recharge are included in the documents referenced on page 4C.20-1.

[110] (Page 4C.20-9). Table 4C.20-4 is difficult to interpret. Additional explanation of the footnote is needed. In addition, it would be helpful to have more explanation of how the Sustained Pumpage Increase and Increase in Springflow columns relate to average versus drought conditions.

Response: The Sustained Yield Pumpage Increase is, by definition, a fixed annual amount available under both average and drought conditions. For additional information, refer to Appendix C in Volume II. Section 7 provides information regarding the effects regional plan implementation on Edwards springflow.

[111] (Page 4C.20-14). The Environmental Issues section should address the issue impacts on estuary inflows.

Response: Section 7 provides information regarding the effects regional plan implementation on estuarine inflow.

[112] (Page 4C.20-16). The last sentence on the page, which carries over to the next page notes,"[E]ffects on downstream aquatic communities will be mediated through the extent to which perennial aquatic habitats (pools and flowing reaches) persist in the stream reaches immediately below the recharge zone." Without information about the prevalence of pools or the likelihood of the persistence of pools or flowing reaches, this statement is not particularly meaningful.

Response: Noted.

(Page 4C.21-1) Section 4C.21.1 Brackish Groundwater Desalination-Wilcox Aquifer

[113] (Page 4C.21-4). A diagram of the geologic cross section associated with this project would be helpful to show the thickness of the aquifer and its relationship to other freshwater and brackish aquifers in the area. The discussion assumes that pumpage from the Wilcox will not

have any effect on other aquifers. The text states the area is not overlain by the Carrizo Aquifer. However, Figure 4C.21.1-3 appears to show the area of predicted drawdowns extended into the area overlain by the Carrizo Aquifer. That would seem to suggest that supplies in the Carrizo could be affected. At any rate, some discussion of that issue would be appropriate.

Response: Wilcox Aquifer pumpage associated with this strategy is included in the groundwater simulations of cumulative effects of regional plan implementation presented in Section 7. Studies from which more detailed information could be obtained have not been done, but the regional planning group has been informed by SAWS that such studies will be initiated in early 2006.

[114] (Page 4C.21-10) The disposal of concentrate is a central issue to desalination projects. Some discussion of issues regarding the depth, location, and other characteristics of the proposed disposal is needed in this discussion.

Response: Technical evaluation of this water management strategy for planning purposes is necessarily conceptual. It is believed that sufficient costs have been included to provide for deep well injection of concentrate.

(Page 4C.21-14 Section 4C.21.2 Brackish Groundwater Desalination-Gulf Coast

[115] (Page 4C.21-14). Now that SAWS has decided to drop the Lower Guadalupe Water Supply Project (LGWSP), it seems unlikely that this project has independent viability. Accordingly, it should not be retained in the plan. If some new version of the project is developed that might be viable without the participation of SAWS, that new version of the project should be considered for inclusion at that time on its own merits.

Response: Brackish Groundwater Desalination-Gulf Coast Aquifer has been removed from the plan.

[116] (Page 4C.21-16): The discussion of impacts of desalination concentrate is overly simplified. The greatest potential for adverse impacts would be expected during dry conditions. Accordingly, the discussion should address that situation rather than just noting impacts during average conditions. In addition, the potential for impacts may well depend on the location of the proposed outfall because salinity conditions in the Bay are not uniform. In addition, the potential for imbalances in ion concentrations in the concentrate discharge versus the receiving water should be acknowledged and considered regarding potential adverse impacts.

Response: Noted, but will not be modified in the plan. See response to comment Number 115.

(Page 4C.22-1) Section 4C.22 Seawater Desalination

[117] Seawater desalinization certainly is worthy of consideration as a potential water supply strategy for the state of Texas. However, there are many environmental and energy implications that need to be carefully considered. The sensitivity of this option to issues of the cost and availability of large quantities of electrical power, although acknowledged, is not discussed in any detail. That is a very significant issue for a large-scale desalination plant, particularly given

recent trends in fossil fuel prices. In addition, the complications of constructing a concentrate disposal pipeline are not adequately discussed. The issue is acknowledged at page 4C.22-9, but without any elaboration on potential environmental impacts, especially in regard to routing the concentrate pipeline through Matagorda Island State Park and Wildlife Management Area.

Response: Noted. The issues listed, among many others, are extremely important, but could not be more comprehensively addressed within the scope and budgets for regional planning. The TWDB is conducting special investigations and funding pilot desalination projects.

[118] (Page 4C.22-9) The discussion includes the following sentence: "Bay volumes, inflows, and tidal exchanges with the Gulf of Mexico are so large relative to this alternative that substantial impacts to overall salinity gradients, or to the delivery of nutrients and sediment are not realistic." Without careful consideration of circulation patterns in the bay, this statement seems to be an over-generalization, particularly during periods of low inflows.

Response: Noted, however, the statement speaks for itself.

(Page 4C.23-1) Section 4C.23 Inter-Regional Seawater Desalination

[119] Seawater desalinization certainly is worthy of consideration as a potential water supply strategy for the state of Texas. However, there are many environmental and energy implications that need to be carefully considered. The sensitivity of this option to issues of the cost and availability of large quantities of electrical power, although acknowledged, is not discussed in any detail. That is a very significant issue for a large-scale desalination plant, particularly given recent trends in fossil fuel prices. In addition, the complications of constructing a concentrate disposal pipeline are not adequately discussed.

Response: See response to comment Number 117.

[120] The absence of any discussion regarding potential impacts on instream flows in the Nueces River downstream of Choke Canyon Reservoir and on freshwater inflows to the Nueces Estuary is a serious shortcoming. Without that information, the required quantitative evaluation of impacts on environmental flows is lacking.

Response: The environmental issues discussion pertains to the terrestrial environment of the facilities to move water from Choke Canyon Reservoir to the South Central Texas Region and the desalination plant and facilities located in south Corpus Christi to supply water to replace that from Choke Canyon Reservoir. It is implicitly assumed and seems to go without saying, that such an exchange involving Choke Canyon Reservoir and the Lake Corpus Christi System would appropriately consider and be operated under existing freshwater inflow requirements, as contained in the permits for the CCR/LCC System.

(Page 4C.24-1) Section 4C.24 CRWA Dunlap

[121] This project has not yet been adequately evaluated. Accordingly, it should not be included in the plan. If evaluations are completed and the project is proposed for inclusion in the plan,

reasonable opportunities for public review and comment on the project should be provided. Without the completed evaluation, it is not possible to comment meaningful on the project.

Response: The project was evaluated, a public hearing was held, and the SCTRWPG approved an amendment to include the project in the 2001 plan and approved the inclusion of the project in the 2006 plan.

(Page 4C.25-1) Section 4C.25 CRWA Siesta
[122] This project has not yet been adequately evaluated. Accordingly, it should not be included in the plan. If evaluations are completed and the project is proposed for inclusion in the plan, reasonable opportunities for public review and comment on the project should be provided. Without the completed evaluation, it is not possible to comment meaningful on the project.

Response: The project was evaluated, a public hearing was held, and the SCTRWPG approved an amendment to include the project in the 2001 plan and approved the inclusion of the project in the 2006 plan.

(Page 4C.27-1) Section 4C.27 Lockhart Reservoir
[123] The inclusion of the Lockhart Reservoir in the Plan, even as a future option, is troubling particularly because it appears to be more of an economic development project than a water supply project. Page 4B.1-26 notes, "The reservoir is considered by local public officials to be an important economic development project to create growth opportunities for the area."

Response: Noted.

[124] (Page 4C.27-3) Table 4C.27-1 probably should be titled "Monthly Naturalized Streamflow Statistics" rather than Daily Naturalized Streamflows

Response: The table title is correct. Values shown are daily median and 25th percentile flows for the months listed.

[125] (Page 4C.27-7) This discussion notes that "flows at the Saltwater Barrier are relatively unaffected by the project, with an expected reduction in the mean annual flow of about 2 percent." Again, a simple evaluation of average conditions can fail to identify significant impacts. Different statistics present different results. For example, at page 4C.27-3, the discussion states that "[m]onthly median streamflows at the Saltwater Barrier would be reduced about 1 percent." The potential effects may not be great, but it would be better at least to include some information about potential drought period impacts. Particularly given the potential for cumulative impacts from a variety of water development projects, careful consideration is appropriate.

Response: Figure 4C.27-3 includes a comparison of streamflow frequency with and without Lockhart Reservoir based on the entire simulation period, including drought periods. Cumulative effects of water management strategies recommended for

implementation in the regional plan are presented in Section 7. Lockhart Reservoir has only been recommended by the SCTRWPG for further study, not implementation.

(Page 4C. 28-1) Section 4C.28 Brush Management
[126] Land stewardship is a broader term that includes brush management as one of its components. Land stewardship is a concept that has been strongly championed by the Texas Wildlife Association. We encourage the group to examine that broader concept as a strategy worthy of consideration.

Water savings from "brush management" could be greatly enhanced if the strategy also involved proper riparian habitat management. Improving range conditions by clearing brush and planting grasses 'capture' some of the water that now runs off because of sparse vegetative cover. This 'captured' water is more likely to recharge the water table and increase the amount of water that is released to baseflow. The full benefits of this 'captured' water are lost, however, if the baseflow discharges to a scoured river channel. Properly managed riparian zones can greatly increase the storage potential of water saved from brush management. This increased storage potential results in increased baseflows and higher water tables that supply needs during times of drought. Increased baseflows also decrease the need for water from other sources to meet drought demands.

Response: Noted. Language has been added on page 4C.28-2 which further explains brush management and its relationship to voluntary land stewardship.

[127] (Page 4C.28-24) It is unclear in the discussion about Engineering and Cost of Brush Control if the uniform annual cost incorporates the on-going management practices necessary for successful brush management.

Response: In the discussion, both initial and periodic costs are mentioned. The periodic costs are the "on-going management costs necessary to maintain the strategy. Thus, the uniform annual cost, as presented, incorporates the on-going management practices costs. The uniform annual cost for a 30 year brush management project includes an initial cost, year 4 cost, and recurring cost each 7 years for maintaining brush management program (see Table 4C.28-17). The text has been edited to explain these costs.

(Page 4C.29-1) Section 4C.29 Weather Modification
[128] (Page 4C.29-15) In the discussion of Baseline + Weather Modification Conditions, it is noted in the last paragraph of page 15 that a 6.5% increase in precipitation was assumed for all days (April-September) when daily precipitation was between 0 and 3 inches. This does not appear to be a valid assumption. Assuming a 6.5% increase for all days when daily precipitation was between 0 and 3 inches assumes that every seeding attempt was successful and every possible precipitation event was available for seeding. It is not clear from the discussion if the SE/PREC ratio discussed previously was incorporated into this calculation.

Response: Earlier in the paragraph mentioned, the rate for the Nueces Basin analysis was stated at 5%. The 6.5% mentioned in the comment is the rate used for the Blanco Basin. These coefficients were selected on May 27, 2005 at a meeting of the Region L Staff

workgroup after review of the information obtained from the EAA, STWA, and SWTREA weather modification programs. The 6.5% is the SE/PREC ratio for the Blanco Basin area of analysis.

[129] (Page 4C.29-16) It is not clear from the discussion of Recharge Enhancements that the increased precipitation values for the Nueces and the Blanco during the drought of record were adjusted to reflect only those precipitation events that could have been seeded/enhanced. There would certainly have been fewer opportunities for successful cloud seeding during the drought. It is not appropriate to calculate increased precipitation due to modification by simply adjusting annual precipitation data. In addition, there is a considerable margin of error associated with assigning precipitation gage data to large areas. This needs to be incorporated into the discussion and assumptions.

Response: Increased precipitation associated with weather modification was only applied to days with noticeable precipitation (greater than 0 and less than 2.5 inches (Nueces Basin) or 3 inches (Blanco Basin)), as described on page 4C.29-15.

[130] (Page 4C.29-20) Weather modification may result in increased recharge to the Edwards, but the amounts of increased available water for pumpage due to these increases must be carefully evaluated. As the Edwards is a very porous aquifer, the recharged water may not remain in the aquifer long enough to allow for increases in pumpage. In addition, pumpage demands may not coincide with the increased yields reportedly available from enhanced recharge.

Response: The analyses present estimates of increase in sustained yield of the Edwards Aquifer that is estimated to result from increase recharge to the aquifer through the effects weather modification. The regional water planning effort is at a reconnaissance level. Additional studies regarding the relationship of pumping schedules to yield increases is beyond the scope of these planning activities and may be considered during future project-specific studies or water planning efforts.

[131] (Page 4C.29-20) The discussion on environmental effects assumes that increases in rainfall in seeded areas do not result in decreases in rainfall elsewhere. Some documentation and discussion of this assumption would be appropriate.

Response: In the information available to the planning group, there has been no mention of the effects mentioned in this comment.

(Page 4C.30-1) Section 4C.30 Rainwater Harvesting

[132] Rainwater harvesting as a water supply option is becoming increasingly popular throughout the Texas, especially in areas where reliable groundwater sources are not available. We commend the RWPG for evaluating Rainwater Harvesting as a strategy.

Due to its popularity in the area, there is much local experience regarding this strategy. One of the members of the planning group is a regionally recognized expert on the topic. In February of this year, the Sierra Club made a Rainwater Harvesting presentation to the RWPG that included new information available in TWDB's revised Texas Manual on Rainwater Harvesting. We urge the planning group to consider updating this discussion, which appears, with the exception of cost estimates, not to have been updated since 2001.

Response: The information in the plan is up to date.

(Page 5-1). Section 5. Impacts of Water Management Strategies on Key Parameters of Water Quality and Moving Water from Rural and Agricultural Areas

[133] As part of our active participation in the regional water planning process, Myron Hess raised the issue at a planning group meeting of including an assessment of impacts to salinity gradients in estuaries. Maintenance of acceptable salinity gradients is addressed by Section 307.4 (g)(3) of the Texas Surface Water Quality Standards. Mr. Hess had understood from that meeting that the consultant had agreed to include such an assessment as part of the review of impacts on water quality. Unfortunately, no information or discussion of that issue appears in the plan.

At least for those strategies which are recognized as having the potential for water quality impacts, some discussion is needed about the water bodies and areas expected to experience those impacts. Also, significant water quality impacts may be hidden in the "baseline" assumptions. The discussion here indicates that "baseline" is the same as that assumed in Section 7, which means that full use of existing water rights is assumed as the "baseline" condition. In reality, that is much different than the actual current condition that is being experienced. For example, conditions in Canyon Lake likely would be much different under "baseline" conditions than they are today because of changed water levels in the reservoir. Similarly, flows in some portions of the Guadalupe River would be significantly different than they are currently if full use of water rights were assumed. Those changed flows would be expected to result in different water quality conditions. Section 357.7 (a)(12) of the Board's rules specifically calls for "comparing conditions with the recommended water management strategies to current conditions using best available data." Further examination and analysis is needed to provide the required consideration of water quality impacts.

In addition, the discussion of the LGWSP suggests that impacts on water quality resulting from changed flows downstream of the proposed diversion point may not have been considered. Such reduced flows likely would have the potential to affect dissolved oxygen levels downstream of the diversion. That potential should be considered.

Response: The SCTRWPG consultant agreed to consider potential effects of recommended water management strategies on estuarine salinity gradients to the extent that the regional water planning budget would allow. Analyses of estuarine salinity gradients are data intensive, involve application of complex models, necessitate substantial commitment of staff resources, and, once completed, interpretation of results with respect to maintenance of a healthy estuarine system is considered by some to be highly subjective. While it recognizes the importance of estuarine salinity gradients, the SCTRWPG has chosen to allocate its limited funding to other matters. By way of a cursory assessment, Seawater Desalination and the LSWP are the only planned water management strategies that could be perceived to have significant negative impacts on salinity gradients relative to the

baseline conditions selected by the SCTRWPG. With regard to baseline conditions, see response to comment Number 69.

Finally, with regard to dissolved oxygen levels downstream of diversions for the LGWSP, water quality modeling performed as part of the Trans-Texas Water Program indicates full recovery from the dissolved oxygen sag associated with effluent loadings downstream of Victoria at the San Antonio River confluence. As there are no additional effluent loadings below the San Antonio River confluence and above the LGWSP point of diversion, no significant impacts on dissolved oxygen levels are expected as a result of the LGWSP for GBRA Needs.

(Page 5-7) Discussion Related to Rural and Agricultural Areas
[134] The areas around San Antonio Bay and Matagorda Bay are rural areas. Many businesses in those areas rely on natural resources supported by environmental flows. Examples include commercial fisherman, seafood wholesalers, fishing and birding guides, restaurants, hotels, and retailers. Those businesses could be harmed if reduced inflows adversely affect the natural resources that directly or indirectly support their operations. Those potential impacts should be acknowledged.

Response: Studies are ongoing with regard to the sensitivity of commercial, recreational, and other species of interest to freshwater inflows entering San Antonio and Matagorda Bay. See response to comment Number 16.

[135] (Page 5-7 through 5-8) Costs are discussed for increased pumping costs that would be associated with drops in water levels. Lowered levels also might result in significant expenses associated with the need to deepen existing wells.

Response: Within the context of the discussion referenced, in which operating wells have been established, it is not expected that it would be necessary to deepen wells. However, the point is well taken, and has been included in the text.

(Page 7-1) Section 7 Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources
[136] TWDB may not approve a regional plan unless it is able to make an affirmative finding that the regional plan is consistent with long-term protection of the state's water resources, agricultural resources, and natural resources. See Texas Water Code Section 16.053 (h)(7)(C). We believe the initially prepared plan contains a good start towards analyzing the issue of consistency with long-term protection of natural resources. As we have previously noted, we do think that some improvements are needed in that analysis and we acknowledge the commitment of the planning group and its consultants to work with the National Wildlife Federation in incorporating additional analyses into the plan. We believe those additional analyses also would help demonstrate compliance with 31 TAC §§ 357.5(l) and 357.7(a)(1)(L), TWDB rules that direct planning groups to "consider environmental water needs including instream flows and bay and estuary inflows" and to identify threats to natural resources due to water quantity problems. In addition, this information also will assist in ensuring compliance with 31 TAC § 357.7 (a)(8)(A)(ii) by providing addition information for the required quantitative reporting of environmental factors, including effects on environmental water needs.

We have two primary concerns with the existing analyses in the initially prepared plan. Those analyses do provide information about flow changes, but only by looking at changes from some future condition. First, we believe it is essential to evaluate changes from current conditions or some other identifiable baseline. If is difficult to appreciate the significance of a change from one potential future condition to some other potential future condition because none of us have experienced either. Second, we believe the future conditions should be assessed against some established biological criteria.

An additional complication that arises with respect to the analysis of overall impacts is the inclusion in the plan of projects supplying far more water than the region is projected to need. This complicates the potential to present an accurate view of likely impacts. The inclusion of some additional projects, which involve the movement of water supplies into the area from other areas of the state, may serve to increase return flows that would partially offset the impacts of downstream diversion projects. However, if only some of the projects actually are needed, including all of them in the analysis may paint an unduly rosy picture. Conversely, including other projects that are not likely to be built may result in an over-prediction of adverse impacts in another area.

In October of 2004, the National Wildlife Federation released a report called Bays in Peril: A Forecast for Freshwater Inflows to Texas Estuaries. It is, as the title suggests, a forecast of future conditions. The report used a standard TCEQ water availability model (WAM) run for the Guadalupe and San Antonio Rivers to forecast inflows to the estuary if all the existing water permits were fully used and if reuse of wastewater were increased to 50%. The report then evaluated the predicted inflows against each of two ecologically significant criteria: a drought criterion and a freshwater pulse (or higher flows) productivity criterion based on the results of the state's freshwater inflows studies.

NWF has proposed to work cooperatively with the Region and its consultants to devise an alternative representation of future inflows that reflects anticipated levels of water use and reuse and wastewater discharge with the regional water plan implemented. We understand that the planning group has agreed to participate in that effort. The expectation is that, instead of the standard analysis used in Bays in Peril that assumes full use of existing permits and 50% reuse of wastewater, NWF and representatives of the planning group would jointly produce an analysis that looks at the water usage levels, including potential wastewater reuse or other new projects, the planning group considers most likely for 2060 conditions. Our belief is that the inclusion of such an analysis in the regional plan would provide critical information for helping to satisfy new requirements in this round of planning for "… quantitative assessments of environmental factors" as they relate to consideration of impacts to freshwater inflows and would provide information needed for a meaningful assessment of consistency of the regional plan with long-term protection of the state's natural resources.

Response: Noted.

(Page 8-1) Section 8 Policies and Recommendations
8.2 Rural Water

[137] We support the call for adequately equipping groundwater districts with the information and capacity to respond to groundwater export proposals and for ensuring that adequate technical information is available to analyze such proposals.

Response: Noted.

8.3 Groundwater

Groundwater Sustainability

[138] We strongly support the goal of groundwater sustainability. However, we believe a clear definition of "sustainability" is necessary because it appears to mean different things to different people. In our terminology, groundwater sustainability means that in the long-term (well beyond the current planning horizon) withdrawals must be balanced with recharge while also maintaining adequate natural discharges such as seeps and springs.

Response: Noted.

8.6 Innovative Strategies

Drought Contingency Plan

[139] The SCTRWPG policy regarding drought management states, "it does not select drought management as a water management strategy because by definition, drought management is only implemented during times of crisis." We do agree that times of serious drought are times of crisis. However, the SB1 process is driven by planning to meet water needs during just such times of crisis. If measures are in-place to reduce water demands during drought periods, why should those measures be ignored in the process of planning to meet the water demands?

Response: TWDB Rules, pursuant to SB1 and SB2 require development of water plans to meet projected needs (shortages) during drought of record conditions. The SCTRWPG considered and decided not to use "drought management" as a water management strategy to meet projected needs for the reasons cited in the plan and repeated in comment 139. As a result of facilitated discussions regarding issues raised through public comment, the SCTRWPG has modified its policy and now recommends that a more thorough analysis of drought management as a water management strategy be conducted during the planning interim. Text in Sections 4B and 8 has been modified accordingly.

8.7 Environmental

[140] We acknowledge and commend the planning group for its strong overall recognition of the importance of protecting environmental flows and natural resources.

Response: Noted.

Protection of Edwards Aquifer Springflow and Downstream Water Rights

[141] This discussion suggests that any decrease in pumping amounts from the Edwards Aquifer during drought periods would require the development of additional water management strategies over those in the current version of the plan. However, as acknowledged elsewhere in the initially prepared plan, the recommended water management strategies included in the plan

would provide in excess of 800,000 acre-feet/year of new supplies. By contrast, projected 2060 demands are about 417,000 acre-feet/year.

Response: The discussion addresses the need for the water management strategies included in the plan, and is predicated upon the assumption that pumpage from the Edwards aquifer will not be reduced below 340,000 acft/yr. It further states, that if pumpage is reduce below 340,000 acft/yr, then additional water management strategies to those of the plan will be needed. Incidentally, the concluding statement in comment number 141 is not accurate. The projected total water needs (shortages) in 2060 are about 417,000 acft/yr. Projected total demand in 2060 is about 1,273,000 acft/yr.

Ecologically Unique Stream Segments and Unique Reservoir Sites
[142] We are disappointed that the planning group has again chosen not to recommend any river or stream segments for designation as ecologically unique.

Response: Noted.

Responses to September 19, 2005 Comments Submitted by D.M. O'Connor Interests

Comment: It was arbitrary and capricious to include the LGWSP in the Initially Prepared 2006 Regional Water Plan (IPP) because SAWS decided to withdraw its support of the project and concerns regarding feasibility and lack of local support.

Response: The LGWSP, as included in the IPP and documented in Section 4C.7, is not a recommended water management strategy in the 2006 regional water plan pursuant to a unanimous vote of the SCTRWPG during their meeting of December 1, 2005. In response to public comment and the withdrawal of SAWS support, the LGWSP presented in Section 4C.7 has been modified to exclude the groundwater components and provide service only to customers within the GBRA statutory district. This modified water management strategy, identified as LGWSP for GBRA Needs, has been technically evaluated in accordance with TWDB rules (Section 4C.32), considered by the SCTRWPG, and included as a strategy recommended to meet projected needs in the 2006 regional water plan.

Comment: The IPP lacks a sound science basis relative to the LGWSP and, in particular, the associated groundwater analyses. Commentor expresses concerns including: 1) amendment of the Refugio Groundwater Conservation District management plan; 2) modeling methodology; 3) consideration of site-specific information; and 4) leakage between the Chicot and Evangeline formations.

Response:
1) Long-term average groundwater production associated with the LGWSP, as documented in Sections 4C.7 and 4C.19, was in substantial compliance with the management plans of both the Refugio and Goliad County groundwater conservation districts at the time the IPP was adopted and would appear to be in compliance with the

quoted availability estimates in the Refugio district management plan amended after adoption of the IPP.

2) Modeling methodologies used in applications of the TWDB's Central Gulf Coast Groundwater Availability Model (CGC GAM) by the technical consultant to the SCTRWPG were coordinated with and approved by TWDB staff and are documented in Section 4C.19. Pursuant to an April 12, 2005 request from the D.M. O'Connor Interests, the CGC GAM, associated input data files, and a summary presentation of results were transmitted to the groundwater consultant of the D.M. O'Connor interests on April 25, 2005.

3) The site-specific information referenced by the commentor is understood to be a groundwater model developed by Texas A&M University at Kingsville under the sponsorship of the South Texas Regional Groundwater Alliance. The SCTRWPG is not aware of this model being approved by the TWDB for use in regional water planning.

4) Commentor is encouraged to provide any available technical data regarding leakage between the Chicot and Evangeline formations of the Gulf Coast Aquifer to the TWDB for consideration in future refinement of the CGC GAM.

Comment: The IPP lacks a sound science basis relative to the LGWSP and, in particular, the associated surface water analyses. Commentor expresses concerns regarding alternation of: 1) springflow data, 2) return flow data, and 3) Guadalupe – San Antonio River Basin Water Availability Model (GSA WAM) code.

Response:

1) In accordance with Hydrologic Assumptions and Operational Procedures for Assessment of Surface Water Supply (Section 3.2.3.1) considered and approved by both the SCTRWPG and the TWDB, the technical consultant to the SCTRWPG applied the GWSIM-IV model of the Edwards Aquifer in order to obtain appropriate springflows for use in the GSA WAM. The springflows used by the SCTRWPG reflect current critical period rules enacted by the Edwards Aquifer Authority, which include pumpage reductions of up to 15 percent for municipal, industrial, and irrigation users. The springflows used in the TCEQ GSA WAM are less because they are based on outdated critical period rules which did not effectively limit pumpage during drought. More specifically, Comal and San Marcos springflows used by the SCTRWPG average about 23,000 acft/yr more and Edwards pumpage averages about 27,000 acft/yr less than the corresponding figures used by in the TCEQ GSA WAM. The balance of about 4,000 acft/yr is likely attributable to other springs and/or differences in Edwards storage.

2) Consideration of treated effluent (return flows) in the evaluation of surface water availability for existing supply and water management strategies is consistent with hydrologic assumptions and operational procedures considered and approved by both the SCTRWPG and the TWDB.

3) Modifications to the GSA WAM code (originally used in the development of the 2001 regional water plan) by the SCTRWPG technical consultant in development of the 2006 regional water plan are included in the approved Scope of Work and primarily associated with daily accounting procedures for Canyon Reservoir in accordance with Certificate of Adjudication No. 18-2074E. The decision to use a "basin-specific" version of the GSA WAM for planning purposes in Region L was made in consultation with the SCTRWPG

and TWDB and TCEQ staff. This decision was made in order to most accurately model major water rights (e.g., Canyon Reservoir, Medina Lake System) and correctly apply Consensus Criteria for Environmental Flow Needs as required for regional water planning.

Comment: There are impacts of the LGWSP that have not been adequately evaluated in the regional planning process associated with sedimentation and flooding in the Guadalupe delta, maintenance of a sound ecological environment in the Guadalupe Estuary, and protection of the endangered whooping crane.

Response: It is the understanding of the SCTRWPG that these areas of concern are the subjects of more comprehensive studies by the U.S. Army Corps of Engineers, University of Texas Center for Research in Water Resources, and Texas A&M University. The SCTRWPG has added a policy recommendation to Section 8 to encourage the continuation of such studies. In addition, the SCTRWPG has cooperated with the National Wildlife Federation in the performance of Supplemental Evaluations of Potential Long-Term Changes in Freshwater Inflows to the Guadalupe Estuary, the results of which are presented in Section 7 of the 2006 Regional Water Plan.

10.3 Coordination with Other Regions

Members of the SCTRWPG (Region L) have attended neighboring RWPG meetings and/or maintained contact with neighboring RWPGs for purposes of communicating content, status, and progress of panning work of the respective RWPGs. Joint meetings were held with Regions K and N, to pursue water management strategies of mutual interest, communicate current project status, and discuss issues of mutual interest.

10.4 Final Plan Adoption

As explained in Section 10.2.2, the RWGP held public hearings in Victoria, Seguin, Uvalde and San Antonio and also gathered written comments submitted by various individuals and organizations as well as public agencies. The TWDB reviewed the IPP and sent comments and questions. The TWDB comments, together with RWPG responses are included in Section 10.2.2.1. A summary of public comments and RWPG responses are presented in Section 10.2.2.2, Section 10.2.2.3 and Section 10.2.2.4.

In addition to the regular monthly meetings, the RWPG held several workshops to complete the review and approval of responses to the comments.

The SCTRWPG met on January 4, 2006 to consider adoption of the 2006 South Central Texas Regional Water Plan as revised pursuant to comments on the Initially Prepared Plan and December 1, 2005 decisions of the SCTRWPG regarding outstanding issues. There was not a consensus to adopt the Regional Water Plan. A motion was made to vote on adoption of the plan and the resulting vote recorded 9 in favor of adoption and 8 against. Since the motion did not receive the required two-thirds majority of the voting members present to adopt a plan, the plan was not adopted. A discussion that followed resulted in the identification of seven subjects of concern to planning group members. The seven topics that the planning group wanted to discuss further are:

1. Public comment consideration;
2. Vote on an 11,000 acft/yr groundwater export from Wilson County;
3. Time to consider documents posted on website;
4. Cumulative effects discrepancies/clarifications;
5. Desired consensus;
6. Public vetting of Lower Guadalupe Water Supply Project for GBRA Needs; and
7. Consistency with current Groundwater Conservation District Rules.

The SCTRWPG decided to request from the TWDB an extension of time to deliver a plan, and to meet on January 19, 2006 by which time planning group members would have had time to review revised Regional Water Plan documents in more detail.

The SCTRWPG met on January 19, 2006 and, after some discussion relevant to the topics listed above, considered a motion including the following provisions: (1) The 2006 regional water plan for Region L is adopted with the changes approved at the January 4, 2006 meeting; (2) The minutes and the letter transmitting the approved plan to TWDB will reflect that the planning group's adoption of the plan does not mean that each planning group member agrees to everything in the plan or that the interests of every member in the plan have been satisfied to the fullest extent, and in fact they have not; (3) That a list of planning members concerns be provided to TWDB for guidance in its consideration; and (4) That during the update of the 2006 plan, particular attention will be given to resolving divisive aspects of the 2006 plan to the maximum extent allowed by the scope of work and budget. This motion passed by a vote of 18 for and 1 against. The Executive Committee was authorized to prepare and send the letter transmitting the approved plan to the TWDB.

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Appendix A
List of References

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List of References

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Appendix B
Reliability Information for Surface Water Rights

Appendix B
Reliability Information for Water Rights in the South Central Texas Region

Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Guadalupe	Caldwell	HYD	P4492_1	15,000	71.8	0	HYDRACO POWER INC	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3886_1	150	80.5	3	HAYS COUNTY REC ASSOC INC	BLANCO RIVER
Guadalupe	Caldwell	IRR	C3888_1	320	96.2	144	JOHN F BAUGH	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3889_1	24	100.0	24	JOE & ALYNE RANDOLPH FOSTER	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3890_1	50	92.0	9	GEORGE PARTNERSHIP LTD	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3898_1	20	92.0	3	CITY OF LULING	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3899_1	1,180	92.0	204	MIGUEL CALZADA URQUIZA ET UX	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3904_1	28	79.7	17	SHERRY CHAPPELL	ELM CRK
Guadalupe	Caldwell	IRR	C3906_1	63	90.1	17	TEXAS PARKS & WILDLIFE DEPT	CLEAR FRK PLUM CRK
Guadalupe	Caldwell	IRR	C3906_2	12	93.1	4	TEXAS PARKS & WILDLIFE DEPT	CLEAR FRK PLUM CRK
Guadalupe	Caldwell	IRR	P3995_1	700	72.0	15	MIGUEL CALZADA URQUIZA ET UX	SALT BR
Guadalupe	Caldwell	IRR	P4022_1	450	79.8	10	MARY ANN LANGFORD ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4033_1	300	79.8	7	DICK BROWN	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4043_1	150	79.8	3	TERRAND LTD ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4080_1	425	79.8	9	BENO CORPORATION	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4502_1	600	79.7	0	JOHN SCOTT GREENE ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4518_1	120	82.0	0	JOHN H COX	PLUM CRK
Guadalupe	Caldwell	IRR	P4569_1	0	0.0	0	DON B MORGAN ET UX	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4569_2	240	79.6	0	ROBERT L BOOTHE	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P5234_1	1,022	73.1	0	THE LULING FOUNDATION	SAN MARCOS RIVER
Guadalupe	Caldwell	MUN	C3891_1	500	100.0	500	TRI-COMMUNITY WSC	SAN MARCOS RIVER
Guadalupe	Caldwell	MUN	C3896_1	1,500	89.6	185	GUADALUPE-BLANCO RIVER AUTH	SAN MARCOS RIVER
Guadalupe	Caldwell	MUN	C3896_2	1,300	83.0	8	GUADALUPE-BLANCO RIVER AUTH	SAN MARCOS RIVER
Guadalupe	Caldwell	MUN	P5092_2	150	72.6	0	WILLIAM JAMES WOOTEN ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	REC	C3897_1	0	0.0	0	JAMES E KEITH TRUSTEE ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	REC	C3905_1	0	0.0	0	ALLAN C ASHCRAFT ET AL	DRY BR
Guadalupe	Calhoun	IND	C2074_68_CON	1,100	100.0	1,100	BP CHEMICAL	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C2074_69_CON	334	100.0	334	SEADRTFT COKE L P	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C2074_70_CON	100	100.0	100	UNION CARBIDE CHEM & PLASTICS	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5173_2	1,250	100.0	1,250	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5174_1	0	0.0	0	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5174_3	935	100.0	935	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5175_2	470	100.0	470	UNION CARBIDE CHEM & PLASTICS	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5176_3	3,315	100.0	3,214	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5177_1	10,763	100.0	10,763	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5177_4	10,000	100.0	10,000	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5177_5	4,316	100.0	4,316	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5178_2	30,525	99.4	24,875	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5484_1	0	0.0	0	GUADALUPE-BLANCO R A ET AL	GUADALUPE RIVER
Guadalupe	Calhoun	IND	P4586_1	272	82.0	188	DEL & GLORIA WILLIAMS, Crawfish Isle Pla	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C3863_1	200	100.0	200	JESS YELL WOMACK II ET AL	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5173_1	1,250	100.0	1,250	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5174_2	935	100.0	935	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5175_1	470	100.0	470	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5176_1	3,315	100.0	3,315	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5177_2	10,763	100.0	10,763	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5177_6	4,316	100.0	4,316	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5178_3	5,475	95.4	1,703	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C2074_65_CON	1,500	100.0	1,500	PLWTP	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C2074_66_CON	500	100.0	500	CCRWSC	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C3863_2	3,000	100.0	3,000	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5176_2	3,314	100.0	3,314	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5177_3	11,089	100.0	11,089	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5178_1	70,000	99.4	54,079	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C2074_60_CON	60	100.0	60	POC MUD	GUADALUPE RIVER
Guadalupe	Calhoun	OTH	P5381_1	150	82.6	106	BRETT BRATCHER	GUADALUPE RIVER
Guadalupe	Comal	HYD	C3824_1	124,870	95.5	24,671	NEW BRAUNFELS UTILITIES	COMAL RIVER
Guadalupe	Comal	HYD	P4445_1	0	0.0	0	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Comal	IND	C2074_19_USCON	3	97.0	2	COMAL RD. DEPT.	GUADALUPE RIVER
Guadalupe	Comal	IND	C2074_41_CON	1	100.0	1	COMAL FAIR	GUADALUPE RIVER
Guadalupe	Comal	IND	LAKESIDE			6	HARRIS ROAD CO.	
Guadalupe	Comal	IRR	C1954_1	15	49.0	0	LAWRENCE D KRAUSE	JENTSCH CRK
Guadalupe	Comal	IRR	C1954_2	5	65.3	0	LAWRENCE D KRAUSE	JENTSCH CRK
Guadalupe	Comal	IRR	C1955_1	10	47.9	0	CHESTER & RICKIE KRAUSE	UNNAMED TRIB JENTSCH CRK
Guadalupe	Comal	IRR	C2050_2	136	80.5	44	Klemstein	
Guadalupe	Comal	IRR	C2068_1	72	81.9	0	KWW Ranches LTD	Wallter Creek
Guadalupe	Comal	IRR	C2070_1	98	21.0	0	FRANK A STANUSH	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2070_2	22	21.0	0	FRANK A STANUSH	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2071_1	1	100.0	1	GUADALUPE RIVER RANCH & CATTLE	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2072_1	35	98.6	13	ELOY GARCIA JR ET UX	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_10_USCON	350	79.0	83	Southerland A5647	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_20_USCON	2	95.3	1	CUNNINGHAM	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_21_USCON	1	95.6	0	GOLDBECK	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_22_USCON	200	71.2	36	REBECCA CREEK GOLF	UNNAMED TRIB REBECCA CR
Guadalupe	Comal	IRR	C2074_23_USCON	5	95.6	2	FITZPATRICK	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_24_USCON	5	95.6	2	GARRETT	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_25_USCON	1	95.6	0	PARKER	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_26_USCON	1	95.6	0	HARRIS	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_28_USCON	1	95.6	0	JAVIER MARTINEZ	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_29_USCON	1	95.6	0	MAXWELL	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_45_CON	2	100.0	2	CISD	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_46_CON	5	100.0	5	ERBEN	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_51_CON	6	100.0	6	RIVER ENCLAVE ASSOC.	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_75_CON	20	100.0	20	COMAL CTY - HIDDEN VALLEY	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_76_USCON	300	95.3	109	Rayner Ranch Golf Club	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3817_1	79	95.5	29	CLARENCE B ANDERSON ET AL	GUADALUPE RIVER

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Guadalupe	Comal	IRR	C3819_1	14	99.3	9	PATRICK S MOLAK	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3820_1	4	99.3	2	VETERANS OF FOREIGN WARS	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3821_1	4	99.3	2	ROBERT & MARY RAE PRESTON	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3821_2	1	99.3	1	ROBERT & MARY RAE PRESTON	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3822_1	3	100.0	3	ROBERT KRUEGER ET AL	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3824_4	200	86.4	0	NEW BRAUNFELS UTILITIES	COMAL RIVER
Guadalupe	Comal	IRR	C3826_1	100	26.6	0	CITY OF NEW BRAUNFELS	OLD CHL COMAL RIVER
Guadalupe	Comal	IRR	C3828_1	1	0.0	0	CAMP WARNECKE INC	COMAL RIVER
Guadalupe	Comal	IRR	C3828_2	2	100.0	2	LIBERTY PARTNERSHIP LTD	COMAL RIVER
Guadalupe	Comal	IRR	P4607_1	50	19.7	0	PURALLOY INC	GUADALUPE RIVER
Guadalupe	Comal	IRR	LAKESIDE			1	RALSTON	
Guadalupe	Comal	IRR	LAKESIDE			1	LODGE AT TURKEY COVE	
Guadalupe	Comal	IRR	LAKESIDE			2	DESCHNER	
Guadalupe	Comal	MUN	C2074_1_LKE	15,144	100.0	15,144	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_11_USCON	1	97.6	1	JOHNSON	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_12_USCON	1	97.6	1	EDGE	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_13_USCON	2	96.8	1	BELL	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_14_USCON	2	96.8	1	HOLLAND	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_15_USCON	1	97.6	1	GAVILCK	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_16_USCON	4	96.9	2	O'DONNELL	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_17_USCON	2	96.8	1	ROBERTS	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_2_YLD	25,335	100.0	22,953	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_30_CON	1	100.0	1	WHITEWATER SPORTS INC	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_4_USCON	4	96.9	2	YACHT CLUB	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_40_CON	2	100.0	2	MAR LODGE	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_7_USCON	1	97.6	1	PROPST	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_8_USCON	1	97.6	1	SALGE	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_9_USCON	1	97.6	1	KLECK	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_RF_99	0	0.0	0	GBRA	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3815_1	3	25.5	0	J D MURRELL	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3819_2	9	99.6	7	PATRICK S MOLAK	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3823_2	1,289	74.3	0	CITY OF NEW BRAUNFELS	COMAL RIVER
Guadalupe	Comal	MUN	C3824_5	2,240	99.6	1,693	NEW BRAUNFELS UTILITIES	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3824_6	3,418	73.2	0	NEW BRAUNFELS UTILITIES	COMAL RIVER
Guadalupe	Comal	MUN	C3830_2	5	72.5	0	NEW BRAUNFELS UTILITIES	GUADALUPE RIVER
Guadalupe	Comal	MUN	P4106_1	25	20.2	0	TEXAS PARKS & WILDLIFE DEPT	GUADALUPE RIVER
Guadalupe	Comal	MUN	P4491_1	120	28.1	0	COMAL CO FRESH WSD #1	REBECCA CRK
Guadalupe	Comal	REC	C1952_1	0	0.0	0	CYPRESS COVE MAINTENANCE ASSN	SCHULTZ CRK
Guadalupe	Comal	REC	C2068_R	0	0.0	0	KWW Ranches LTD	Wallter Creek
Guadalupe	Comal	REC	C2073_1	0	0.0	0	LAKE OF THE HILL PROP OWNERS	UNNAMED TRIB REBECCA
Guadalupe	Comal	REC	C3816_1	1,460	22.8	0	WHITEWATER SPORTS INC	GUADALUPE RIVER
Guadalupe	Comal	REC	C3816_2	0	0.0	0	WHITEWATER SPORTS INC	GUADALUPE RIVER
Guadalupe	Comal	REC	C3818_1	0	0.0	0	ROBERT LEE BRETZKE	GUADALUPE RIVER
Guadalupe	Comal	REC	C3827_1	0	0.0	0	CITY OF NEW BRAUNFELS	COMAL RIVER
Guadalupe	Comal	REC	P4114_1	3,711	20.0	0	BAD SCHOLOESS INC	COMAL RIVER
Guadalupe	Comal	REC	P4114_2	1,289	20.8	0	BAD SCHOLOESS INC	COMAL RIVER
Guadalupe	Comal	REC	P4230_1	0	0.0	0	JOHNNIE J BEZDEK JR ET UX	UNNAMED TRIB GUADALUPE RIVER
Guadalupe	Comal	REC	P4491_2	0	0.0	0	COMAL CO FRESH WSD #1	REBECCA CRK
Guadalupe	De Witt	HYD	C3853_1	538,560	61.4	6,262	CUERO HYDROELECTRIC, INC.	GUADALUPE RIVER
Guadalupe	De Witt	REC	C3853_2	0	0.0	0	CUERO HYDROELECTRIC, INC.	GUADALUPE RIVER
Guadalupe	De Witt	REC	C3853_3	0	0.0	0	CUERO HYDROELECTRIC, INC.	GUADALUPE RIVER
Guadalupe	Dewitt	IND	C2074_62_CON	5	100.0	5	DUBOSE	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3850_1	80	99.0	36	JOSEPHINE B MUSSELMAN ET AL	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3855_1	26	99.0	12	MRS JOHN C LEY	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3856_1	50	83.5	1	PATRICK B & MARY KARYN ELDER	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	P4318_1	80	82.6	2	F T BUCHEL	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	P5006_1	0	0.0	0	DORIS NELL GOEBEL	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	P5006_2	299	86.6	7	LORITA MAE FITZGERALD	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	STORY_1	400	91.5	20	JIM STORY	
Guadalupe	Dewitt	REC	P5294_1	15	77.4	0	CITY OF YORKTOWN	YORKTOWN CRK
Guadalupe	Dewitt	REC	P5659_1	0	0.0	0	QSTS Ranch	UNNAMED TRIB O'NEIL CREEK
Guadalupe	Dewitt	WRP	C3851_1	182	99.8	162	JACK H BOOTHE	GUADALUPE RIVER
Guadalupe	Dewitt	WRP	C3852_1	35	99.8	31	JOHN BRADEN JR ET AL	GUADALUPE RIVER
Guadalupe	Dewitt	WRP	C3854_1	32	99.0	29	J D BRAMLETTE JR	GUADALUPE RIVER
Guadalupe	Gonzales	HYD	C3846_1	796,363	55.6	6,993	CITY OF GONZALES	GUADALUPE RIVER
Guadalupe	Gonzales	HYD	C5172_1	585,599	56.9	28,118	GUADALUPE-BLANCO R A H-4	GUADALUPE RIVER
Guadalupe	Gonzales	HYD	C5172_2	574,832	57.7	28,246	GUADALUPE-BLANCO R A H-5	GUADALUPE RIVER
Guadalupe	Gonzales	IND	C2074_34_CON	1	100.0	1	GUADALUPE COUNTY	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	C2074_36_CON	1	100.0	1	THE CADUS CO.	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C2074_49_CON	10	100.0	10	GOLF ASSOCIATES	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C2074_59_CON	6	100.0	6	MALDONADO	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C2074_61_CON	2	100.0	2	IND. GOLF ASSN.	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C3847_1	250	99.0	113	DR JAMES W NIXON JR	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C3848_1	1,800	100.0	1,800	KING RANCH INC	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C3908_1	670	92.0	116	LARRY E & PHYLIS A BROWNE	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P3916_1	50	83.2	1	DON A LIGHTSEY ET UX	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P4075_1	225	68.6	0	DAVID S SHELTON	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	P4089_1	830	82.6	18	DR I V EPSTEIN	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P4539_1	8	86.1	0	T PAUL SIDES	UNNAMED TRIB COTTLE CRK
Guadalupe	Gonzales	IRR	P5036_1	50	82.6	0	ERNEST L MINYARD	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P5037_1	230	82.0	0	RICHARD D BRAMLET	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P5038_1	66	82.0	0	ARTHUR DENNIS HUEBNER ET AL	SAN MARCOS RIVER
Guadalupe	Gonzales	MUN	C2074_53_CON	700	100.0	700	GCWSC	GUADALUPE RIVER
Guadalupe	Gonzales	MUN	C2074_6_CON	75	100.0	75	CITY OF MARION	GUADALUPE RIVER
Guadalupe	Gonzales	MUN	C3846_2	2,240	100.0	2,240	CITY OF GONZALES	GUADALUPE RIVER
Guadalupe	Gonzales	OTH	P5267_1	0	0.0	0	FLETCHER JOHNSON	UNNAMED TRIB SANDY FRK
Guadalupe	Gonzales	REC	C3845_1	0	0.0	0	ALICE AINSWORTH	GUADALUPE RIVER
Guadalupe	Gonzales	REC	C3907_1	0	0.0	0	JOHN R & MARIE A MAY	SAN MARCOS RIVER
Guadalupe	Guadalupe	HYD	C3839_4	0	0.0	0	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	HYD	C5488_1	663,892	50.2	24,204	GUADALUPE-BLANCO R A TP-1	GUADALUPE RIVER

Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Guadalupe	Guadalupe	HYD	C5488_2	659,995	50.4	24,059	GUADALUPE-BLANCO R A TP-3	GUADALUPE RIVER
Guadalupe	Guadalupe	HYD	C5488_3	655,323	50.5	23,915	GUADALUPE-BLANCO R A TP-4	GUADALUPE RIVER
Guadalupe	Guadalupe	HYD	C5488_4	624,781	52.3	25,538	GUADALUPE-BLANCO R A TP-5	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_37_CON	1	100.0	1	Boehm (Pecan Dr.)	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_43_CON	6,840	100.0	6,840	PANDA ENERGY	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_44_CON	2,464	100.0	2,464	HAYES ENERGY	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_55_CON	700	100.0	700	SMI	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_56_CON	25	100.0	25	ACME BRICK COMPANY	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_57_CON	258	100.0	258	STD. GYPSUM LLC	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3829_1	5,000	99.5	3,559	MISSION VALLEY TEXTILES, INC	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3829_2	0	0.0	0	MISSION VALLEY TEXTILES, INC	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3830_1	5	100.0	5	NEW BRAUNFELS UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3836_1	25	100.0	25	ACME BRICK COMPANY	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3837_1	34	99.6	27	STRUCTURAL METALS INC	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	P5240_1	31	74.0	0	H B SHANKLIN	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	A5664_1	6	66.5	0	Maldonado Nursery	UNNAMED TRIB GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_47_CON	4	100.0	4	ZUROVEC	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_48_CON	1	100.0	1	SOUTHBANK	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_50_CON	13	100.0	13	W W FARMS	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_58_CON	25	100.0	25	CHAPARRAL	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_63_CON	330	100.0	330	Foresight Golf Partners	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_74_CON	1	100.0	1	ANIOL	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3832_1	44	100.0	44	RAY E DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3834_1	71	100.0	72	CANYON REGIONAL WATER AUTH	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3835_1	19	87.1	8	OTTO VOIGT	YOUNGS CRK
Guadalupe	Guadalupe	IRR	C3838_1	37	31.8	0	DONALD E NORED	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3839_3	200	100.0	200	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3840_1	34	89.0	14	ARNO NEUMANN	GERONIMO CRK
Guadalupe	Guadalupe	IRR	C3841_1	5	49.8	0	LEO P CLOUD JR ET AL	GERONIMO CRK
Guadalupe	Guadalupe	IRR	C3842_1	158	100.0	158	SARA DARILEK RAINWATER	GERONIMO CRK
Guadalupe	Guadalupe	IRR	C3843_1	27	100.0	27	LEONARD FLEMING	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3844_1	608	100.0	608	KENNETH E CASTLE	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3900_2	500	85.7	12	JAMES D JAMISON	UNNAMED TRIB
Guadalupe	Guadalupe	IRR	P3857_1	144	83.6	3	ROBERT M KIEHN	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P3859_1	750	81.8	17	ABNER M USSERY	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P3973_1	73	27.3	0	DONALD J JOHNSON ET UX	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	P4110_1	240	80.9	5	LYNN STORM	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P4373_1	300	73.4	0	CONTINENTAL WHOLESALE FLORISTS	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P4373_2	300	73.2	0	CONTINENTAL WHOLESALE FLORISTS	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P4597_1	320	79.6	0	JOHN T O'BANION JR ET AL	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P5604_1	8	72.0	0	ALBERT GREEN, ET UX	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	C2074_31_CON	2,038	100.0	2,038	CRWA	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_32_CON	6,720	100.0	6,720	CITY OF NEW BRAUNFELS	COMAL RIVER
Guadalupe	Guadalupe	MUN	C2074_33_CON	800	100.0	800	CRYSTAL CLEAR	COMAL RIVER
Guadalupe	Guadalupe	MUN	C2074_35_CON	5,000	100.0	5,000	CITY OF SAN MARCOS	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	C2074_38_CON	1,100	100.0	1,100	GREEN VALLEY FARMS INC	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	C2074_39_CON	589	100.0	589	KYLE	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_42_CON	5	100.0	5	GARY DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_52_CON	3,425	100.0	3,425	SHWSC	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_54_CON	3,000	100.0	3,000	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_67_CON	600	100.0	600	CITY OF CIBOLO	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_71_CON	1,120	100.0	1,120	CITY OF BUDA	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_72_CON	5	100.0	5	RAY DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_73_CON	1,400	100.0	1,400	East Central WSC	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_77_CON	4,000	100.0	4,000	BEXAR MET WD	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3833_1	56	100.0	56	GARY A DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3833_2	5	100.0	5	GARY A DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3834_2	19	100.0	19	CANYON REGIONAL WATER AUTH	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3839_1	7,000	100.0	7,000	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3839_2	0	0.0	0	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3895_2	580	87.2	73	STATE BANK & TRUST COMPANY	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	P4308_1	0	0.0	0	C W GRUMBLES	SAN MARCOS RIVER
Guadalupe	Guadalupe	REC	C3825_1	0	0.0	0	CENTRAL TX COUNTRY CLUB INC	UNNAMED TRIB DRY COMAL CRK
Guadalupe	Guadalupe	REC	C3892_1	0	0.0	0	AARON A WILBURN ESTATE	OYSTER CRK
Guadalupe	Guadalupe	REC	C3892_2	0	0.0	0	HANNO GUENTHER	OYSTER CRK
Guadalupe	Guadalupe	REC	C3892_3	0	0.0	0	SOUTHWEST TEXAS STATE UNIV	OYSTER CRK
Guadalupe	Guadalupe	REC	C3893_1	0	0.0	0	ALFRED H KOEBIG	KOEBIG CRK
Guadalupe	Guadalupe	REC	C3893_2	0	0.0	0	JACINTO & CECILIA S RINCON	KOEBIG CRK
Guadalupe	Guadalupe	REC	C3893_3	0	0.0	0	JOHN O & RUDY SEIDEL	KOEBIG CRK
Guadalupe	Guadalupe	REC	C3894_1	0	0.0	0	LEONARD O MOELLER ET AL	COTTONWOOD CRK
Guadalupe	Guadalupe	REC	C3900_1	0	0.0	0	DAVID NEAL PAPE ET AL	UNNAMED TRIB
Guadalupe	Guadalupe	REC	P5121_1	83	66.6	0	GUADALUPE SKI-PLEX HOME ASSOC	YORK CRK
Guadalupe	Hays	HYD	C3865_1	64,370	97.3	34,529	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IND	C3865_3	534	100.0	534	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IND	C3866_1	60	80.6	37	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IND	C3869_1	10,000	100.0	10,000	TEXAS PARKS & WILDLIFE DEPT	SAN MARCOS RIVER
Guadalupe	Hays	IND	P4426_1	0	0.0	0	LYLE & MARY BOLLINGER	ANDREWS BR
Guadalupe	Hays	IRR	C3865_5	100	100.0	100	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3866_2	20	94.3	4	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3866_3	20	58.1	0	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3868_2	70	100.0	70	J R THORNTON, ET AL	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3881_1	40	100.0	40	LYON L BRINSMADE	BLANCO RIVER
Guadalupe	Hays	IRR	C3882_1	100	94.3	13	NEWTON B THOMPSON	PIN OAK CRK
Guadalupe	Hays	IRR	C3884_1	20	79.9	8	BRUCE COLLIE ET AL	BLANCO RIVER
Guadalupe	Hays	IRR	C3884_2	90	82.5	32	BRUCE COLLIE ET AL	BLANCO RIVER
Guadalupe	Hays	IRR	C3887_2	20	100.0	20	GREEN VALLEY FARMS INC	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3901_1	100	94.5	20	M D HEATLY SR	PECAN SPRINGS
Guadalupe	Hays	IRR	C3902_1	30	85.7	5	FRITZ OTTO ANTON	BUNTON BR
Guadalupe	Hays	IRR	P4027_1	9	64.1	0	JESS WEBB ET UX	BLANCO RIVER
Guadalupe	Hays	IRR	P4027_2	82	64.2	2	THOMAS L HUSBANDS ET UX	BLANCO RIVER

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Guadalupe	Hays	IRR	P5371_1	5	66.8	1	ROBERT BOURKE SIMPSON	UNNAMED TRIB CYPRESS CRK
Guadalupe	Hays	IRR	P5426_1	165	72.6	49	JOHN G CURRIE	LTL BLANCO RIVER
Guadalupe	Hays	IRR	P5545_1	8	72.1	2	FRANK T & PAMELA H ARNOSKY	UNNAMED TRIB
Guadalupe	Hays	MUN	C3865_4	513	100.0	513	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	MUN	C3887_1	376	100.0	376	GREEN VALLEY FARMS INC	SAN MARCOS RIVER
Guadalupe	Hays	OTH	5539_1	9,476	71.2	0	CITY OF SAN MARCOS	SAN MARCOS RIVER
Guadalupe	Hays	OTH	C3865_2	700	100.0	700	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	REC	C3865_6	0	0.0	0	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	REC	C3867_1	0	0.0	0	SAN MARCOS, CITY OF	SAN MARCOS RIVER
Guadalupe	Hays	REC	C3868_1	0	0.0	0	J R THORNTON ET AL	SAN MARCOS RIVER
Guadalupe	Hays	REC	C3880_1	0	0.0	0	BOY SCOUTS- SAM HOUSTON	BLANCO RIVER
Guadalupe	Hays	REC	C3883_1	0	0.0	0	WOODCREEK RESORT INC	UNNAMED TRIB CYPRESS CRK
Guadalupe	Hays	REC	C3903_1	0	0.0	0	KY-TEX PROPERTIES INC	BRUSHY CRK
Guadalupe	Hays	REC	P3747_1	0	0.0	0	S & H PROPERTIES INC	UNNAMED TRIB
Guadalupe	Hays	REC	P3899_1	0	0.0	0	LEWIS L PIERCE	UNNAMED TRIB BLANCO RIVER
Guadalupe	Hays	REC	P4388_1	0	0.0	0	COMANCHE WATERS POA	LONE MAN CRK
Guadalupe	Kendall	IRR	C2034_1	2	98.5	1	CHESTER P HEINEN ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2035_1	2	20.9	0	HARRY C MECKEL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2036_1	125	46.8	0	WILLIAM K ANDERSON ET UX	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2041_1	25	92.9	9	THOMAS L BRUNDAGE ET AL	CYPRESS CRK
Guadalupe	Kendall	IRR	C2041_2	109	19.3	0	THOMAS L BRUNDAGE ET AL	CYPRESS CRK
Guadalupe	Kendall	IRR	C2043_1	17	20.0	0	EDGAR SEIDENSTICKER ET UX	CYPRESS CRK
Guadalupe	Kendall	IRR	C2043_2	4	20.0	0	L J MANNERING ET UX	CYPRESS CRK
Guadalupe	Kendall	IRR	C2043_3	20	20.0	0	MARY LEE EDWARDS	CYPRESS CRK
Guadalupe	Kendall	IRR	C2044_1	16	100.0	16	LION'S LAIR LLC	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2044_2	2	100.0	2	PATRICIA GALT STEVES	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2045_1	8	100.0	8	MARSHALL STEVES	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2046_1	28	22.9	0	WILLIAM G & MILDRED D SPROWLS	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2047_1	20	95.3	7	H C SEIDENSTICKER	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2048_1	100	23.2	0	RAYMOND JAMES ROSE	BLOCK CRK
Guadalupe	Kendall	IRR	C2049_1	5	20.9	0	KENNETH M & CYNTHIA RUSCH	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2051_1	2	20.5	0	JOE B. KERCHEVILLE	JOSHUA CRK
Guadalupe	Kendall	IRR	C2051_2	260	19.7	0	JOE B. KERCHEVILLE	JOSHUA CRK
Guadalupe	Kendall	IRR	C2052_1	232	95.4	84	ZARCO FOWARDING, INC	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2053_1	32	20.8	0	ERNO SPENRATH	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2054_1	80	20.8	0	EDMUND BEHR ESTATE	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2056_1	20	55.0	0	MARK E. WATSON, JR., ET UX	WILLIE CRK
Guadalupe	Kendall	IRR	C2057_1	25	55.0	0	MARK E. WATSON, JR., ET UX	ASKEY CRK
Guadalupe	Kendall	IRR	C2058_1	40	21.0	0	OTTO KASTEN	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2059_1	39	21.0	0	ROBERT C REINARZ ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2060_1	90	21.0	0	TEXAS BEVERAGE PACKERS INC	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2061_1	16	20.7	0	LOUIS SCOTT FELDER ET UX	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2061_2	18	20.8	0	MARJORIE RANZAU INGENHUETT	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2061_3	37	20.7	0	MURRAY A WINN JR	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2062_1	60	44.5	0	WILLIAM L PULS	WASP CRK
Guadalupe	Kendall	IRR	C2063_1	44	95.3	16	FROST-LANCASTER PROPERTIES	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2063_2	15	95.3	5	RONALD L BAETZ ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2064_1	4	97.6	2	EARL S DODERER ET UX	SABINAS CRK
Guadalupe	Kendall	IRR	C2064_2	8	96.3	3	SYBIL R JONES CO-TRUSTEE ET AL	SABINAS CRK
Guadalupe	Kendall	IRR	C2065_1	10	20.9	0	G PHIL BERRYMAN ET UX	SABINAS CRK
Guadalupe	Kendall	IRR	C2065_2	10	20.9	0	GUY BODINE III ET UX	SABINAS CRK
Guadalupe	Kendall	IRR	C2066_1	5	21.3	0	ROY C SMITH ESTATE	SABINAS CRK
Guadalupe	Kendall	IRR	C2067_1	20	22.1	0	TY RAMPY ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2067_2	20	46.4	0	TY RAMPY ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2069_1	30	98.0	16	DOUBLE U-SPRING BRANCH	SIMMONS CRK
Guadalupe	Kendall	IRR	C3870_1	3	99.5	2	PATRICIA RYAN	BLANCO RIVER
Guadalupe	Kendall	IRR	C3870_2	22	99.5	16	T R IMMEL ET UX	BLANCO RIVER
Guadalupe	Kendall	IRR	P4590_1	50	19.7	0	GEORGE M WILLIAMS SR ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P4598_1	80	19.6	0	JACOB C GASS	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5107_1	518	23.3	0	WILLIAM K ANDERSON ET UX	UNNAMED TRIB GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5321_1	150	19.6	0	LARRY J LANGBEIN	E SISTER CRK
Guadalupe	Kendall	IRR	P5474_1	10	19.8	0	ELTON RUST	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5490_1	10	20.0	0	BILLY J. & KARAN R. BOLES	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5501_1	5	19.8	0	BARRY T & KATHRYN B NALL	FLAT ROCK CRK
Guadalupe	Kendall	IRR	P5528_1	98	19.7	0	GEORGE A SCHMIDT ET UX	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5534_1	20	19.7	0	MARGOT O BURRELL	GUADALUPE RIVER
Guadalupe	Victoria	IND	C2074_COLCON	0	0.0	0	CENTRAL POWER & LIGHT CO	GUADALUPE RIVER
Guadalupe	Victoria	IND	C3859_1	1,900	96.7	1,159	SOUTH TEXAS ELECTRIC COOP INC	GUADALUPE RIVER
Guadalupe	Victoria	IND	C3861_1	60,000	99.7	33,000	E I DU PONT DE NEMOURS	GUADALUPE RIVER
Guadalupe	Victoria	IND	C5486_1	12,500	100.0	12,500	CENTRAL POWER & LIGHT CO	COLETO CREEK
Guadalupe	Victoria	IND	C5486_2	0	0.0	0	CENTRAL POWER & LIGHT CO	GUADALUPE RIVER
Guadalupe	Victoria	IND	P3895_1	9,676	94.8	2,940	KATE S O'CONNOR TRUST	GUADALUPE RIVER
Guadalupe	Victoria	IND	P5376_1	2	100.0	2	HELDENFELS BROTHERS INC	SPRING CRK
Guadalupe	Victoria	IRR	C3858_1	1,000	99.0	450	FIRST VICTORIA NATL BANK, TRST	GUADALUPE RIVER
Guadalupe	Victoria	IRR	C3862_1	263	99.6	209	BIG RACK LTD	GUADALUPE RIVER
Guadalupe	Victoria	IRR	C3862_2	137	99.6	109	E I DUPONT DE NEMOURS & CO	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4020_1	100	86.4	2	NELSON PANTEL	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4062_1	90	88.5	8	RONALD A KURTZ ET UX	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4182_1	200	88.3	11	MAXINE ROBSON KYLE ET AL	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4441_1	200	86.6	4	S F RUSCHHAUPT III	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P5012_1	140	70.3	19	JOE D. HAWES	ELM BAYOU
Guadalupe	Victoria	MUN	C3860_1	250	79.8	169	W L LIPSCOMB ET AL (CITY OF VICTORIA)	GUADALUPE RIVER
Guadalupe	Victoria	MUN	C3860_2	10	78.3	7	W L LIPSCOMB ET AL (CITY OF VICTORIA)	GUADALUPE RIVER
Guadalupe	Victoria	MUN	P5466_1	20,000	87.9	1,320	VICTORIA, CITY OF	GUADALUPE RIVER
Guadalupe	Victoria	OTH	P5489_1	750	88.4	595	JESS Y WOMACK II	CUSHMAN BAYOU
Guadalupe	Victoria	REC	P4324_1	0	0.0	0	SPRING CREEK DEVELOPMENT CO	SPRING CRK
Guadalupe	Victoria	REC	P5424_1	0	0.0	0	ARTHUR E BUCKERT ET UX	UNNAMED TRIB
Guadalupe	Victoria	REC	P5424_2	0	0.0	0	VISTA MANAGEMENT COMPANY, AGT	UNNAMED TRIB

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
San Antonio	Bexar	IND	C2161_1	12,000	100.0	12,000	CITY OF SAN ANTONIO	Arroyo Seco/San Antonio R.
San Antonio	Bexar	IND	C2161_2	0	0.0	0	CITY OF SAN ANTONIO	Arroyo Seco/San Antonio R.
San Antonio	Bexar	IND	C2161_3	0	0.0	0	CITY OF SAN ANTONIO	Arroyo Seco/San Antonio R.
San Antonio	Bexar	IND	C2162_1	36,900	100.0	36,900	CITY OF SAN ANTONIO	San Antonio R./Calaveras Cr.
San Antonio	Bexar	IND	C2162_2	0	0.0	0	CITY OF SAN ANTONIO	SAN ANTONIO RIVER
San Antonio	Bexar	IND	C2162_3	11	100.0	11	CITY OF SAN ANTONIO	SAN ANTONIO RIVER
San Antonio	Bexar	IND	C2162_5	0	0.0	0	CITY OF SAN ANTONIO	San Antonio R./Calaveras Cr.
San Antonio	Bexar	IND	C4768_4	0	0.0	0	BEXAR METROPOLITAN WATER DIST	Medio Cr. & Medina R.
San Antonio	Bexar	IND	P5211_1	100	69.3	0	LONE STAR GROWERS CO	MEDINA RIVER
San Antonio	Bexar	IND	P5211_2	2,900	73.8	0	LONE STAR GROWERS CO	MEDINA RIVER
San Antonio	Bexar	IND	P5337_1	25	53.5	3	H B ZACHRY CO	SIX MILE CRK
San Antonio	Bexar	IRR	C1146_1	26	99.1	17	CIBOLO CREEK MUNICIPAL AUTH	CIBOLO CRK
San Antonio	Bexar	IRR	C1146_2	62	96.6	25	DOUG WISE	CIBOLO CRK
San Antonio	Bexar	IRR	C1146_3	5	92.4	2	JOHN E NEWTON ET AL	CIBOLO CRK
San Antonio	Bexar	IRR	C1146_4	8	91.4	2	JOHN K KOHLHAAS	CIBOLO CRK
San Antonio	Bexar	IRR	C1170_1	17	99.8	16	JAMES N EVANS SR ET AL	MARTINEZ
San Antonio	Bexar	IRR	C1931_1	1,440	88.6	148	SAN JUAN DITCH WSC	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1933_1	480	75.7	0	MISSION CEMETERY CO	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1942_1	886	92.1	132	ESPADA DITCH COMPANY	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1944_1	16	48.2	0	SAN ANTONIO MISSIONS NATL PARK	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1960_1	20	43.8	1	JOHN O SPICE	SALADO CRK
San Antonio	Bexar	IRR	C1962_1	10	48.3	2	JULIA H. KUSENER JACQUET ET AL	SALADO CRK
San Antonio	Bexar	IRR	C1965_1	300	48.8	50	LOMAS SANTA FE LTD	SALADO CRK
San Antonio	Bexar	IRR	C2140_1	963	75.1	41	METROPOLITAN RESOURCES INC	MEDINA RIVER
San Antonio	Bexar	IRR	C2141_1	75	80.3	0	BIPPERT FARMS	E BR BIG SOUS CRK
San Antonio	Bexar	IRR	C2142_1	197	90.0	45	ANTONIO MARIO FERNANDEZ	MEDINA RIVER
San Antonio	Bexar	IRR	C2142_2	3	88.0	0	BEXAR, COUNTY OF	MEDINA RIVER
San Antonio	Bexar	IRR	C2144_1	215	98.7	111	STRAUS MEDINA RANCH	MEDINA RIVER
San Antonio	Bexar	IRR	C2144_2	93	98.7	48	STRAUS MEDINA RANCH	MEDINA RIVER
San Antonio	Bexar	IRR	C2144_3	308	63.1	0	STRAUS MEDINA RANCH	MEDINA RIVER
San Antonio	Bexar	IRR	C2145_1	32	96.0	15	JERRY & MARIAM SPEARS	MEDINA RIVER
San Antonio	Bexar	IRR	C2146_1	215	100.0	215	BURRELL DAY	MEDINA RIVER
San Antonio	Bexar	IRR	C2147_1	28	93.2	14	JOSE LUIS AMADOR	ELM CRK
San Antonio	Bexar	IRR	C2148_1	8	92.7	4	DONALD G RAMBIE	ELM CRK
San Antonio	Bexar	IRR	C2149_1	32	100.0	32	RANDALL S PREISSIG TRUSTEE	LEON CRK
San Antonio	Bexar	IRR	C2150_1	62	100.0	62	ANGELINA BORDANO	LEON CRK
San Antonio	Bexar	IRR	C2151_1	1,500	82.3	165	SOUTH LOOP LAND & CATTLE LC	SAUZ CRK
San Antonio	Bexar	IRR	C2152_1	409	81.9	135	CAROLYN VANCE COOK	MITCHELL LAKE
San Antonio	Bexar	IRR	C2154_1	0	0.0	0	AKYROID & SIMMONS	MITCHELL LAKE
San Antonio	Bexar	IRR	C2154_2	200	52.5	24	ARNOLD ALBERT	MITCHELL LAKE
San Antonio	Bexar	IRR	C2155_1	240	100.0	240	LES MENDELSOHN	MEDINA RIVER
San Antonio	Bexar	IRR	C2156_1	294	100.0	294	CITY OF SAN ANTONIO	MEDINA RIVER
San Antonio	Bexar	IRR	C2157_1	50	100.0	50	LOUIS PAWELEK	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C2158_1	24	100.0	24	JOE S GARCIA JR ET UX	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C2159_1	60	100.0	60	CITY OF SAN ANTONIO	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C2160_1	116	100.0	116	BEN B MORRIS ESTATE	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C4768_5	0	0.0	0	BEXAR METROPOLITAN WATER DIST	Medio Cr. & Medina R.
San Antonio	Bexar	IRR	P3476_1	100	75.1	2	SAN ANTONIO RANCH LTD	UNNAMED OF LOS REYES CRK
San Antonio	Bexar	IRR	P3888_1	290	81.0	0	ALAN D BARIBEAU ET UX	MEDINA RIVER
San Antonio	Bexar	IRR	P4105_1	150	88.9	22	CITY OF LIVE OAK	SALITRILLO CRK
San Antonio	Bexar	IRR	P4105_2	0	0.0	0	WILLIAM F & BERNEICE CASTELLA	SALITRILLO CRK
San Antonio	Bexar	IRR	P4134_1	200	70.7	0	ANITA T WALSH ESTATE	MEDINA RIVER
San Antonio	Bexar	IRR	P4135_1	200	71.3	0	BESSIE WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4136_1	124	69.8	0	EDWARD WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4137_1	34	70.3	0	FRANK WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_2	92	70.9	0	EDWARD PATRICK WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_3	61	70.9	0	HARRY WALSH ESTATE	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_4	126	70.1	0	JOHN H SMALL	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_4	126	70.1	0	JOHN H SMALL	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_5	23	69.5	0	SAN ANTONIO WATER SYSTEM	MEDINA RIVER
San Antonio	Bexar	IRR	P4139_1	200	70.0	0	BESSIE WALSH	LEON CRK
San Antonio	Bexar	IRR	P4141_1	20	69.8	0	GULF LAND & INVESTMENT CO INC	LEON CRK
San Antonio	Bexar	IRR	P4141_2	23	69.7	0	H H GIRDLEY TRUSTEE	LEON CRK
San Antonio	Bexar	IRR	P4141_3	179	69.5	0	JOHN POWELL WALKER TRUSTEE	LEON CRK
San Antonio	Bexar	IRR	P4141_4	77	69.5	0	PEOPLES SAVINGS & LOAN ASSN	LEON CRK
San Antonio	Bexar	IRR	P4187_1	666	69.2	0	LOTTIE WALSH MAHLA ESTATE	LEON CRK
San Antonio	Bexar	IRR	P4294_1	40	99.4	26	MARY HARPER TUDHOPE	PARITA CRK
San Antonio	Bexar	IRR	P4361_1	20	79.8	4	JEROME & FLORENCE REAL	MARTINEZ CRK
San Antonio	Bexar	IRR	P4362_1	20	79.8	4	WALLACE REAL ET UX	MARTINEZ CRK
San Antonio	Bexar	IRR	P4496_1	30	79.7	6	WILLIAM WALLS JR	MARTINEZ CRK
San Antonio	Bexar	IRR	P4497_1	206	84.8	52	CARL RAY DRZYMALLA ET AL	MARTINEZ CRK
San Antonio	Bexar	IRR	P4498_1	83	79.1	6	VIRGINIA JAKSIK	MARTINEZ CRK
San Antonio	Bexar	IRR	P4499_1	54	79.1	4	JOSEPH M STANUSH ET AL	MARTINEZ CRK
San Antonio	Bexar	IRR	P5262_1	250	41.0	0	ANTHONY J GRANIERI	E CHANNEL
San Antonio	Bexar	IRR	P5265_1	35	88.9	7	MARY JAKSIK ZIGMOND	MARTINEZ CRK
San Antonio	Bexar	IRR	P5266_1	45	66.9	0	RANDALL K HOOVER ET UX	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	P5289_1	300	37.8	0	SOUTHEAST INVESTMENTS INC	ROSILLO CRK
San Antonio	Bexar	IRR	P5503_1	220	60.4	0	O-SPORTS GOLF DEVELOPMENT II	PANTHER SPRING CRK
San Antonio	Bexar	IRR	P5577_1	420	76.5	0	ROBERT L G WATSON	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	P5598_1	120	76.5	0	VERSTRAETEN BROTHERS FARMS INC	LONG HOLLOW CRK
San Antonio	Bexar	MIN	P4025_1	431	79.2	0	CAPITOL AGGREGATES INC	MEDINA RIVER
San Antonio	Bexar	MIN	P4025_2	769	72.3	0	CAPITOL AGGREGATES INC	MEDINA RIVER
San Antonio	Bexar	MIN	P4025_3	3,304	54.4	0	CAPITOL AGGREGATES INC	MEDINA RIVER
San Antonio	Bexar	MUN	C1959_1	150	100.0	150	BEXAR METROPOLITAN WATER DIST	SAN ANTONIO RIVER
San Antonio	Bexar	MUN	C1966_1	481	100.0	481	BEXAR METROPOLITAN WATER DIST	SAN ANTONIO RIVER
San Antonio	Bexar	MUN	C2162_4	100	100.0	100	CITY OF SAN ANTONIO	SAN ANTONIO RIVER
San Antonio	Bexar	MUN	C4768_1	89	100.0	89	BEXAR METROPOLITAN WATER DIST	MEDIO CRK
San Antonio	Bexar	MUN	C4768_2	417	100.0	417	BEXAR METROPOLITAN WATER DIST	MEDIO CRK
San Antonio	Bexar	MUN	C4768_3	4,494	96.8	3,394	BEXAR METROPOLITAN WATER DIST	Medio Cr. & Medina R.
San Antonio	Bexar	MUN	P4137_2	276	72.8	0	FRANK WALSH	MEDINA RIVER

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
San Antonio	Bexar	MUN	P4137_3	566	72.7	0	FRANK WALSH	MEDINA RIVER
San Antonio	Bexar	MUN	P4137_4	152	72.5	0	FRANK WALSH	MEDINA RIVER
San Antonio	Bexar	MUN	P5469_2	1,500	73.1	0	SAN ANTONIO WATER SYSTEM	LEON CRK
San Antonio	Bexar	MUN	P5517_1	7,500	69.5	0	SAN ANTONIO WATER SYSTEM	LEON CRK
San Antonio	Bexar	MUN	P5549_1	2,250	59.7	0	BEXAR METROPOLITAN WATER DIST	POLECAT CRK
San Antonio	Bexar	OTH	C1951_1	0	0.0	0	BEXAR METROPOLITAN WATER DIST	MINITA CRK
San Antonio	Bexar	OTH	JOSKE	2,891	100.0	2,891	SAWS (JOSKE & Hidelbrand wells)	SAN ANTONIO RIVER
San Antonio	Bexar	OTH	P3898_1	0	0.0	0	CITY OF SAN ANTONIO	OLMOS CRK
San Antonio	Bexar	OTH	P5469_1	0	0.0	0	SAN ANTONIO WATER SYSTEM	LEON CRK
San Antonio	Bexar	REC	571031_1	0	0.0	0	CENTEX	Lorence Creek
San Antonio	Bexar	REC	C1145_1	0	0.0	0	MARGARET B HARPER ET AL	BALCONES
San Antonio	Bexar	REC	C2019_1	241	100.0	241	THE BLUE WING CLUB	SAN ANTONIO RIVER
San Antonio	Bexar	REC	C2019_2	509	100.0	509	THE BLUE WING CLUB	SAN ANTONIO RIVER
San Antonio	Bexar	REC	C2019_3	250	64.4	0	THE BLUE WING CLUB	SAN ANTONIO RIVER
San Antonio	Bexar	REC	C2151_2	0	0.0	0	SOUTH LOOP LAND & CATTLE LC	SAUZ CRK
San Antonio	Bexar	REC	C4768_6	0	0.0	0	BEXAR METROPOLITAN WATER DIST	Medio Cr. & Medina R.
San Antonio	Bexar	REC	P4051_1	0	0.0	0	EL DORADO HOMES ASSN INC	UNNAMED TRIB BEITEL CRK
San Antonio	Bexar	REC	P4202_1	0	0.0	0	CITY OF SAN ANTONIO	APACHE CRK
San Antonio	Bexar	REC	P4440_1	0	0.0	0	CITY OF SAN ANTONIO	ALAZAN CRK
San Antonio	Bexar	REC	P4510_1	0	0.0	0	MIDWAY DEVELOPMENT COMPANY	UNNAMED TRIB SALADO CRK
San Antonio	Bexar	REC	P5391_1	0	0.0	0	SAN ANTONIO RIVER AUTHORITY	SAN ANTONIO RIVER
San Antonio	Bexar	REC	P5423_2	0	0.0	0	SAN ANTONIO PARKS & REC. DEPT.	UNNAMED TRIB HUESTA CRK
San Antonio	Bexar	WRP	P5596_1	770	58.0	0	BILLY T MITCHELL	MEDINA RIVER
San Antonio	Comal	REC	P4350_1	0	0.0	0	JOHN R BARRANCO JR	UNNAMED TRIB CIBOLO CRK
San Antonio	Goliad	IRR	C2193_1	284	96.5	142	JAMES M PETTUS ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2194_1	1,020	100.0	1,020	JULIA GANTT NEWTON ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2196_1	336	100.0	336	COLETO CATTLE COMPANY	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2197_1	86	95.9	43	JAMES M PETTUS II	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2198_1	0	0.0	0	ROBINSON CECIL RAMSEY ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2198_2	333	100.0	333	SAM HOUSTON CLINTON	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2199_1	325	100.0	325	SAM HOUSTON CLINTON ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P4117_1	950	93.4	236	JUNE PETTUS	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P4117_2	0	0.0	0	MRS JOE COHN	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P5079_1	114	93.1	26	JOHN C & SHERRY BROOKE	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P5220_1	90	93.1	19	CLARENCE F SCHENDEL ET UX	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P5313_1	100	99.7	84	EDWIN JACOBSON ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P5478_1	300	77.8	54	PATRICIA PITTMAN LIGHT	SAN ANTONIO RIVER
San Antonio	Goliad	WRP	C2195_1	410	99.0	365	JOE F FRENCH	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C1167_1	5	100.0	5	FRANK B KRAWIETZ	CIBOLO CRK
San Antonio	Karnes	IRR	C1168_1	30	100.0	30	ALOYS PAWELEK	CIBOLO CRK
San Antonio	Karnes	IRR	C2183_2	100	100.0	100	B. Pawelek/Yanta	Cibolo Creek
San Antonio	Karnes	IRR	C2184_1	120	85.0	8	BONNIE SKLOSS	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2184_2	80	78.1	2	BONNIE SKLOSS	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2185_1	90	93.5	22	FRANCIS MOY & MARY MOY KOWALIK	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2186_1	70	93.5	17	VINCENT LABUS JR	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2188_1	40	93.5	10	ALFRED MOCZYGEMBA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2190_1	100	100.0	100	FLORENCE S BAUMANN ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2192_1	140	100.0	140	HALLIS DAVENPORT REVC MAN TR	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3431_1	60	93.5	15	ANDREW RIVES ET UX	CIBOLO CRK
San Antonio	Karnes	IRR	P3767_1	20	93.6	5	FELIX MOCZYGEMBA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3803_1	80	90.4	17	OLIVE L RIDLEY ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3803_2	80	90.9	17	OLIVE L RIDLEY ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3808_1	232	84.8	15	FLAVIAN B MOCZYGEMBA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3851_1	50	90.3	11	SAM M. KORZEKWA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3852_1	50	90.3	11	THOMAS A KORZEKWA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3852_2	25	73.6	2	THOMAS A KORZEKWA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4002_1	80	79.9	17	CASPER F MOCZYGEMBA JR ET AL	CIBOLO CRK
San Antonio	Karnes	IRR	P4407_1	50	90.3	11	TOMMY NAJVAR ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4490_1	90	78.0	2	DANIEL R ANDERSON ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4503_1	55	78.1	1	HENRY D STRINGER JR	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4512_1	160	93.8	40	OLIVE L RIDLEY ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4536_1	100	90.3	21	JAMES M & NANCY W BAILEY	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4536_2	200	90.0	42	JAMES M & NANCY W BAILEY	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4538_1	150	90.3	32	ALICE P JENDRUSCH ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4561_1	525	90.3	110	RIO GRANDE RESOURCES CORP	CIBOLO CRK
San Antonio	Karnes	IRR	P5002_1	150	90.3	32	WM A JEFFERS JR & ANN JACKSON	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5043_1	150	93.1	37	MELANIE A JACOBS ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5044_1	150	90.0	32	CHARLES WAYNE HUBBARD ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5062_1	100	90.0	21	ALFRED J RAHE	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5214_1	100	77.8	7	OTTO WACLASWCZYK	CIBOLO CRK
San Antonio	Karnes	IRR	P5239_1	4	89.7	1	HOLY TRINITY CATHOLIC CHURCH	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5296_1	74	90.3	16	DENNIS J MOY	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5306_1	200	90.0	42	HERBERT JOHN EWALD JR ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5323_1	100	76.6	7	WILLIAM I DUBEL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5333_1	90	76.7	6	HECTOR O HERRERA, ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5333_2	300	76.6	20	HECTOR O HERRERA, ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5367_1	300	76.6	20	SUSIE LEE YANTA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5368_1	300	76.6	20	ARTHUR RAY YANTA ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5455_1	3	76.5	0	DAVID C. "CHARLIE" ZUNKER	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5532_1	3	75.0	0	FELIX BRONDER	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5622_1	240	70.8	8	JAY E. BAKER ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	PPAWL_1	350	72.9	23	MIKE PAWALEK	Cibolo Creek
San Antonio	Karnes	REC	C2191_1	0	0.0	0	JOHN A FOGELLE ET AL	ESCONDIDO CRK
San Antonio	Karnes	WRP	C2189_1	350	99.0	311	CLEM R CANNON ET AL	SAN ANTONIO RIVER
San Antonio	Kendall	IRR	C1142_1	4	94.1	0	JEB B MAEBIUS JR ET UX	CIBOLO CRK
San Antonio	Kendall	IRR	C1144_1	48	97.2	0	WILLIS JAY HARPOLE	FREDERICK CRK
San Antonio	Kendall	IRR	C1144_2	7	96.9	0	WILLIS JAY HARPOLE	ROBROY CRK
San Antonio	Kendall	IRR	C2042OC	209	30.1	0	THOMAS L BRUNDAGE ET AL	CYPRESS CRK
San Antonio	Kendall	MUN	C1143_1	523	99.1	325	CITY OF BOERNE	CIBOLO CRK

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
San Antonio	Kendall	MUN	C1143_2	310	99.0	181	CITY OF BOERNE	CIBOLO CRK
San Antonio	Kendall	REC	C1142_2	0	0.0	0	JEB B MAEBIUS JR ET UX	CIBOLO CRK
San Antonio	Kendall	REC	C1169_1	0	0.0	0	CITY OF BOERNE	CIBOLO CRK
San Antonio	Kendall	REC	P3752_1	0	0.0	0	AFFILIATED DEVELOPERS INC	CIBOLO CRK
San Antonio	Kendall	REC	P4001_1	0	0.0	0	WILLIS JAY HARPOLE	FREDERICK
San Antonio	Kendall	REC	P4211_1	0	0.0	0	SMITH INVESTMENT COMPANY	FREDERICK CRK
San Antonio	Medina	IRR	C2130_4	45,856	83.2	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	IRR	C2131_1	0	0.0	0	Bexar-Medina-Atascosa WCID #1	Chacon Creek
San Antonio	Medina	IRR	C2133_1	18	84.4	0	HARLEY & DOROTHY TSCHIRHART	MEDINA RIVER
San Antonio	Medina	IRR	C2134_1	17	86.0	0	GLENNIS W STEIN	MEDINA RIVER
San Antonio	Medina	IRR	C2135_1	5	95.8	1	KITTIE NELSON FERGUSON	SAN GERONIMO CRK
San Antonio	Medina	IRR	C2136_1	6	88.4	0	KITTIE NELSON FERGUSON	UNNAMED TRIB SAN GERONIMO CRK
San Antonio	Medina	IRR	C2139_1	112	84.8	0	A L GILLIAM	MEDINA RIVER
San Antonio	Medina	IRR	P4140_1	185	63.5	0	KATHLEEN DAVENPORT CARSKADDEN	MEDINA RIVER
San Antonio	Medina	IRR	P4149_1	20	67.2	0	GLENNIS W STEIN	MEDINA RIVER
San Antonio	Medina	IRR	P4151_1	170	67.2	0	JAMES A OPPELT ET UX	MEDINA RIVER
San Antonio	Medina	IRR	P4159_1	50	66.9	0	MARIE I HABY ET AL	MEDINA RIVER
San Antonio	Medina	IRR	P4170_1	15	64.7	0	TWAIN J JAGGE ET UX	MEDINA RIVER
San Antonio	Medina	IRR	P4434_1	156	66.9	0	ALVIN C & CARMEN SANTLEBEN	MEDINA RIVER
San Antonio	Medina	MUN	C2130_1	750	92.6	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	MUN	C2130_2	170	92.6	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	MUN	C2130_3	19,974	83.4	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	RCG	P3220_1	9,996	8.2	0	EDWARDS UNDERGROUND WD	SAN GERONIMO
San Antonio	Medina	REC	C2132_1	0	0.0	0	MEDINA RANCH INC	MEDINA RIVER
San Antonio	Medina	REC	C2137_1	0	0.0	0	TEXAS PARKS & WILDLIFE DEPT	MEDINA RIVER
San Antonio	Wilson	IRR	C1148_1	11	100.0	11	ALLAN G LYNHAM ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1149_1	62	100.0	62	RAY SMITH ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1150_1	200	100.0	200	PAT HIGGINS ESTATE	CIBOLO CRK
San Antonio	Wilson	IRR	C1151_1	86	100.0	86	RAYMOND D HEGWER ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1152_1	35	96.8	18	BILL & MELVIN DEAGEN ET AL	CIBOLO CRK
San Antonio	Wilson	IRR	C1153_1	100	93.5	25	WAYNE H STROUD ET AL	CIBOLO CRK
San Antonio	Wilson	IRR	C1154_1	69	100.0	69	JONAH H WILSON	CIBOLO CRK
San Antonio	Wilson	IRR	C1155_1	42	100.0	42	SIESTA CATTLE COMPANY	CIBOLO CRK
San Antonio	Wilson	IRR	C1156_1	35	100.0	35	WAYNE H STROUD ET AL	CIBOLO CRK
San Antonio	Wilson	IRR	C1158_1	30	95.9	15	VIVA LEA MILLS	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_1	0	0.0	0	DEBORAH M IRWIN ET VIR	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_2	13	96.5	7	GAYLON T CLICK ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_3	16	96.5	8	GAYLON T CLICK ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_4	7	96.5	4	PATRICK NEIDORF	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_5	3	96.3	1	WAYNE DODD ET AL TRUSTEES	CIBOLO CRK
San Antonio	Wilson	IRR	C1160_1	140	96.0	70	MRS MAGGIE WEBER	CIBOLO CRK
San Antonio	Wilson	IRR	C1161_1	15	95.9	7	JOHN DRZYMALA	CIBOLO CRK
San Antonio	Wilson	IRR	C1162_1	2	93.6	1	ALVIN PRUSKI	CIBOLO CRK
San Antonio	Wilson	IRR	C1162_2	78	88.9	16	ALVIN PRUSKI	CIBOLO CRK
San Antonio	Wilson	IRR	C1163_1	80	100.0	80	CYNTHIA A TITZMAN ET VIR	CIBOLO CRK
San Antonio	Wilson	IRR	C1164_1	6	96.5	3	JANE LYSSY OPIELA ET AL	CIBOLO CRK
San Antonio	Wilson	IRR	C1165_1	4	100.0	4	EMERYK KELLER	CIBOLO CRK
San Antonio	Wilson	IRR	C1166_1	25	96.5	13	GERVAS JASKINIA ESTATE	CIBOLO CRK
San Antonio	Wilson	IRR	C1171_1	80	99.8	69	ROSS OWEN SCULL	CIBOLO CRK
San Antonio	Wilson	IRR	C1171_2	250	90.3	52	ROSS OWEN SCULL	CIBOLO CRK
San Antonio	Wilson	IRR	C1171_3	330	78.2	22	ROSS OWEN SCULL	CIBOLO CRK
San Antonio	Wilson	IRR	C2163_1	44	100.0	44	CHARLES HONEYCUTT, ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2163_2	256	76.7	6	CHARLES HONEYCUTT, ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2164_1	23	100.0	23	JOHN WILLIAM HELTON JR ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2164_2	59	71.3	0	JOHN WILLIAM HELTON JR ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2165_1	50	93.5	13	ED WISEMAN MARITAL TRUST	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2165_2	70	69.2	0	ED WISEMAN MARITAL TRUST	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2166_1	105	96.8	52	NICK KOLENDA	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2166_2	95	71.3	0	NICK KOLENDA	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2167_1	17	100.0	17	TOMAS CAVAZOS	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2168_1	16	95.7	8	H W FINCK	UNNAMED TRIB SEGUIN BR
San Antonio	Wilson	IRR	C2169_1	29	100.0	29	JIMMY E HOLT ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2169_2	18	100.0	18	RICHARD E ULLMANN ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2171_1	63	99.8	54	R C CARROLL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2172_1	18	100.0	18	CLYDE R MAHA ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2172_2	0	0.0	0	MELBA L MAHA KOTARA	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2174_1	14	100.0	14	WILLIE HOSEK ESTATE	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2175_1	38	100.0	38	WELMA L R KIRCHOFF ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2175_2	60	68.5	0	WELMA L R KIRCHOFF ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2176_1	105	100.0	105	POTH LAND & CATTLE CO	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2176_2	145	71.3	0	POTH LAND & CATTLE CO	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2177_1	81	100.0	81	FRANK & J A LABUS	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2178_1	1	100.0	1	FELIX J JANEK JR ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2178_2	5	100.0	5	FELIX J JANEK JR ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2178_3	15	76.0	0	FELIX J JANEK JR ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2178_4	42	100.0	42	SIX J FARMS INC	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2178_5	175	100.0	175	SIX J FARMS INC	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2178_6	485	76.4	0	SIX J FARMS INC	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2179_1	47	100.0	47	A D D CORPORATION	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2179_2	72	100.0	72	A D D CORPORATION	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2179_3	39	100.0	39	A D D CORPORATION	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2179_4	467	77.2	11	A D D CORPORATION	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2180_1	18	100.0	18	DONALD A OCKER ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2180_2	110	100.0	110	DONALD A OCKER ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2180_3	497	76.9	11	DONALD A OCKER ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2181_1	64	100.0	64	FRED J LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2181_2	157	77.6	4	FRED J LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2181_3	159	77.3	4	FRED J LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2182_1	700	93.5	174	LEO V LYSSY ET AL	SAN ANTONIO RIVER

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
San Antonio	Wilson	IRR	C2182_2	166	71.3	0	LEO V LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3837_1	21	84.6	1	LAWRENCE R HALLIBURTON ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3837_2	29	84.6	2	W H HALLIBURTON, ESTATE OF	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3861_1	200	84.5	13	GEO D POOL & RONALD R STINSON	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3887_1	50	84.4	3	PATTILLO FAMILY FARMS INC	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3897_1	716	50.0	36	ALFRED J NEWMAN, ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3994_1	1,056	82.2	70	BOENING ENTERPRISES	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4121_1	38	78.1	1	BENITO D. CABRIALES ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4181_1	86	78.1	2	BERTRAND O BAETZ ESTATE ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4181_2	120	76.7	3	BERTRAND O BAETZ ESTATE ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4484_1	5	76.6	0	DELBERT J KELLER	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4484_2	200	89.4	41	DELBERT J KELLER	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4484_3	100	92.7	24	DELBERT J KELLER	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4495_1	50	78.2	1	WILLIAM & IRENE C WALLS JR	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5126_1	150	77.3	4	WILLIAM M PAVLISKA	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5171_1	200	77.3	5	MESCALERO PROPERTIES	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5182_1	100	78.9	7	JAMES T WATSON	CIBOLO CRK
San Antonio	Wilson	IRR	P5194_1	210	77.2	5	JOE R HOLLAWAY JR ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5202_1	75	76.7	2	GEORGE R GAWLIK ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5218_1	360	89.0	75	WILLIAM P REDDICK ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	P5224_1	60	88.9	13	JOHNNY KOSUB & BETTY KOSUB	CIBOLO CRK
San Antonio	Wilson	IRR	P5243_1	54	76.2	0	FRANK R BOLF	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5264_1	130	71.3	0	LILLIAN S WISEMAN TRUST ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5307_1	300	71.3	0	JAMES R LEININGER	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5308_1	100	68.3	7	SAM JARZOMBEK	CIBOLO CRK
San Antonio	Wilson	IRR	P5320_1	200	69.3	0	SHELBY KOEHLER ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5395_1	254	69.2	0	RENATO MARTINEZ ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5395_2	450	68.8	0	RENATO MARTINEZ ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5499_1	50	68.5	0	GARY ZOOK, ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5559_1	99	64.7	3	RALPH MCGREW ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	P5587_1	300	53.3	0	ALOIS D KOLLODZIEJ ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5611_1	175	63.0	5	ELIAS DUGI, ET UX	CIBOLO CREEK
San Antonio	Wilson	IRR	P5633_1	130	94.3	0	LOUIS T. AND SONIA ROSENBERG	UNNAMED TRIB SAN ANTONIO
San Antonio	Wilson	MUN	C1157_1	117	93.8	33	OSCAR SANDERS	CIBOLO CRK
San Antonio	Wilson	OTH	C2170_1	0	0.0	0	HERMAN T. HEREFORD FARM	CONNALLY CRK
San Antonio	Wilson	REC	P5298_1	0	0.0	0	PATTEN CORPORATION SOUTHWEST	EAGLE CRK
San Antonio	Wilson	WRP	C2173_1	78	99.0	70	CECIL MARK RICHARDSON ET AL	SAN ANTONIO RIVER
Nueces	Atascosa	IND	P5145_1	0	0.0	0	SAN MIGUEL ELECTRIC COOP INC	Unnamed Trib of Caballos Creek
Nueces	Atascosa	IRR	C3213_1	13	1.6	0	SAM COUNTISS	UNNAMED TRIB LIVE OAK CRK
Nueces	Atascosa	IRR	C3216_1	20	42.6	0	ATASCOSA COWBOY RECREATION	UNNAMED TRIB ATASCOSA RIVER
Nueces	Atascosa	IRR	C3217_1	27	41.0	0	WOODROW W MARSH	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3218_1	7	40.9	0	JACK L MCGINNIS ET UX	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3218_2	11	41.0	0	DOYLE LAWHON ET UX	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3219_1	30	41.1	0	ERNEST KORUS	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3219_2	0	0.0	0	IRENE KORUS SEILER	ATASCOSA RIVER
Nueces	Atascosa	IRR	C4772_1	2	100.0	1	MAGSONS N. V.	BONITA CRK
Nueces	Atascosa	MIN	P5511_1	120	0.7	0	SAN MIGUEL ELECTRIC COOP INC	UNNAMED TRIB LA PARITA CRK
Nueces	Dimmit	IRR	C3082_12	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Soldier and Espantosa Slough
Nueces	Dimmit	IRR	C3082_13	0	0.0	0	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Dimmit	IRR	C3082_4	0	0.0	0	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Dimmit	IRR	C3082_5	0	0.0	0	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Dimmit	IRR	C3082_6	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Soldier and Espantosa Slough
Nueces	Dimmit	IRR	C3082_7	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Unnamed Trib to Live Oak Slough
Nueces	Dimmit	IRR	C3082_8	19,996	55.9	1,839	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Dimmit	IRR	C3086_1	554	30.2	0	CHARLES W. WILSON, SR., ET AL	NUECES RIVER
Nueces	Dimmit	IRR	C3093_1	102	100.0	102	CHARLES H THALMAN	BERMUDA RES- SOLDIER SLOUGH
Nueces	Dimmit	IRR	C3094_1	300	100.0	300	ALBERT IVY	LIVE OAK CRK
Nueces	Dimmit	IRR	C3095_1	1,090	100.0	1,090	MARRS MCLEAN BOWMAN	NUECES RIVER
Nueces	Dimmit	IRR	C3095_2	201	100.0	201	MARRS MCLEAN BOWMAN	NUECES RIVER
Nueces	Dimmit	IRR	C3096_1	337	100.0	337	DONALD JACKSON ET UX	NUECES RIVER
Nueces	Dimmit	IRR	C3097_1	231	100.0	231	DALE L HASTEN	NUECES RIVER
Nueces	Dimmit	IRR	C3098_1	60	52.3	0	LUCILE C WHITECOTTON ET AL	SOLDIER SLOUGH
Nueces	Dimmit	IRR	C3099_1	34	40.1	0	CHARLES W & MARJORIE V WILSON	EL BARROSA CRK
Nueces	Dimmit	IRR	C3102_1	15	36.2	0	NEEDMORE RANCH INC	APPURCEON CRK
Nueces	Dimmit	IRR	C3103_1	400	82.0	1	R W BRIGGS, JR	BURRO CRK
Nueces	Dimmit	IRR	P5631_1	0	0.0	0	LOUIS STUMBERG, JR.	
Nueces	Dimmit	IRR	P5631_2	0	0.0	0	LOUIS STUMBERG, JR.	
Nueces	Dimmit	IRR	P5650_1	0	0.0	0	BRISCO	
Nueces	Dimmit	IRR	P5661_1	0	0.0	0	NUNLEY	
Nueces	Dimmit	IRR	P5661_2	0	0.0	0	NUNLEY	
Nueces	Dimmit	IRR	P5661_3	0	0.0	0	NUNLEY	
Nueces	Dimmit	MIN	C3082_9	4	32.5	0	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Dimmit	MIN	C3093_2	1	100.0	1	CHARLES H THALMAN	SOLDIER SLOUGH
Nueces	Dimmit	REC	C3101_1	0	0.0	0	J R MARMION JR	UNNAMED TRIB EL MORO CRK
Nueces	Frio	IRR	C3193_1	8	33.9	0	HOWARD F BENNETT	FRIO RIVER
Nueces	Frio	IRR	C3199_1	50	17.6	0	PANTHER HOLLOW RANCH, LTD	UNNAMED TRIB TODOS SANTOS CRK
Nueces	Frio	IRR	C3208_1	230	0.0	0	COX FEEDLOTS INC	UNNAMED TRIB CHACON CRK
Nueces	Frio	IRR	C3209_1	118	85.8	63	E F MORRIS	CHACON CRK
Nueces	Frio	IRR	C3210_1	20	40.1	0	FRANCIS MALDONADO	UNNAMED TRIB SAN MIGUEL CRK
Nueces	Frio	IRR	C3211_1	40	87.8	22	GLEN EARL BAKER	SAN MIGUEL CRK
Nueces	Frio	IRR	C3211_2	60	68.2	25	GLEN EARL BAKER	SAN MIGUEL CRK
Nueces	Frio	IRR	C3212_1	25	0.0	0	CHARLES CURTIS RAMSEY ET UX	BUCKHORN CRK
Nueces	Frio	IRR	P3884_1	80	0.0	0	CLAUDE D J SMITH	SAN MIGUEL CRK
Nueces	Frio	IRR	P3914_1	19	0.2	0	A E SCHLETZE FARMS	ELM CRK
Nueces	Frio	IRR	P3914_2	7	0.0	0	A R GALLOWAY ET UX	ELM CRK
Nueces	Frio	IRR	P4014_1	124	0.0	0	JOE H BERRY	LEONA RIVER
Nueces	Frio	IRR	P4041_1	25	0.0	0	FLOYD B NEUMAN	SAN MIGUEL CRK
Nueces	Frio	IRR	P4041_2	20	0.0	0	FLOYD B NEUMAN	SAN MIGUEL CRK
Nueces	Frio	IRR	P4113_1	15	4.7	0	DR LESLIE R FRICKE	SAN MIGUEL CRK
Nueces	Frio	MUN	C3200_1	0	0.0	0	T E BURNS ET AL	MARTINE CRK

Basin	*County of Diversion Location(s)*	*Use*	*WR ID#*	*Authorized Diversion (acft/yr)*	*Volume Reliability (%)*	*Minimum Annual Diversion (acft)*	*Owner*	*Stream*
Nueces	La Salle	IRR	C3104_1	250	97.3	149	WAITZ SUPER MARKET, INC	NUECES RIVER
Nueces	La Salle	IRR	C3105_1	150	99.9	131	FRANKLIN JERRY MEEKS	NUECES RIVER
Nueces	La Salle	IRR	C3106_1	20	91.2	6	M C WHITWELL ET UX	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3106_2	20	88.9	5	M C WHITWELL ET UX	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3107_1	210	30.9	7	CARL CONWAY	NUECES RIVER
Nueces	La Salle	IRR	C3108_1	298	19.9	0	C L LEHMAN ESTATE	NUECES RIVER
Nueces	La Salle	IRR	C3109_1	10	33.1	0	M C WHITWELL ET UX	NUECES RIVER
Nueces	La Salle	IRR	C3111_1	30	87.9	14	EUGENE WHITE	NUECES RIVER
Nueces	La Salle	IRR	C3112_1	47	94.5	33	FREDNA K DOBIE	NUECES RIVER
Nueces	La Salle	IRR	C3114_1	199	94.0	140	RALPH P. GUTTMAN	NUECES RIVER
Nueces	La Salle	IRR	C3115_1	55	92.7	39	VALLEY FLEA MARKET INC	NUECES RIVER
Nueces	La Salle	IRR	C3116_1	33	92.4	23	BRENDA JOAN BOYD	NUECES RIVER
Nueces	La Salle	IRR	C3116_2	145	92.4	102	PRINCE WOOD ET AL	NUECES RIVER
Nueces	La Salle	IRR	C3117_1	270	90.1	184	ROBERT CARL HART ET UX	NUECES RIVER
Nueces	La Salle	IRR	C3118_1	50	100.0	50	GLENN T ROBERTS ET UX	NUECES RIVER
Nueces	La Salle	IRR	C3119_1	40	100.0	40	MANUEL TRISTON RAMIREZ	NUECES RIVER
Nueces	La Salle	IRR	C3120_1	200	100.0	200	JOE L. GILBERT	NUECES RIVER
Nueces	La Salle	IRR	C3121_1	5	100.0	5	RUDY & TERESA RODRIGUEZ SR	NUECES RIVER
Nueces	La Salle	IRR	C3122_1	30	100.0	30	SANTANA A MORIN ET AL	NUECES RIVER
Nueces	La Salle	IRR	C3123_1	70	100.0	70	LOUIS OSWALD LIND	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3123_2	130	100.0	126	LOUIS OSWALD LIND	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3124_1	5	100.0	5	RAUL DEL TORO ET UX	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3125_1	20	65.3	0	GEORGE & SHARON TRIGO	NUECES RIVER
Nueces	La Salle	IRR	C3126_1	100	72.8	10	SILLER BROTHERS	NUECES RIVER
Nueces	La Salle	IRR	C3126_2	260	58.3	8	SILLER BROTHERS	NUECES RIVER
Nueces	La Salle	IRR	C3127_1	180	79.6	18	LEE M & VALDA M GATES	NUECES RIVER
Nueces	La Salle	IRR	C3128_1	39	81.1	5	VALDA M GATES	NUECES RIVER
Nueces	La Salle	IRR	C3129_1	180	83.9	26	LOUISE G DAVIS	NUECES RIVER
Nueces	La Salle	IRR	C3130_1	126	77.8	32	BILLIE JEAN TAYLOR	NUECES RIVER
Nueces	La Salle	IRR	C3131_1	50	77.8	11	RONALD C FEUDO	NUECES RIVER
Nueces	La Salle	IRR	C3132_1	195	77.6	34	EL TRES EXPLORATION INC	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3133_1	54	89.9	24	H B RAMSEY	NUECES RIVER
Nueces	La Salle	IRR	C3133_2	296	87.2	123	RODNEY D JONES	NUECES RIVER
Nueces	La Salle	IRR	C3134_1	398	81.2	148	GEORGE C HIXON	NUECES RIVER
Nueces	La Salle	IRR	C3135_1	42	100.0	42	H.B. RAMSEY	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3135_2	38	78.4	14	H.B. RAMSEY	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3136_1	200	100.0	200	DOROTHY M. KINSEL	NUECES RIVER
Nueces	La Salle	IRR	C3137_1	84	78.1	23	T.G. RANKIN	NUECES RIVER
Nueces	La Salle	IRR	C3138_1	55	78.0	14	CHARLES D. JOHNSON	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3139_1	2,023	94.5	1,195	HOLLAND TEXAS DAM & IRR. CO.	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3140_1	76	87.6	0	FRED HILLJE ESTATE	NUECES RIVER
Nueces	La Salle	IRR	C3201_1	649	38.9	0	JEFF E RUSK ET AL	FRIO RIVER
Nueces	La Salle	IRR	C3203_1	106	48.6	0	DOUGLAS A MILLER, ET AL	UNNAMED SLOUGH FRIO RIVER
Nueces	La Salle	MUN	P5170_1	0	0.0	0	PATRICK HUGHES WELDER JR	UNNAMED TRIB GREEN BR
Nueces	Medina	IRR	C3189_1	40	6.4	0	RICHARD W SCHWEERS	HONDO CRK
Nueces	Medina	IRR	C3190_1	80	25.6	0	WIMBERLY DEVELOPMENT CORP	UNNAMED TRIB HONDO CRK
Nueces	Medina	IRR	C3191_1	20	16.4	0	L S MOLLERE, TRUSTEE	SECO CRK
Nueces	Medina	IRR	C3207_1	2,000	0.7	0	BEXAR-MEDINA-ATASCOSA WCID 1	CHACON CRK
Nueces	Medina	IRR	P4286_1	4	0.0	0	C H PIFER	CHACON CRK
Nueces	Medina	IRR	P4506_1	40	0.1	0	JAMES THOMAS BAGBY JR	HONDO CRK
Nueces	Medina	IRR	P5783_1	35	0.0	0	MUMME	
Nueces	Medina	OTH	P5192_1	0	0.0	0	JOHN ROBERT WINDROW ET UX	W BR LIVE OAK
Nueces	Medina	RCG	C3192_1	6,012	0.0	0	EDWARDS UNDERGROUND WATER DIST	PARKERS CRK
Nueces	Medina	RCG	P3745_1	12,172	0.3	0	EDWARDS UNDERGROUND W D	MIDDLE VERDE
Nueces	Medina	RCG	P3806_1	42,258	1.5	0	EDWARDS UNDERGROUND W D	SECO CRK
Nueces	Uvalde	IND	C3087_1	10	89.4	0	R L WHITE COMPANY	GATO CRK
Nueces	Uvalde	IRR	C3064_1	150	11.8	0	ADANA TEAGUE	NUECES RIVER
Nueces	Uvalde	IRR	C3065_1	720	100.0	720	GLENN WILLIAMS & TERRY WYNN	NUECES RIVER
Nueces	Uvalde	IRR	C3066_1	10	11.7	0	GEORGE H MOFF	NUECES RIVER
Nueces	Uvalde	IRR	C3067_1	1,461	87.7	124	EVERETT L CLARK	NUECES RIVER
Nueces	Uvalde	IRR	C3068_1	310	85.0	12	WILLARD R WALLACE ET AL	NUECES RIVER
Nueces	Uvalde	IRR	C3069_1	134	54.0	0	ARIZONA T CRUMP	NUECES RIVER
Nueces	Uvalde	IRR	C3072_1	200	52.1	0	MIRASOL RANCH FAMILY LTD PART	NUECES RIVER
Nueces	Uvalde	IRR	C3073_1	144	8.8	0	SAM BARKLEY	NUECES RIVER
Nueces	Uvalde	IRR	C3163_1	113	39.3	0	JOHN HAMMAN JR ESTATE	FRIO RIVER
Nueces	Uvalde	IRR	C3163_2	133	0.3	0	JOHN HAMMAN JR ESTATE	FRIO RIVER
Nueces	Uvalde	IRR	C3165_1	86	39.2	0	WALLACE S & ISABEL B WILSON	FRIO RIVER
Nueces	Uvalde	IRR	C3166_1	35	41.3	0	JOE C KRANZ ET UX	FRIO RIVER
Nueces	Uvalde	IRR	C3167_1	11	39.8	0	MACONDA BROWN O'CONNOR	FRIO RIVER
Nueces	Uvalde	IRR	C3168_1	4	41.2	0	JOHN S BUCHANAN	FRIO RIVER
Nueces	Uvalde	IRR	C3168_2	37	39.6	0	JOHN S BUCHANAN	FRIO RIVER
Nueces	Uvalde	IRR	C3169_1	40	39.2	0	JOHN S. GRAVES, JR, ET AL	MAYHEW
Nueces	Uvalde	IRR	C3170_1	19	15.3	0	JOHN M & MARY ANN BARKLEY	FRIO RIVER
Nueces	Uvalde	IRR	C3171_1	75	33.0	0	MICHAEL L STONER	FRIO RIVER
Nueces	Uvalde	IRR	C3172_1	1,000	0.3	0	THOMAS & GRETEL EKBAUM	FRIO RIVER
Nueces	Uvalde	IRR	C3173_1	1,000	0.3	0	ALVIN M RIMKUS	FRIO RIVER
Nueces	Uvalde	IRR	C3174_1	31	17.9	0	RIO GRANDE CHILDRENS HOME INC	DRY FRIO RIVER
Nueces	Uvalde	IRR	C3175_1	9	15.2	0	EL CAMINO GIRL SCOUT COUNCIL	DRY FRIO RIVER
Nueces	Uvalde	IRR	C3182_1	40	8.5	0	PAUL G SILBER JR	SABINAL RIVER
Nueces	Uvalde	IRR	C3182_2	0	0.0	0	TRAVIS R STEWART ET UX	SABINAL RIVER
Nueces	Uvalde	IRR	C3194_1	50	0.0	0	GEORGE E LIGOCKY	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	C3194_2	49	0.0	0	GEORGE E LIGOCKY	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	C3196_1	40	10.9	0	SAMUEL DON SMITH	LEONA RIVER
Nueces	Uvalde	IRR	C3197_1	523	81.7	236	MARJORIE LEE KERR ESTATE	LEONA RIVER
Nueces	Uvalde	IRR	C3197_2	305	81.7	138	MARJORIE LEE KERR ESTATE	LEONA RIVER
Nueces	Uvalde	IRR	P3988_1	28	0.0	0	GEORGE LIGOCKY	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P3989_1	56	0.0	0	JAMES C HENRY, ET UX	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P3990_1	30	0.0	0	DON INMAN	UNNAMED TRIB COOK'S SLOUGH

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Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Nueces	Uvalde	IRR	P3991_1	250	40.3	0	D S TURNER ET UX	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P4177_1	200	0.6	0	MARVIN G VERSTUYFT ET AL	FRIO RIVER
Nueces	Uvalde	IRR	P4177_2	795	0.6	0	MARVIN G VERSTUYFT ET AL	FRIO RIVER
Nueces	Uvalde	IRR	P4238_1	140	0.3	0	CON CAN ENTERPRISES INC	FRIO RIVER
Nueces	Uvalde	IRR	P4305_1	1,140	0.3	0	A C SANDERLIN ET AL	FRIO RIVER
Nueces	Uvalde	IRR	P4352_1	110	0.3	0	LOUIS A WATERS	LITTLE CRK
Nueces	Uvalde	IRR	P5063_1	94	0.4	0	GAFFORD FAMILY PARTNERSHIP	FRIO RIVER
Nueces	Uvalde	IRR	P5241_1	108	0.3	0	BARKAT LAND & CATTLE CO	FRIO RIVER
Nueces	Uvalde	IRR	P5325_1	255	0.3	0	RONALD E LEE, JR	SABINAL RIVER
Nueces	Uvalde	IRR	P5372_1	320	0.3	0	ROBERT L K LYNCH ET AL	FRIO RIVER
Nueces	Uvalde	MUN	P3913_1	0	0.0	0	JOE G SMYTH JR	WOOD SLOUGH
Nueces	Uvalde	MUN	P4505_1	200	1.0	0	UTOPIA WATER SUPPLY CORP	SABINAL RIVER
Nueces	Uvalde	MUN	P5063_2	6	0.7	0	GAFFORD FAMILY PARTNERSHIP	FRIO RIVER
Nueces	Uvalde	MUN	P5497_1	35	0.6	0	CONCAN WATER SUPPLY CORP	FRIO RIVER
Nueces	Uvalde	REC	C3063_1	0	0.0	0	COUNTY OF UVALDE	NUECES RIVER
Nueces	Uvalde	REC	C3164_1	0	0.0	0	TEXAS PARKS & WILDLIFE DEPT	FRIO RIVER
Nueces	Uvalde	REC	C3195_1	0	0.0	0	UVALDE COUNTY	LEONA RIVER
Nueces	Uvalde	REC	P5297_1	0	0.0	0	CITY OF UVALDE	LEONA RIVER
Nueces	Uvalde	REC	P5304_1	0	0.0	0	CAMP RIVERVIEW INC	FRIO RIVER
Nueces	Uvalde	REC	P5398_1	0	0.0	0	ROBERT B NUNLEY JR ET AL	UNNAMED TRIB E ELM CRK
Nueces	Zavala	IRR	C3074_1	200	8.8	0	DONALD R LINDENBORN JR TRUSTEE	NUECES RIVER
Nueces	Zavala	IRR	C3075_1	124	8.8	0	WALTER D MOORE	NUECES RIVER
Nueces	Zavala	IRR	C3076_1	200	8.8	0	DON P DIXON	NUECES RIVER
Nueces	Zavala	IRR	C3077_1	200	8.8	0	K & M FARMS	NUECES RIVER
Nueces	Zavala	IRR	C3078_1	200	8.8	0	WILBA RALPH WALKER ET AL	NUECES RIVER
Nueces	Zavala	IRR	C3079_1	313	8.8	0	JACK RUTLEDGE	NUECES RIVER
Nueces	Zavala	IRR	C3080_1	75	4.6	0	F F BONNET EX UX	NUECES RIVER
Nueces	Zavala	IRR	C3080_2	0	0.0	0	F F BONNET EX UX	NUECES RIVER
Nueces	Zavala	IRR	C3081_1	390	18.3	0	GEORGE C THOREEN ET AL	NUECES RIVER
Nueces	Zavala	IRR	C3082_1	8,000	47.5	0	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Zavala	IRR	C3082_10	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Unnamed Trib to Nueces River
Nueces	Zavala	IRR	C3082_11	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Alligator Slough
Nueces	Zavala	IRR	C3082_2	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Unnamed Trib to Nueces River
Nueces	Zavala	IRR	C3082_3	0	0.0	0	ZAVALA-DIMMIT CO WID 1	Alligator Slough
Nueces	Zavala	IRR	C3083_1	230	17.2	0	MARIO A ESCOBAR ET UX	NUECES RIVER
Nueces	Zavala	IRR	C3084_1	80	18.3	0	OPAL E C MARBURGER	NUECES RIVER
Nueces	Zavala	IRR	C3085_1	320	8.8	0	WARD L BOX	NUECES RIVER
Nueces	Zavala	IRR	C3088_1	150	95.6	0	CHAPARROSA RANCHES, LTD	CHAPARROSA CRK
Nueces	Zavala	IRR	C3089_1	206	90.2	0	ERROL O JONSSON ET AL	CHACON CRK
Nueces	Zavala	IRR	C3090_1	45	37.8	0	JIM G FERGUSON, JR	COMANCHE CRK
Nueces	Zavala	IRR	C3090_2	65	28.6	0	JIM G FERGUSON, JR	COMANCHE CRK
Nueces	Zavala	IRR	C3091_1	800	46.7	0	L C ROBBINS JR	COMANCHE CRK
Nueces	Zavala	IRR	C3091_2	400	45.5	0	TURKEY CREEK RANCHES LTD	COMANCHE CRK
Nueces	Zavala	IRR	C3091_3	400	45.3	0	FRANK W HARBORTH	COMANCHE CRK
Nueces	Zavala	IRR	C3091_4	498	44.0	0	RICHARD DALE LEDOUX ET AL	COMANCHE CRK
Nueces	Zavala	IRR	C3092_1	684	38.7	0	TURKEY CREEK RANCHES LTD	UNNAMED TRIB COMANCHE CRK
Nueces	Zavala	IRR	C3198_1	150	2.7	0	DENVER C CARNES	LEONA RIVER

Appendix C
Comprehensive Water Needs Assessment Data

Table C-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand								
Nueces Basin								
Benton City WSC		464	710	963	1,185	1,353	1,506	1,617
Bexar Met Water District		389	505	621	715	780	843	895
Charlotte		282	296	312	324	332	342	350
Jourdanton		740	801	861	914	955	994	1,026
Lytle		399	412	423	433	439	448	456
McCoy WSC		760	1,065	1,381	1,643	1,851	2,042	2,181
Pleasanton		1,833	1,906	1,969	2,027	2,063	2,109	2,151
Poteet		729	735	741	740	740	745	752
Rural		569	432	328	242	172	124	94
Subtotal		6,165	6,862	7,599	8,223	8,685	9,153	9,522
San Antonio Basin								
Benton City WSC		40	62	84	103	118	131	141
Rural		24	17	13	9	6	4	3
Subtotal		64	79	97	112	124	135	144
Total Municipal Demand		6,229	6,941	7,696	8,335	8,809	9,288	9,666
Municipal Existing Supply								
Nueces Basin								
Benton City WSC	Carrizo	831	831	831	831	831	831	831
Bexar Met Water District	ROR (San Antonio)	186	186	186	186	186	186	186
Charlotte	Carrizo	1,109	1,004	1,027	1,050	1,073	1,097	1,109
Jourdanton	Carrizo	1,799	1,629	1,666	1,703	1,741	1,779	1,799
Lytle	Edwards	243	243	243	243	243	243	243
McCoy WSC	Carrizo	632	572	585	598	612	625	632
Pleasanton	Carrizo	2,823	2,557	2,614	2,673	2,732	2,791	2,823
Poteet	Carrizo	968	877	896	917	937	957	968
Rural	Carrizo	377	341	349	357	365	373	377
	Sparta	196	172	177	182	188	193	198
Rural Subtotal		573	513	526	539	553	566	575
Subtotal		9,164	8,412	8,574	8,740	8,908	9,075	9,166
San Antonio Basin								
Benton City WSC	Carrizo	72	72	72	72	72	72	72
Rural	Carrizo	24	21	21	22	23	24	24
Subtotal		96	93	93	94	95	96	96
Total Existing Municipal Supply		9,260	8,505	8,667	8,834	9,003	9,171	9,262
Municipal Surplus/Shortage								
Nueces Basin								
Benton City WSC		367	121	-132	-354	-522	-675	-786
Bexar Met Water District		-203	-319	-435	-529	-594	-657	-709
Charlotte		827	708	715	726	741	755	759
Jourdanton		1,059	828	805	789	786	785	773
Lytle		-156	-169	-180	-190	-196	-205	-213
McCoy WSC		-128	-493	-796	-1,045	-1,239	-1,417	-1,549
Pleasanton		990	651	645	646	669	682	672
Poteet		239	142	155	177	197	212	216
Rural		4	81	198	297	381	442	481
Subtotal		2,999	1,550	975	517	223	-78	-356

Table C-1 Projected Water Demands, Supplies, and Needs Atascosa County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio Basin								
Benton City WSC		32	10	-12	-31	-46	-59	-69
Rural		0	4	8	13	17	20	21
Subtotal		32	14	-4	-18	-29	-39	-48
Total Municipal Suprlus/Shortage		3,031	1,564	971	499	194	-117	-404
Municipal New Supply Need								
Nueces Basin								
Benton City WSC		0	0	132	354	522	675	786
Bexar Met Water District		203	319	435	529	594	657	709
Charlotte		0	0	0	0	0	0	0
Jourdanton		0	0	0	0	0	0	0
Lytle		156	169	180	190	196	205	213
McCoy WSC		128	493	796	1,045	1,239	1,417	1,549
Pleasanton		0	0	0	0	0	0	0
Poteet		0	0	0	0	0	0	0
Rural		0	0	0	0	0	0	0
Subtotal		487	981	1,543	2,118	2,551	2,954	3,257
San Antonio Basin								
Benton City WSC		0	0	12	31	46	59	69
Rural		0	0	0	0	0	0	0
Subtotal		0	0	12	31	46	59	69
Total Municipal New Supply Need		487	981	1,555	2,149	2,597	3,013	3,326
Industrial Demand								
Nueces Basin		6	6	6	6	6	6	6
San Antonio Basin		0	0	0	0	0	0	0
Total Industrial Demand		6	6	6	6	6	6	6
Industrial Existing Supply								
Nueces Basin	Carrizo	8	7	7	7	8	8	8
San Antonio Basin		0	0	0	0	0	0	0
Total Industrial Supply		8	7	7	7	8	8	8
Industrial Surplus/Shortage								
Nueces Basin		2	1	1	1	2	2	2
San Antonio Basin		0	0	0	0	0	0	0
Total Industrial Surplus/Shortage		2	1	1	1	2	2	2
Industrial New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0
Steam-Electric Demand								
Nueces Basin		5,814	5,884	5,954	6,962	8,189	9,685	11,510
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		5,814	5,884	5,954	6,962	8,189	9,685	11,510
Steam-Electric Existing Supply								
Nueces Basin	Carrizo	7,558	6,845	6,999	7,156	7,315	7,473	7,558

Table C-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		7,558	6,845	6,999	7,156	7,315	7,473	7,558
Steam-Electric Surplus/Shortage								
Nueces Basin		1,744	961	1,045	194	-874	-2,212	-3,952
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		1,744	961	1,045	194	-874	-2,212	-3,952
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	874	2,212	3,952
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	874	2,212	3,952
Irrigation Demand								
Nueces Basin		34,107	39,782	38,442	37,154	35,914	34,723	33,570
San Antonio Basin		946	1,103	1,067	1,031	997	963	932
Total Irrigation Demand		35,053	40,885	39,509	38,185	36,911	35,686	34,502
Irrigation Supply								
Nueces Basin	Edwards	1,168	1,168	1,168	1,168	1,168	1,168	1,168
	Run-of-River	1	1	1	1	1	1	1
	Carrizo	30,355	32,066	31,681	31,308	30,933	30,557	29,877
	Sparta	954	978	973	968	962	957	952
	Queen City	3,411	3,684	3,638	3,604	3,569	3,472	3,357
Subtotal		35,889	37,897	37,461	37,049	36,633	36,155	35,355
San Antonio Basin	Edwards	547	547	547	547	547	547	547
	Carrizo	475	480	479	478	477	475	474
Subtotal		1,022	1,027	1,026	1,025	1,024	1,022	1,021
Total Irrigation Supply		36,911	38,924	38,487	38,074	37,657	37,177	36,376
Irrigation Surplus/Shortage								
Nueces Basin		1,782	-1,885	-981	-105	719	1,432	1,785
San Antonio Basin		76	-76	-41	-6	27	59	89
Total Irrigation Surplus/Shortage		1,858	-1,961	-1,022	-111	746	1,491	1,874
Irrigation New Supply Need								
Nueces Basin		0	1,885	981	105	0	0	0
San Antonio Basin		0	76	41	6	0	0	0
Total Irrigation New Supply Need		0	1,961	1,022	111	0	0	0
Mining Demand								
Nueces Basin		1,125	1,298	1,370	1,405	1,439	1,472	1,509
San Antonio Basin		0	0	0	0	0	0	0
Total Mining Demand		1,125	1,298	1,370	1,405	1,439	1,472	1,509
Mining Supply								
Nueces Basin	Carrizo	731	764	825	865	905	946	981
	Queen City	506	541	583	613	644	662	679
Subtotal		1,237	1,305	1,408	1,478	1,549	1,608	1,660
San Antonio Basin		0	0	0	0	0	0	0
Total Mining Supply		1,237	1,305	1,408	1,478	1,549	1,608	1,660

Table C-1
Projected Water Demands, Supplies, and Needs
Atascosa County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining Surplus/Shortage								
Nueces Basin		112	7	38	73	110	136	151
San Antonio Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		112	7	38	73	110	136	151
Mining New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0
Livestock Demand								
Nueces Basin		1,675	1,675	1,675	1,675	1,675	1,675	1,675
San Antonio Basin		70	70	70	70	70	70	70
Total Livestock Demand		1,745	1,745	1,745	1,745	1,745	1,745	1,745
Livestock Supplies								
Nueces Basin	Carrizo	669	606	619	633	647	661	669
	Queen City	168	156	159	163	167	168	168
	Local	838	913	897	879	861	846	838
Subtotal		1,675	1,675	1,675	1,675	1,675	1,675	1,675
San Antonio Basin	Carrizo	19	17	17	18	18	19	20
	Local	51	53	53	52	52	51	50
Subtotal		70	70	70	70	70	70	70
Total Livestock Supply		1,745	1,745	1,745	1,745	1,745	1,745	1,745
Livestock Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0
Livestock New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Livestock New Supply Need		0	0	0	0	0	0	0
Total County Demand								
Municipal		6,229	6,941	7,696	8,335	8,809	9,288	9,666
Industrial		6	6	6	6	6	6	6
Steam-Electric		5,814	5,884	5,954	6,962	8,189	9,685	11,510
Irrigation		35,053	40,885	39,509	38,185	36,911	35,686	34,502
Mining		1,125	1,298	1,370	1,405	1,439	1,472	1,509
Livestock		1,745	1,745	1,745	1,745	1,745	1,745	1,745
Total County Demand		49,972	56,759	56,280	56,638	57,099	57,882	58,938
Total County Supply								
Municipal		9,260	8,505	8,667	8,834	9,003	9,171	9,262
Industrial		8	7	7	7	8	8	8
Steam-Electric		7,558	6,845	6,999	7,156	7,315	7,473	7,558
Irrigation		36,911	38,924	38,487	38,074	37,657	37,177	36,376
Mining		1,237	1,305	1,408	1,478	1,549	1,608	1,660
Livestock		1,745	1,745	1,745	1,745	1,745	1,745	1,745
Total County Supply		56,719	57,331	57,313	57,294	57,277	57,182	56,609

Table C-1 Projected Water Demands, Supplies, and Needs Atascosa County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total County Surplus/Shortage								
Municipal		3,031	1,564	971	499	194	-117	-404
Industrial		2	1	1	1	2	2	2
Steam-Electric		1,744	961	1,045	194	-874	-2,212	-3,952
Irrigation		1,858	-1,961	-1,022	-111	746	1,491	1,874
Mining		112	7	38	73	110	136	151
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		6,747	572	1,033	656	178	-700	-2,329
Total Basin Demand								
Nueces								
Municipal		6,165	6,862	7,599	8,223	8,685	9,153	9,522
Industrial		6	6	6	6	6	6	6
Steam-Electric		5,814	5,884	5,954	6,962	8,189	9,685	11,510
Irrigation		34,107	39,782	38,442	37,154	35,914	34,723	33,570
Mining		1125	1298	1370	1405	1439	1472	1509
Livestock		1,675	1,675	1,675	1,675	1,675	1,675	1,675
Total Nueces Basin Demand		48,892	55,507	55,046	55,425	55,908	56,714	57,792
San Antonio								
Municipal		64	79	97	112	124	135	144
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		946	1,103	1,067	1,031	997	963	932
Mining		0	0	0	0	0	0	0
Livestock		70	70	70	70	70	70	70
Total San Antonio Basin Demand		1,080	1,252	1,234	1,213	1,191	1,168	1,146
Total Basin Supply								
Nueces								
Municipal		9,164	8,412	8,574	8,740	8,908	9,075	9,166
Industrial		8	7	7	7	8	8	8
Steam-Electric		7,558	6,845	6,999	7,156	7,315	7,473	7,558
Irrigation		35,889	37,897	37,461	37,049	36,633	36,155	35,355
Mining		1,237	1,305	1,408	1,478	1,549	1,608	1,660
Livestock		1,675	1,675	1,675	1,675	1,675	1,675	1,675
Total Nueces Basin Supply		55,531	56,141	56,124	56,105	56,088	55,994	55,422
San Antonio								
Municipal		96	93	93	94	95	96	96
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,022	1,027	1,026	1,025	1,024	1,022	1,021
Mining		0	0	0	0	0	0	0
Livestock		70	70	70	70	70	70	70
Total San Antonio Basin Supply		1188	1190	1189	1189	1189	1188	1187
Total Basin Surplus/Shortage								
Nueces								
Municipal		2,999	1,550	975	517	223	-78	-356
Industrial		2	1	1	1	2	2	2
Steam-Electric		1,744	961	1,045	194	-874	-2,212	-3,952

Table C-1 Projected Water Demands, Supplies, and Needs Atascosa County South Central Texas Region								
		Total in	**Projections**					
Basin	**Source**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
		(acft)	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**
Irrigation		1,782	-1,885	-981	-105	719	1,432	1,785
Mining		112	7	38	73	110	136	151
Livestock		0	0	0	0	0	0	0
Total Nueces Basin Supply		6,639	634	1,078	680	180	-720	-2,370
San Antonio								
Municipal		32	14	-4	-18	-29	-39	-48
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		76	-76	-41	-6	27	59	89
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total San Antonio Basin Supply		108	-62	-45	-24	-2	20	41
Groundwater Supplies								
Available								
Nueces	Edwards	1,168	1,168	1,168	1,168	1,168	1,168	1,168
San Antonio	Edwards	547	547	547	547	547	547	547
Nueces	Carrizo	47,288	47,288	47,288	47,288	47,288	47,288	47,288
San Antonio	Carrizo	518	518	518	518	518	518	518
Nueces	Sparta	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Nueces	Queen City	4,380	4,380	4,380	4,380	4,380	4,380	4,380
Total Available		55,051	55,051	55,051	55,051	55,051	55,051	55,051
Allocated								
Nueces	Edwards	1,168	1,168	1,168	1,168	1,168	1,168	1,168
San Antonio	Edwards	547	547	547	547	547	547	547
Nueces	Carrizo	47,050	47,288	47,288	47,288	47,288	47,288	46,822
San Antonio	Carrizo	518	518	518	518	518	518	518
Nueces	Sparta	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Nueces	Queen City	4,085	4,380	4,380	4,380	4,380	4,303	4,204
Total Allocated		54,518	55,051	55,051	55,051	55,051	54,974	54,409
Total Unallocated		533	0	0	0	0	77	642

Table C-2 Projected Water Demands, Supplies, and Needs Bexar County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand								
Nueces Basin								
Atascosa Rural WSC		31	38	44	51	56	60	65
Bexar Met Water District		159	161	163	165	165	167	171
Lytle		3	5	7	8	10	11	12
Rural		251	258	263	268	270	273	279
Subtotal		444	462	477	492	501	511	527
San Antonio Basin								
Alamo Heights		2,000	2,071	2,134	2,136	2,132	2,146	2,170
Atascosa Rural WSC		735	903	1,068	1,213	1,335	1,441	1,548
Balcones Heights		480	514	555	578	600	633	670
Bexar Met Water District		8,635	8,736	8,869	8,944	8,945	9,081	9,278
Castle Hills (BMWD)		838	820	807	793	780	771	771
China Grove		288	376	457	531	591	645	695
Converse		1,495	1,907	2,331	2,729	3,044	3,311	3,564
East Central SUD		975	1,325	1,572	1,790	1,974	2,133	2,289
Elmendorf		99	112	123	132	140	148	156
Fair Oaks Ranch		889	1,090	1,094	1,097	1,101	1,099	1,104
Green Valley SUD		247	458	646	818	939	1,068	1,182
Helotes		845	1,537	2,249	2,820	3,264	3,679	4,047
Hill Country Village (BMWD)		842	838	835	831	828	826	826
Hollywood Park (BMWD)		2,229	2,314	2,389	2,458	2,511	2,565	2,616
Kirby		1,001	1,005	1,004	1,007	1,001	1,013	1,034
Lackland AFB (CDP)		3,136	3,104	3,080	3,056	3,032	3,016	3,016
Leon Valley		711	694	678	667	655	650	659
Leon Valley (SAWS)		407	397	388	382	375	372	377
Live Oak		1,128	1,145	1,157	1,177	1,193	1,232	1,284
Olmos Park		381	403	424	441	452	468	484
San Antonio (BMWD)		21,419	24,654	27,471	30,157	32,187	34,150	36,107
San Antonio (SAWS)		166,813	192,007	213,943	234,865	250,671	265,958	281,204
San Antonio (Others)		247	284	317	348	371	394	416
Schertz		167	272	371	456	525	591	649
Selma		252	1,531	1,927	2,309	2,260	2,204	2,155
Shavano Park		802	819	835	847	856	868	880
Somerset (BMWD)		321	405	484	552	609	660	709
St. Hedwig		256	310	358	403	436	469	501
Terrell Hills		815	863	914	956	983	1,018	1,057
Universal City		2,329	2,608	2,916	3,175	3,125	3,101	3,101
Water Service Inc. (Apex Water Ser.)		435	570	697	809	902	982	1,061
Windcrest		1,212	1,204	1,196	1,187	1,177	1,174	1,182
Rural		1,226	705	559	472	742	985	1,205
Rural (SAWS)		5,595	5,661	5,747	5,796	5,796	5,884	6,012
Subtotal		229,250	261,642	289,595	315,932	335,532	354,735	374,009
Total Municipal Demand		229,694	262,104	290,072	316,424	336,033	355,246	374,536
Municipal Existing Supply								
Nueces Basin								
Atascosa Rural WSC	Edwards	16	16	16	16	16	16	16
Bexar Met Water District	ROR (San Antonio)	233	233	233	233	233	233	233
Lytle	Edwards	1	1	1	1	1	1	1
Rural	Carrizo	256	259	265	160	164	168	173
Subtotal		506	509	515	410	414	418	423
San Antonio Basin								
Alamo Heights	Edwards	1,556	1,556	1,556	1,556	1,556	1,556	1,556
Atascosa Rural WSC	Edwards	364	364	364	364	364	364	364
Balcones Heights	Edwards (SAWS)	480	514	555	578	600	633	670

Table C-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Bexar Met Water District		Edwards	3,235	735	735	735	735	735	735
		Trinity	113	113	113	113	113	113	113
		Carrizo	1,000	1,000	1,000	780	769	759	750
		ROR (San Antonio)	658	574	495	427	370	319	270
Bexar Met Water District Subtotal			5,006	2,422	2,343	2,055	1,987	1,926	1,868
Castle Hills (BMWD)		Edwards (BMWD)	724	724	724	724	724	724	724
China Grove		Edwards (SAWS)	288	376	457	531	591	645	695
Converse		Edwards	632	632	632	632	632	632	632
		Edwards (BMWD)	0	1,500	1,500	1,500	1,500	1,500	1,500
Converse Subtotal			632	2,132	2,132	2,132	2,132	2,132	2,132
East Central SUD		Canyon (CRWA)	1,170	1,170	251	251	251	251	251
		Carrizo (Springs Hill/CRWA)	322	322	322	322	322	322	322
		Edwards (SAWS)	1,873	0	0	0	0	0	0
		Edwards (BMWD)	1,003	1,003	1,003	1,003	1,003	1,003	1,003
East Central Subtotal			4,368	2,495	1,576	1,576	1,576	1,576	1,576
Elmendorf		Edwards (SAWS)	99	112	123	132	140	148	156
Fair Oaks Ranch		Trinity (Comal County)	197	197	197	197	197	161	161
		Canyon (GBRA)	0	900	962	1,036	1,036	1,036	1,036
Fair Oaks Ranch Subtotal			197	1,097	1,159	1,233	1,233	1,197	1,197
Green Valley SUD		Edwards	69	69	69	69	69	69	69
		Edwards (East Central)	21	21	21	21	21	21	21
		Canyon (GBRA)	21	21	32	32	75	75	75
		Canyon (CRWA)	193	193	182	182	182	182	182
Green Valley SUD Subtotal			304	304	304	304	347	347	347
Helotes		Edwards (SAWS)	845	1,537	2,249	2,820	3,264	3,679	4,047
Hill Country Village (BMWD)		Edwards (BMWD)	108	108	108	108	108	108	108
Hollywood Park (BMWD)		Edwards (BMWD)	345	345	345	345	345	345	345
Kirby		Edwards	706	706	706	706	706	706	706
Lackland AFB (CDP)		Edwards	2,247	2,247	2,247	2,247	2,247	2,247	2,247
Leon Valley		Edwards	753	753	753	753	753	753	753
Leon Valley (SAWS)		Edwards (SAWS)	407	397	388	382	375	372	377
Live Oak		Edwards	1,008	1,008	1,008	1,008	1,008	1,008	1,008
		Edwards (BMWD)	0	1,000	1,000	1,000	1,000	1,000	1,000
Live Oak Subtotal			1,008	2,008	2,008	2,008	2,008	2,008	2,008
Olmos Park		Edwards (SAWS)	381	403	424	441	452	468	484
San Antonio (BMWD)		Edwards (BMWD)	7,066	7,066	7,066	7,066	7,066	7,066	7,066
		Canyon (CRWA)	4,000	4,000	0	0	0	0	0
		ROR (San Antonio)	3,133	3,133	3,133	3,133	3,133	3,133	3,133
San Antonio (BMWD) Subtotal			14,199	14,199	10,199	10,199	10,199	10,199	10,199
San Antonio (SAWS)		Edwards	104,845	105,948	104,954	105,295	104,730	104,084	103,433
		Carrizo	6,400	6,400	6,400	4,992	4,923	4,855	4,797
		Canyon (GBRA)	0	7,500	5,500	4,000	0	0	0
		Direct Reuse	18,994	18,994	18,994	18,994	18,994	18,994	18,994
San Antonio (SAWS) Subtotal			130,239	138,842	135,848	133,281	128,647	127,933	127,224
San Antonio (Others)		ROR (San Antonio)	100	100	100	100	100	100	100
Schertz		Edwards	57	57	57	57	57	57	57
		Carrizo (Gonzales) - S/S	304	304	304	304	304	304	304
Schertz Subtotal			361	361	361	361	361	361	361
Selma		Edwards	101	101	101	101	101	101	101
		Carrizo (Gonzales)	733	733	733	733	733	733	733
Selma Subtotal			834	834	834	834	834	834	834
Shavano Park		Edwards	320	320	320	320	320	320	320
Somerset (BMWD)		ROR (San Antonio)	321	405	484	552	609	660	709
St. Hedwig	Estimate	Edwards	256	310	358	403	436	469	501
Terrell Hills		Edwards (SAWS)	815	863	914	956	983	1,018	1,057
Universal City		Edwards	1,667	1,667	1,667	1,667	1,667	1,667	1,667
		Carrizo (Gonzales) - S/S	800	800	800	800	800	800	800
Universal City Subtotal			2,467	2,467	2,467	2,467	2,467	2,467	2,467
Water Service Inc. (Apex Water Ser.)		Edwards	26	26	26	26	26	26	26
Windcrest	Estimate	Edwards	1,212	1,204	1,196	1,187	1,177	1,174	1,182

Table C-2 Projected Water Demands, Supplies, and Needs Bexar County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Rural		Edwards	7,114	7,068	7,028	6,992	6,969	6,939	6,899
		Edwards (SAWS/EC) - PP	1,120	1,120	1,120	0	0	0	0
		Trinity	13	13	13	13	13	13	13
		Canyon (GBRA)	0	0	50	50	0	0	0
Rural Subtotal			8,247	8,201	8,211	7,055	6,982	6,952	6,912
Rural (SAWS)		Edwards (SAWS)	5,595	5,661	5,747	5,796	5,796	5,884	6,012
	Subtotal		185,810	194,394	187,586	184,532	180,445	180,331	180,264
Total Existing Municipal Supply			186,316	194,903	188,101	184,942	180,859	180,749	180,687
Municipal Surplus/Shortage									
Nueces Basin									
Atascosa Rural WSC			-15	-22	-28	-35	-40	-44	-49
Bexar Met Water District			74	72	70	68	68	66	62
Lytle			-2	-4	-6	-7	-9	-10	-11
Rural			5	1	2	-108	-106	-105	-106
	Subtotal		62	47	38	-82	-87	-93	-104
San Antonio Basin									
Alamo Heights			-444	-515	-578	-580	-576	-590	-614
Atascosa Rural WSC			-371	-539	-704	-849	-971	-1,077	-1,184
Balcones Heights			0	0	0	0	0	0	0
Bexar Met Water District			-3,629	-6,314	-6,526	-6,889	-6,958	-7,155	-7,410
Castle Hills (BMWD)			-114	-96	-83	-69	-56	-47	-47
China Grove			0	0	0	0	0	0	0
Converse			-863	225	-199	-597	-912	-1,179	-1,432
East Central SUD			3,393	1,170	4	-214	-398	-557	-713
Elmendorf			0	0	0	0	0	0	0
Fair Oaks Ranch			-692	7	65	136	132	98	93
Green Valley SUD			57	-154	-342	-514	-592	-721	-835
Helotes			0	0	0	0	0	0	0
Hill Country Village (BMWD)			-734	-730	-727	-723	-720	-718	-718
Hollywood Park (BMWD)			-1,884	-1,969	-2,044	-2,113	-2,166	-2,220	-2,271
Kirby			-295	-299	-298	-301	-295	-307	-328
Lackland AFB (CDP)			-889	-857	-833	-809	-785	-769	-769
Leon Valley			42	59	75	86	98	103	94
Leon Valley (SAWS)			0	0	0	0	0	0	0
Live Oak			-120	863	851	831	815	776	724
Olmos Park			0	0	0	0	0	0	0
San Antonio (BMWD)			-7,220	-10,455	-17,272	-19,958	-21,988	-23,951	-25,908
San Antonio (SAWS)			-36,574	-53,165	-78,095	-101,584	-122,024	-138,025	-153,980
San Antonio (Others)			-147	-184	-217	-248	-271	-294	-316
Schertz			194	89	-10	-95	-164	-230	-288
Selma			582	-697	-1,093	-1,475	-1,426	-1,370	-1,321
Shavano Park			-482	-499	-515	-527	-536	-548	-560
Somerset (BMWD)			0	0	0	0	0	0	0
St. Hedwig			0	0	0	0	0	0	0
Terrell Hills			0	0	0	0	0	0	0
Universal City			138	-141	-449	-708	-658	-634	-634
Water Service Inc. (Apex Water Ser.)			-409	-544	-671	-783	-876	-956	-1,035
Windcrest			0	0	0	0	0	0	0
Rural			7,021	7,496	7,652	6,583	6,240	5,967	5,707
Rural (SAWS)			0	0	0	0	0	0	0
	Subtotal		-43,440	-67,248	-102,009	-131,400	-155,087	-174,404	-193,745
Total Municipal Surplus/Shortage			-43,378	-67,201	-101,971	-131,482	-155,174	-174,497	-193,849

Table C-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal New Supply Need								
Nueces Basin								
Atascosa Rural WSC		15	22	28	35	40	44	49
Bexar Met Water District		0	0	0	0	0	0	0
Lytle		2	4	6	7	9	10	11
Rural		0	0	0	108	106	105	106
Subtotal		17	26	34	150	155	159	166
San Antonio Basin								
Alamo Heights		444	515	578	580	576	590	614
Atascosa Rural WSC		371	539	704	849	971	1,077	1,184
Balcones Heights		0	0	0	0	0	0	0
Bexar Met Water District		3,629	6,314	6,526	6,889	6,958	7,155	7,410
Castle Hills (BMWD)		114	96	83	69	56	47	47
China Grove		0	0	0	0	0	0	0
Converse		863	0	199	597	912	1,179	1,432
East Central SUD		0	0	0	214	398	557	713
Elmendorf		0	0	0	0	0	0	0
Fair Oaks Ranch		692	0	0	0	0	0	0
Green Valley SUD		0	154	342	514	592	721	835
Helotes		0	0	0	0	0	0	0
Hill Country Village (BMWD)		734	730	727	723	720	718	718
Hollywood Park (BMWD)		1,884	1,969	2,044	2,113	2,166	2,220	2,271
Kirby		295	299	298	301	295	307	328
Lackland AFB (CDP)		889	857	833	809	785	769	769
Leon Valley		0	0	0	0	0	0	0
Leon Valley (SAWS)		0	0	0	0	0	0	0
Live Oak		120	0	0	0	0	0	0
Olmos Park		0	0	0	0	0	0	0
San Antonio (BMWD)		7,220	10,455	17,272	19,958	21,988	23,951	25,908
San Antonio (SAWS)		36,574	53,165	78,095	101,584	122,024	138,025	153,980
San Antonio (Others)		147	184	217	248	271	294	316
Schertz		0	0	10	95	164	230	288
Selma		0	697	1,093	1,475	1,426	1,370	1,321
Shavano Park		482	499	515	527	536	548	560
Somerset (BMWD)		0	0	0	0	0	0	0
St. Hedwig		0	0	0	0	0	0	0
Terrell Hills		0	0	0	0	0	0	0
Universal City		0	141	449	708	658	634	634
Water Service Inc. (Apex Water Ser.)		409	544	671	783	876	956	1,035
Windcrest		0	0	0	0	0	0	0
Rural		0	0	0	0	0	0	0
Rural (SAWS)		0	0	0	0	0	0	0
Subtotal		54,867	77,158	110,656	139,036	162,372	181,348	200,363
Total Municipal New Supply Need		54,884	77,184	110,690	139,186	162,527	181,507	200,529
Industrial Demand								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		21,252	25,951	29,497	32,775	36,068	38,965	42,112
Total Industrial Demand		21,252	25,951	29,497	32,775	36,068	38,965	42,112
Industrial Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin	Edwards	13,942	13,942	13,942	13,942	13,942	13,942	13,942
	Trinity	1,025	1,025	1,025	1,025	1,025	1,025	1,025
	Run-of-River	3	3	3	3	3	3	3
	Direct Reuse (SAWS)	7,723	7,723	7,723	7,723	7,723	7,723	7,723
San Antonio Basin Subtotal		22,693	22,693	22,693	22,693	22,693	22,693	22,693
Total Industrial Existing Supply		22,693	22,693	22,693	22,693	22,693	22,693	22,693

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Table C-2 Projected Water Demands, Supplies, and Needs Bexar County South Central Texas Region									
Industrial Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			1,441	-3,258	-6,804	-10,082	-13,375	-16,272	-19,419
Total Industrial Surplus/Shortage			1,441	-3,258	-6,804	-10,082	-13,375	-16,272	-19,419
Industrial New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	3,258	6,804	10,082	13,375	16,272	19,419
Total Industrial New Supply Need			0	3,258	6,804	10,082	13,375	16,272	19,419
Steam-Electric Demand									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			17,399	17,309	17,275	20,196	23,757	28,098	33,390
Total Steam-Electric Demand			17,399	17,309	17,275	20,196	23,757	28,098	33,390
Steam-Electric Existing Supply									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin		Victor Braunig Lake	12,000	12,000	12,000	12,000	12,000	12,000	12,000
		Calaveras Lake	36,900	36,900	36,900	36,900	36,900	36,900	36,900
San Antonio Basin Subtotal			48,900	48,900	48,900	48,900	48,900	48,900	48,900
Total Steam-Electric Existing Supply			48,900	48,900	48,900	48,900	48,900	48,900	48,900
Steam-Electric Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			31,501	31,591	31,625	28,704	25,143	20,802	15,510
Total Steam-Electric Surplus/Shortage			31,501	31,591	31,625	28,704	25,143	20,802	15,510
Steam-Electric New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	0	0
Irrigation Demand									
Nueces Basin			1,333	1,283	1,229	1,177	1,127	1,080	1,034
San Antonio Basin			14,532	13,990	13,399	12,833	12,290	11,770	11,272
Total Irrigation Demand			15,865	15,273	14,628	14,010	13,417	12,850	12,306
Irrigation Supply									
Nueces Basin		Edwards	60	60	60	60	60	60	60
		Carrizo	1,064	1,039	1,019	588	578	568	557
Nueces Basin Subtotal			1,124	1,099	1,079	648	638	628	617
San Antonio Basin		Edwards	18,035	18,035	18,035	18,035	18,035	18,035	18,035
		Run-of-River	2,223	2,223	2,223	2,223	2,223	2,223	2,223
		Carrizo	799	769	737	551	520	491	465
San Antonio Basin Subtotal			21,057	21,027	20,995	20,809	20,778	20,749	20,723
Total Irrigation Supply			22,181	22,126	22,074	21,457	21,416	21,377	21,340
Irrigation Surplus/Shortage									
Nueces Basin			-209	-184	-150	-529	-489	-452	-417
San Antonio Basin			6,525	7,037	7,596	7,976	8,488	8,979	9,451
Total Irrigation Surplus/Shortage			6,316	6,853	7,446	7,447	7,999	8,527	9,034

Table C-2 Projected Water Demands, Supplies, and Needs Bexar County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Irrigation New Supply Need									
Nueces Basin			209	184	150	529	489	452	417
San Antonio Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			209	184	150	529	489	452	417
Mining Demand									
Nueces Basin			106	131	144	152	160	168	175
San Antonio Basin			2,796	3,451	3,790	3,998	4,203	4,408	4,591
Total Mining Demand			2,902	3,582	3,934	4,150	4,363	4,576	4,766
Mining Supply									
Nueces Basin		Carrizo	86	108	122	78	84	90	96
San Antonio Basin		Carrizo	2,796	3,451	3,790	3,119	3,233	3,344	3,441
Total Mining Supply			2,882	3,559	3,912	3,197	3,317	3,434	3,537
Mining Surplus/Shortage									
Nueces Basin			-20	-23	-22	-74	-76	-78	-79
San Antonio Basin			0	0	0	-879	-970	-1,064	-1,150
Total Mining Surplus/Shortage			-20	-23	-22	-953	-1,046	-1,142	-1,229
Mining New Supply Need									
Nueces Basin			20	23	22	74	76	78	79
San Antonio Basin			0	0	0	879	970	1,064	1,150
Total Mining New Supply Need			20	23	22	953	1,046	1,142	1,229
Livestock Demand									
Nueces Basin			24	24	24	24	24	24	24
San Antonio Basin			1,295	1,295	1,295	1,295	1,295	1,295	1,295
Total Livestock Demand			1,319	1,319	1,319	1,319	1,319	1,319	1,319
Livestock Supply									
Nueces Basin		Edwards[2]	12	12	12	12	12	12	12
		Local	12	12	12	12	12	12	12
	Subtotal		24	24	24	24	24	24	24
San Antonio Basin		Carrizo	365	365	365	285	281	277	274
		Trinity	16	16	16	16	16	16	16
		Edwards[2]	266	266	266	266	266	266	266
		Local	648	648	648	648	648	648	648
	Subtotal		1,295	1,295	1,295	1,215	1,211	1,207	1,204
Total Livestock Supply			1,319	1,319	1,319	1,239	1,235	1,231	1,228
Livestock Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	-80	-84	-88	-91
Total Livestock Surplus/Shortage[3]			0	0	0	-80	-84	-88	-91
Livestock New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	80	84	88	91
Total Livestock New Supply Need			0	0	0	80	84	88	91
Total Bexar County Demand									
Municipal			229,694	262,104	290,072	316,424	336,033	355,246	374,536
Industrial			21,252	25,951	29,497	32,775	36,068	38,965	42,112
Steam-Electric			17,399	17,309	17,275	20,196	23,757	28,098	33,390
Irrigation			15,865	15,273	14,628	14,010	13,417	12,850	12,306
Mining			2,902	3,582	3,934	4,150	4,363	4,576	4,766
Livestock			1,319	1,319	1,319	1,319	1,319	1,319	1,319
Total County Demand			288,431	325,538	356,725	388,874	414,957	441,054	468,429

Table C-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Bexar County Supply								
Municipal		186,316	194,903	188,101	184,942	180,859	180,749	180,687
Industrial		22,693	22,693	22,693	22,693	22,693	22,693	22,693
Steam-Electric		48,900	48,900	48,900	48,900	48,900	48,900	48,900
Irrigation		22,181	22,126	22,074	21,457	21,416	21,377	21,340
Mining		2,882	3,559	3,912	3,197	3,317	3,434	3,537
Livestock		1,319	1,319	1,319	1,239	1,235	1,231	1,228
Total County Supply		284,291	293,500	286,999	282,428	278,420	278,384	278,385
Total Bexar County Surplus/Shortage								
Municipal		-43,378	-67,201	-101,971	-131,482	-155,174	-174,497	-193,849
Industrial		1,441	-3,258	-6,804	-10,082	-13,375	-16,272	-19,419
Steam-Electric		31,501	31,591	31,625	28,704	25,143	20,802	15,510
Irrigation		6,316	6,853	7,446	7,447	7,999	8,527	9,034
Mining		-20	-23	-22	-953	-1,046	-1,142	-1,229
Livestock		0	0	0	-80	-84	-88	-91
Total County Surplus/Shortage		-4,140	-32,038	-69,726	-106,446	-136,537	-162,670	-190,044
Total Basin Demand								
Nueces								
Municipal		444	462	477	492	501	511	527
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,333	1,283	1,229	1,177	1,127	1,080	1,034
Mining		106	131	144	152	160	168	175
Livestock		24	24	24	24	24	24	24
Total Nueces Basin Demand		1,907	1,900	1,874	1,845	1,812	1,783	1,760
San Antonio								
Municipal		229,250	261,642	289,595	315,932	335,532	354,735	374,009
Industrial		21,252	25,951	29,497	32,775	36,068	38,965	42,112
Steam-Electric		17,399	17,309	17,275	20,196	23,757	28,098	33,390
Irrigation		14,532	13,990	13,399	12,833	12,290	11,770	11,272
Mining		2,796	3,451	3,790	3,998	4,203	4,408	4,591
Livestock		1,295	1,295	1,295	1,295	1,295	1,295	1,295
Total San Antonio Basin Demand		286,524	323,638	354,851	387,029	413,145	439,271	466,669
Total Basin Supply								
Nueces								
Municipal		506	509	515	410	414	418	423
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,124	1,099	1,079	648	638	628	617
Mining		86	108	122	78	84	90	96
Livestock		24	24	24	24	24	24	24
Total Nueces Basin Supply		1,740	1,740	1,740	1,160	1,160	1,160	1,160
San Antonio								
Municipal		185,810	194,394	187,586	184,532	180,445	180,331	180,264
Industrial		22,693	22,693	22,693	22,693	22,693	22,693	22,693
Steam-Electric		48,900	48,900	48,900	48,900	48,900	48,900	48,900
Irrigation		21,057	21,027	20,995	20,809	20,778	20,749	20,723
Mining		2,796	3,451	3,790	3,119	3,233	3,344	3,441
Livestock		1,295	1,295	1,295	1,215	1,211	1,207	1,204
Total San Antonio Basin Supply		282,551	291,760	285,259	281,268	277,260	277,224	277,225

Table C-2
Projected Water Demands, Supplies, and Needs
Bexar County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Surplus/Shortage									
Nueces									
Municipal			62	47	38	-82	-87	-93	-104
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			-209	-184	-150	-529	-489	-452	-417
Mining			-20	-23	-22	-74	-76	-78	-79
Livestock			0	0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage			-167	-160	-134	-685	-652	-623	-600
San Antonio									
Municipal			-43,440	-67,248	-102,009	-131,400	-155,087	-174,404	-193,745
Industrial			1,441	-3,258	-6,804	-10,082	-13,375	-16,272	-19,419
Steam-Electric			31,501	31,591	31,625	28,704	25,143	20,802	15,510
Irrigation			6,525	7,037	7,596	7,976	8,488	8,979	9,451
Mining			0	0	0	-879	-970	-1,064	-1,150
Livestock			0	0	0	-80	-84	-88	-91
Total San Antonio Basin Surplus/Shortage			-3,973	-31,878	-69,592	-105,761	-135,885	-162,047	-189,444
Groundwater Supplies									
	Available								
	Nueces	Edwards	60	60	60	60	60	60	60
	San Antonio	Edwards	180,817	180,817	180,817	180,817	180,817	180,817	180,817
	Nueces	Carrizo	1,406	1,406	1,406	826	826	826	826
	San Antonio	Carrizo	16,544	16,544	16,544	9,726	9,726	9,726	9,726
	Nueces	Trinity	8	8	8	8	8	8	8
	San Antonio	Trinity	1,167	1,167	1,167	1,167	1,167	1,167	1,167
	Total Available		200,002	200,002	200,002	192,604	192,604	192,604	192,604
	Allocated								
	Nueces	Edwards	60	60	60	60	60	60	60
	San Antonio	Edwards	180,817	180,817	180,817	180,817	180,817	180,817	180,817
	Nueces	Carrizo	1,406	1,406	1,406	826	826	826	826
	Nueces	Trinity	0	0	0	0	0	0	0
	San Antonio	Carrizo	11,360	11,985	12,292	9,726	9,726	9,726	9,726
	San Antonio	Trinity	1,167	1,167	1,167	1,167	1,167	1,167	1,167
	Total Allocated		194,810	195,435	195,742	192,596	192,596	192,596	192,596
	Total Unallocated		5,192	4,567	4,260	8	8	8	8

Notes:
[1] Used for irrigation of golf courses and open spaces.
[2] There is limited supply from the Edwards Aquifer permitted for D&L; however, these values are not part of the 340,000 acft/yr allocated to other uses.
[3] There is insufficient groundwater available in the county to meet all of the projected livestock demand.

Table C-3 Projected Water Demands, Supplies, and Needs Caldwell County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand								
Guadalupe Basin								
Aqua WSC		194	267	339	396	458	518	580
County Line WSC		114	204	308	405	501	600	695
Creedmore-Maha WSC		68	98	127	154	181	207	235
Goforth WSC		112	184	269	342	417	495	571
Gonzales County WSC		46	63	79	94	108	122	136
Lockhart		1,795	2,451	3,094	3,629	4,180	4,725	5,285
Luling		888	1,067	1,210	1,299	1,384	1,486	1,594
Martindale		107	125	134	139	143	150	158
Martindale WSC		93	142	153	158	162	170	179
Maxwell WSC		334	503	678	844	996	1,166	1,331
Mustang Ridge		9	13	18	21	25	29	33
Niederwald		11	26	43	61	78	95	111
Polonia WSC		322	466	618	749	884	1,016	1,155
Rural		207	214	201	177	154	136	122
Subtotal		4,300	5,823	7,271	8,468	9,671	10,915	12,185
Lower Colorado Basin								
Creedmore-Maha WSC		94	136	177	213	250	287	325
Mustang Ridge		84	122	160	194	228	262	296
Polonia WSC		140	202	268	325	384	441	501
Rural		23	23	22	22	22	21	21
Subtotal		341	483	627	754	884	1,011	1,143
Total Municipal Demand		4,641	6,306	7,898	9,222	10,555	11,926	13,328
Municipal Existing Supply								
Guadalupe Basin								
Aqua WSC	Carrizo	218	218	218	218	218	218	218
County Line WSC	Edwards	14	14	14	14	14	14	14
	ROR (Guadalupe) - CRWA	67	67	67	67	67	67	67
	Canyon (CRWA)	328	328	328	328	328	328	328
County Line WSC Total		409	409	409	409	409	409	409
Creedmore-Maha WSC	Edwards (Barton Springs)	263	263	263	263	263	263	263
Goforth WSC	Edwards (Barton Springs)	155	155	155	155	155	155	155
Gonzales County WSC	Carrizo	44	44	44	44	44	44	44
	Canyon (GBRA)	21	21	21	21	21	21	21
Gonzales County WSC Subtotal		65	65	65	65	65	65	65
Lockhart	Carrizo	2,110	2,110	2,110	2,110	2,110	2,110	2,110
Luling	Carrizo	706	706	706	706	706	706	706
	Run-of-River	193	193	193	193	193	193	193
Luling Subtotal		899	899	899	899	899	899	899
Martindale	ROR (Guadalupe) - CRWA	158	158	158	158	158	158	158
Martindale WSC	Canyon (CRWA)	39	39	39	39	39	39	39
	ROR (Guadalupe) - CRWA	140	140	140	140	140	140	140
Martindale WSC Subtotal		179	179	179	179	179	179	179
Maxwell WSC	Edwards	129	129	129	129	129	129	129
	Canyon (CRWA)	477	477	477	477	477	477	477
	ROR (Guadalupe) - CRWA	165	165	165	165	165	165	165
Maxwell Subtotal		771	771	771	771	771	771	771
Mustang Ridge	Carrizo (Aqua WSC)	11	11	11	11	11	11	11
Niederwald	Edwards (Barton Springs)	14	14	14	14	14	14	14
Polonia WSC	Carrizo	653	653	653	653	653	653	653
Rural	Carrizo	86	86	86	86	86	86	86
	Queen City	123	121	125	129	132	135	138
	Run-of-River	500	500	500	500	500	500	500
Rural Subtotal		709	707	711	715	718	721	724
Subtotal		6,615	6,613	6,617	6,621	6,624	6,627	6,630
Lower Colorado Basin								
Creedmore-Maha WSC	Edwards (Barton Springs)	363	363	363	363	363	363	363
Mustang Ridge	Carrizo (Aqua WSC)	105	105	105	105	105	105	105
Polonia WSC	Carrizo	284	284	284	284	284	284	284
Rural	Carrizo	29	29	29	29	29	29	29
Subtotal		781	781	781	781	781	781	781
Total Municipal Existing Supply		7,395	7,393	7,397	7,401	7,404	7,407	7,410

Table C-3 Projected Water Demands, Supplies, and Needs Caldwell County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Surplus/Shortage								
Guadalupe Basin								
Aqua WSC		24	-49	-121	-178	-240	-300	-362
County Line WSC		295	205	101	4	-92	-191	-286
Creedmore-Maha WSC		195	165	136	109	82	56	28
Goforth WSC		43	-29	-114	-187	-262	-340	-416
Gonzales County WSC		19	2	-14	-29	-43	-57	-71
Lockhart		315	-341	-984	-1,519	-2,070	-2,615	-3,175
Luling		11	-168	-311	-400	-485	-587	-695
Martindale		51	33	24	19	15	8	0
Martindale WSC		86	37	26	21	17	9	0
Maxwell WSC		437	268	93	-73	-225	-395	-560
Mustang Ridge		2	-2	-7	-10	-14	-18	-22
Niederwald		3	-12	-29	-47	-64	-81	-97
Polonia WSC		331	187	35	-96	-231	-363	-502
Rural		686	684	689	693	696	700	703
Subtotal		2,499	981	-475	-1,692	-2,915	-4,173	-5,454
Lower Colorado Basin								
Creedmore-Maha WSC		269	227	186	150	113	76	38
Mustang Ridge		21	-17	-55	-89	-123	-157	-191
Polonia WSC		144	82	16	-41	-100	-157	-217
Rural		6	6	7	7	7	8	8
Subtotal		440	298	154	27	-103	-230	-362
Total Municipal Surplus/Shortage		2,938	1,278	-322	-1,666	-3,019	-4,404	-5,817
Municipal New Supply Need								
Guadalupe Basin								
Aqua WSC		0	49	121	178	240	300	362
County Line WSC		0	0	0	0	92	191	286
Creedmore-Maha WSC		0	0	0	0	0	0	0
Goforth WSC		0	29	114	187	262	340	416
Gonzales County WSC		0	0	14	29	43	57	71
Lockhart		0	341	984	1,519	2,070	2,615	3,175
Luling		0	168	311	400	485	587	695
Martindale		0	0	0	0	0	0	0
Martindale WSC		0	0	0	0	0	0	0
Maxwell WSC		0	0	0	73	225	395	560
Mustang Ridge		0	2	7	10	14	18	22
Niederwald		0	12	29	47	64	81	97
Polonia WSC		0	0	0	96	231	363	502
Rural		0	0	0	0	0	0	0
Subtotal		0	601	1,580	2,538	3,725	4,946	6,185
Lower Colorado Basin								
Creedmore-Maha WSC		0	0	0	0	0	0	0
Mustang Ridge		0	17	55	89	123	157	191
Polonia WSC		0	0	0	41	100	157	217
Rural		0	0	0	0	0	0	0
Subtotal		0	17	55	130	223	314	408
Total Municipal New Supply Need		0	618	1,635	2,668	3,948	5,260	6,593
Industrial Demand								
Guadalupe Basin		11	15	18	21	24	27	29
Lower Colorado Basin		0	0	0	0	0	0	0
Total Industrial Demand		11	15	18	21	24	27	29

Table C-3 Projected Water Demands, Supplies, and Needs Caldwell County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial Existing Supply								
Guadalupe Basin	Carrizo	30	30	30	30	30	30	30
Lower Colorado Basin		0	0	0	0	0	0	0
Total Industrial Existing Supply		30	30	30	30	30	30	30
Industrial Surplus/Shortage								
Guadalupe Basin		19	15	12	9	6	3	1
Lower Colorado Basin		0	0	0	0	0	0	0
Total Industrial Surplus/Shortage		19	15	12	9	6	3	1
Industrial New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0
Steam-Electric Demand								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Guadalupe Basin		974	1,029	914	812	722	641	570
Lower Colorado Basin		15	15	14	12	11	10	8
Total Irrigation Demand		989	1,044	928	824	733	651	578
Irrigation Supply								
Guadalupe Basin	Run-of-River	331	331	331	331	331	331	331
	Carrizo	594	628	558	495	440	391	348
	Queen City	85	89	81	74	68	62	56
Guadalupe Basin Subtotal		1,010	1,048	970	900	839	784	735
Lower Colorado Basin	Carrizo	15	15	14	12	11	10	8
Total Irrigation Supply		1,025	1,063	984	912	850	794	743
Irrigation Surplus/Shortage								
Guadalupe Basin		36	19	56	88	117	143	165
Lower Colorado Basin		0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage		36	19	56	88	117	143	165
Irrigation New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0

Table C-3 Projected Water Demands, Supplies, and Needs Caldwell County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining Demand								
Guadalupe Basin		5	5	6	6	6	7	7
Lower Colorado Basin		7	9	9	10	11	11	11
Total Mining Demand		12	14	15	16	17	18	18
Mining Supply								
Guadalupe Basin	Carrizo	5	5	6	6	6	7	7
Lower Colorado Basin	Carrizo	7	9	9	10	11	11	11
Total Mining Supply		12	14	15	16	17	18	18
Mining Surplus/Shortage								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		0	0	0	0	0	0	0
Mining New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0
Livestock Demand								
Guadalupe Basin		762	762	762	762	762	762	762
Lower Colorado Basin		156	156	156	156	156	156	156
Total Livestock Demand		918	918	918	918	918	918	918
Livestock Supply								
Guadalupe Basin	Carrizo	381	381	381	381	381	381	381
	Local	381	381	381	381	381	381	381
Subtotal		762	762	762	762	762	762	762
Lower Colorado Basin	Carrizo	78	78	78	78	78	78	78
	Local	78	78	78	78	78	78	78
Subtotal		156	156	156	156	156	156	156
Total Livestock Supply		918	918	918	918	918	918	918
Livestock Surplus/Shortage								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0
Livestock New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Livestock New Supply Need		0	0	0	0	0	0	0
Total Caldwell County Demand								
Municipal		4,641	6,306	7,898	9,222	10,555	11,926	13,328
Industrial		11	15	18	21	24	27	29
Steam-Electric		0	0	0	0	0	0	0
Irrigation		989	1,044	928	824	733	651	578
Mining		12	14	15	16	17	18	18
Livestock		918	918	918	918	918	918	918
Total County Demand		6,571	8,297	9,777	11,001	12,247	13,540	14,871
Total Caldwell County Supply								
Municipal		7,395	7,393	7,397	7,401	7,404	7,407	7,410
Industrial		30	30	30	30	30	30	30
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,025	1,063	984	912	850	794	743
Mining		12	14	15	16	17	18	18
Livestock		918	918	918	918	918	918	918
Total County Supply		9,380	9,418	9,344	9,277	9,219	9,167	9,119

Table C-3
Projected Water Demands, Supplies, and Needs
Caldwell County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Caldwell County Surplus/Shortage								
Municipal		2,754	1,087	-501	-1,821	-3,151	-4,519	-5,918
Industrial		19	15	12	9	6	3	1
Steam-Electric		0	0	0	0	0	0	0
Irrigation		36	19	56	88	117	143	165
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		2,809	1,121	-433	-1,724	-3,028	-4,373	-5,752
Total Basin Demand								
Guadalupe								
Municipal		4,300	5,823	7,271	8,468	9,671	10,915	12,185
Industrial		11	15	18	21	24	27	29
Steam-Electric		0	0	0	0	0	0	0
Irrigation		974	1,029	914	812	722	641	570
Mining		5	5	6	6	6	7	7
Livestock		762	762	762	762	762	762	762
Total Guadalupe Basin Demand		6,052	7,634	8,971	10,069	11,185	12,352	13,553
Colorado								
Municipal		341	483	627	754	884	1,011	1,143
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		15	15	14	12	11	10	8
Mining		7	9	9	10	11	11	11
Livestock		156	156	156	156	156	156	156
Total Colorado Basin Demand		519	663	806	932	1,062	1,188	1,318
Total Basin Supply								
Guadalupe								
Municipal		6,615	6,613	6,617	6,621	6,624	6,627	6,630
Industrial		30	30	30	30	30	30	30
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,010	1,048	970	900	839	784	735
Mining		5	5	6	6	6	7	7
Livestock		762	762	762	762	762	762	762
Unallocated Groundwater Supply		6,482	6,449	6,518	6,580	6,635	6,684	6,727
Total Guadalupe Basin Supply		14,904	14,906	14,903	14,899	14,896	14,893	14,890
Colorado								
Municipal		781	781	781	781	781	781	781
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		15	15	14	12	11	10	8
Mining		7	9	9	10	11	11	11
Livestock		156	156	156	156	156	156	156
Unallocated Groundwater Supply		705	703	704	705	705	706	708
Total Colorado Basin Supply		1,664	1,664	1,664	1,664	1,664	1,664	1,664
Total Basin Surplus/Shortage								
Guadalupe								
Municipal		2,315	790	-654	-1,847	-3,047	-4,288	-5,555
Industrial		19	15	12	9	6	3	1
Steam-Electric		0	0	0	0	0	0	0
Irrigation		36	19	56	88	117	143	165
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		6,482	6,449	6,518	6,580	6,635	6,684	6,727
Total Guadalupe Basin Surplus/Shortage		8,852	7,272	5,932	4,830	3,711	2,541	1,337

Table C-3 Projected Water Demands, Supplies, and Needs Caldwell County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Colorado									
Municipal			440	298	154	27	-103	-230	-362
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			705	703	704	705	705	706	708
Total Colorado Basin Surplus/Shortage			1,145	1,001	858	732	602	476	346
Groundwater Supplies									
	Available								
	Guadalupe	Carrizo	11,550	11,550	11,550	11,550	11,550	11,550	11,550
	Colorado	Carrizo	950	950	950	950	950	950	950
	Guadalupe	Queen City	328	328	328	328	328	328	328
	Total Available		12,828	12,828	12,828	12,828	12,828	12,828	12,828
	Allocated								
	Guadalupe	Carrizo	5,068	5,101	5,032	4,970	4,915	4,866	4,823
	Colorado	Carrizo	245	247	246	245	245	244	242
	Guadalupe	Queen City	328	328	328	328	328	328	328
	Total Allocated		5,640	5,676	5,606	5,542	5,488	5,438	5,393
	Total Unallocated		7,188	7,152	7,222	7,286	7,340	7,390	7,435

Table C-4 Projected Water Demands, Supplies, and Needs Calhoun County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Guadalupe Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin									
Point Comfort			140	224	323	500	677	667	667
Rural			111	65	39	23	14	8	5
	Subtotal		251	289	362	523	691	675	672
Lavaca-Guadalupe Coastal Basin									
Calhoun County WS			356	436	516	572	609	618	632
Port Lavaca			1,658	1,769	1,877	1,981	2,079	2,209	2,345
Seadrift			247	252	255	257	256	257	258
Rural (Port O'Conner MUD)			186	198	210	222	234	248	264
	Subtotal		2,447	2,655	2,858	3,032	3,178	3,332	3,499
San Antonio-Nueces Coastal Basin									
Rural			7	4	2	1	1	0	0
	Subtotal		7	4	2	1	1	0	0
Total Municipal Demand			2,705	2,948	3,222	3,556	3,870	4,007	4,171
Municipal Existing Supply									
Guadalupe Basin									
Rural		Run-of-River (GBRA)	69,162	69,162	69,162	69,162	69,162	69,162	69,162
	Subtotal		69,162	69,162	69,162	69,162	69,162	69,162	69,162
Colorado-Lavaca Coastal Basin									
Point Comfort		Lake Texana (LNRA)	178	178	178	178	178	178	178
Rural		Gulf Coast	139	139	139	139	139	139	139
	Subtotal		317	317	317	317	317	317	317
Lavaca-Guadalupe Coastal Basin									
Calhoun County WS		Canyon (GBRA)	500	500	500	500	500	500	500
		Run-of-River (GBRA)	140	140	140	140	140	140	140
Calhoun County WS Subtotal			640	640	640	640	640	640	640
Port Lavaca		Canyon (GBRA)	1,500	1,500	1,500	1,500	1,500	1,500	1,500
		Run-of-River (GBRA)	940	940	940	940	940	940	940
Port Lavaca Subtotal			2,440	2,440	2,440	2,440	2,440	2,440	2,440
Seadrift	estimated	Gulf Coast	452	452	452	452	452	452	452
Rural (Port O'Conner MUD)		Canyon (GBRA)	60	60	60	60	60	60	60
		Gulf Coast	221	221	221	221	221	221	221
Rural (Port O'Conner MUD) Subtotal			281	281	281	281	281	281	281
	Subtotal		3,813	3,813	3,813	3,813	3,813	3,813	3,813
San Antonio-Nueces Coastal Basin									
Rural		Gulf Coast	9	9	9	9	9	9	9
	Subtotal		9	9	9	9	9	9	9
Total Municipal Existing Supply			73,301	73,301	73,301	73,301	73,301	73,301	73,301
Municipal Surplus/Shortage									
Guadalupe Basin									
Rural			69,162	69,162	69,162	69,162	69,162	69,162	69,162
	Subtotal		69,162	69,162	69,162	69,162	69,162	69,162	69,162
Colorado-Lavaca Coastal Basin									
Point Comfort			38	-46	-145	-322	-499	-489	-489
Rural			28	74	100	116	125	131	134
	Subtotal		66	28	-45	-206	-374	-358	-355
Lavaca-Guadalupe Coastal Basin									
Calhoun County WS			284	204	124	68	31	22	8
Port Lavaca			782	671	563	459	361	231	95
Seadrift			205	200	197	195	196	195	194
Rural (Port O'Conner MUD)			95	83	71	59	47	33	17
	Subtotal		1,366	1,158	955	781	635	481	314

Table C-4 Projected Water Demands, Supplies, and Needs Calhoun County South Central Texas Region									
Basin		Source	Total in	Projections					
			2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio-Nueces Coastal Basin									
Rural			2	5	7	8	8	9	9
	Subtotal		2	5	7	8	8	9	9
Total Municipal Surplus/Shortage			70,596	70,353	70,079	69,745	69,431	69,294	69,130
Municipal New Supply Need									
Guadalupe Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin									
Point Comfort			0	46	145	322	499	489	489
Rural			0	0	0	0	0	0	0
	Subtotal		0	46	145	322	499	489	489
Lavaca-Guadalupe Coastal Basin									
Calhoun County WS			0	0	0	0	0	0	0
Port Lavaca			0	0	0	0	0	0	0
Seadrift			0	0	0	0	0	0	0
Rural (Port O'Conner MUD)			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
San Antonio-Nueces Coastal Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	46	145	322	499	489	489
Industrial Demand									
Guadalupe Basin			136	160	176	190	204	216	232
Colorado-Lavaca Coastal Basin			19,175	22,516	24,810	26,790	28,753	30,486	32,671
Lavaca-Guadalupe Coastal Basin			23,086	27,108	29,871	32,255	34,618	36,704	39,335
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			42,397	49,784	54,857	59,235	63,575	67,406	72,238
Industrial Existing Supply									
Guadalupe Basin		Canyon (GBRA)	1,534	1,534	1,534	1,534	1,534	1,534	1,534
Colorado-Lavaca Coastal Basin		Lake Texana (LNRA)	32,426	32,426	32,426	32,426	32,426	32,426	32,426
		Gulf Coast	249	249	249	249	249	249	249
Colorado-Lavaca Coastal Basin Subtotal			32,675	32,675	32,675	32,675	32,675	32,675	32,675
Lavaca-Guadalupe Coastal Basin		Run-of-River (Guadalupe)	56,479	56,479	56,479	56,479	56,479	56,479	56,479
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			90,688	90,688	90,688	90,688	90,688	90,688	90,688
Industrial Surplus/Shortage									
Guadalupe Basin			1,398	1,374	1,358	1,344	1,330	1,318	1,302
Colorado-Lavaca Coastal Basin			13,500	10,159	7,865	5,885	3,922	2,189	4
Lavaca-Guadalupe Coastal Basin			33,393	29,371	26,608	24,224	21,861	19,775	17,144
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			48,291	40,904	35,831	31,453	27,113	23,282	18,450
Industrial New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0

Table C-4 Projected Water Demands, Supplies, and Needs Calhoun County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Steam-Electric Demand								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		684	569	454	530	624	738	877
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		684	569	454	530	624	738	877
Steam-Electric Existing Supply								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin	Gulf Coast	889	889	889	889	889	889	889
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		889	889	889	889	889	889	889
Steam-Electric Surplus/Shortage								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		205	320	435	359	265	151	12
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		205	320	435	359	265	151	12
Steam-Electric New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		8,077	15,568	13,654	12,096	11,041	10,285	9,581
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation Demand		8,077	15,568	13,654	12,096	11,041	10,285	9,581
Irrigation Supply								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin	Run-of-River (Guadalupe)	23,058	23,058	23,058	23,058	23,058	23,058	23,058
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation Supply		23,058	23,058	23,058	23,058	23,058	23,058	23,058
Irrigation Surplus/Shortage								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		14,981	7,490	9,404	10,962	12,017	12,773	13,477
San Antonio-Nueces Basin		0	0	0	0	0	0	1
Total Irrigation Surplus/Shortage		14,981	7,490	9,404	10,962	12,017	12,773	13,478
Irrigation New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0

Table C-4 Projected Water Demands, Supplies, and Needs Calhoun County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining Demand									
Guadalupe Basin			13	15	16	17	17	18	18
Colorado-Lavaca Coastal Basin			1	1	1	1	1	1	1
Lavaca-Guadalupe Coastal Basin			6	7	8	8	8	8	8
San Antonio-Nueces Basin			8	9	10	10	11	11	11
Total Mining Demand			28	32	35	36	37	38	38
Mining Supply									
Guadalupe Basin		Gulf Coast	13	15	16	17	17	18	18
Colorado-Lavaca Coastal Basin		Gulf Coast	1	1	1	1	1	1	1
Lavaca-Guadalupe Coastal Basin		Gulf Coast	6	7	8	8	8	8	8
San Antonio-Nueces Basin		Gulf Coast	8	9	10	10	11	11	11
Total Mining Supply			28	32	35	36	37	38	38
Mining Surplus/Shortage									
Guadalupe Basin			0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
Guadalupe Basin			3	3	3	3	3	3	3
Colorado-Lavaca Coastal Basin			17	17	17	17	17	17	17
Lavaca-Guadalupe Coastal Basin			322	322	322	322	322	322	322
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock Demand			342	342	342	342	342	342	342
Livestock Supply									
Guadalupe Basin		Gulf Coast	1	1	1	1	1	1	1
		Local	2	2	2	2	2	2	2
	Subtotal		3	3	3	3	3	3	3
Colorado-Lavaca Coastal Basin		Gulf Coast	8	8	8	8	8	8	8
		Local	9	9	9	9	9	9	9
	Subtotal		17	17	17	17	17	17	17
Lavaca-Guadalupe Coastal Basin		Gulf Coast	161	161	161	161	161	161	161
		Local	161	161	161	161	161	161	161
	Subtotal		322	322	322	322	322	322	322
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock Supply			342	342	342	342	342	342	342
Livestock Surplus/Shortage									
Guadalupe Basin			0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Colorado-Lavaca Coastal Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0

Table C-4 Projected Water Demands, Supplies, and Needs Calhoun County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000	2010	2020	2030	2040	2050	2060
		(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Total Calhoun County Demand								
Municipal		2,705	2,948	3,222	3,556	3,870	4,007	4,171
Industrial		42,397	49,784	54,857	59,235	63,575	67,406	72,238
Steam-Electric		684	569	454	530	624	738	877
Irrigation		8,077	15,568	13,654	12,096	11,041	10,285	9,581
Mining		28	32	35	36	37	38	38
Livestock		342	342	342	342	342	342	342
Total County Demand		54,233	69,243	72,564	75,795	79,489	82,816	87,247
Total Calhoun County Supply								
Municipal		73,301	73,301	73,301	73,301	73,301	73,301	73,301
Industrial		90,688	90,688	90,688	90,688	90,688	90,688	90,688
Steam-Electric		889	889	889	889	889	889	889
Irrigation		23,058	23,058	23,058	23,058	23,058	23,058	23,058
Mining		28	32	35	36	37	38	38
Livestock		342	342	342	342	342	342	342
Total County Supply		188,306	188,310	188,313	188,314	188,315	188,316	188,316
Total Calhoun County Surplus/Shortage								
Municipal		70,596	70,353	70,079	69,745	69,431	69,294	69,130
Industrial		48,291	40,904	35,831	31,453	27,113	23,282	18,450
Steam-Electric		205	320	435	359	265	151	12
Irrigation		14,981	7,490	9,404	10,962	12,017	12,773	13,477
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		134,073	119,067	115,749	112,519	108,826	105,500	101,069
Total Basin Demand								
Guadalupe								
Municipal		0	0	0	0	0	0	0
Industrial		136	160	176	190	204	216	232
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		13	15	16	17	17	18	18
Livestock		3	3	3	3	3	3	3
Total Guadalupe Basin Demand		152	178	195	210	224	237	253
Colorado-Lavaca								
Municipal		251	289	362	523	691	675	672
Industrial		19,175	22,516	24,810	26,790	28,753	30,486	32,671
Steam-Electric		684	569	454	530	624	738	877
Irrigation		0	0	0	0	0	0	0
Mining		1	1	1	1	1	1	1
Livestock		17	17	17	17	17	17	17
Total Colorado-Lavaca Basin Demand		20,128	23,392	25,644	27,861	30,086	31,917	34,238
Lavaca-Guadalupe								
Municipal		2,447	2,655	2,858	3,032	3,178	3,332	3,499
Industrial		23,086	27,108	29,871	32,255	34,618	36,704	39,335
Steam-Electric		0	0	0	0	0	0	0
Irrigation		8,077	15,568	13,654	12,096	11,041	10,285	9,581
Mining		6	7	8	8	8	8	8
Livestock		322	322	322	322	322	322	322
Total Lavaca-Guadalupe Basin Demand		33,938	45,660	46,713	47,713	49,167	50,651	52,745

Table C-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio-Nueces								
Municipal		7	4	2	1	1	0	0
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		8	9	10	10	11	11	11
Livestock		0	0	0	0	0	0	0
Total San Antonio-Nueces Basin Demand		15	13	12	11	12	11	11
Total Basin Supply								
Guadalupe								
Municipal		69,162	69,162	69,162	69,162	69,162	69,162	69,162
Industrial		1,534	1,534	1,534	1,534	1,534	1,534	1,534
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		13	15	16	17	17	18	18
Livestock		3	3	3	3	3	3	3
Unallocated Groundwater Supply		28	26	25	24	24	23	23
Total Guadalupe Basin Supply		70,740	70,740	70,740	70,740	70,740	70,740	70,740
Colorado-Lavaca								
Municipal		317	317	317	317	317	317	317
Industrial		32,675	32,675	32,675	32,675	32,675	32,675	32,675
Steam-Electric		889	889	889	889	889	889	889
Irrigation		0	0	0	0	0	0	0
Mining		1	1	1	1	1	1	1
Livestock		17	17	17	17	17	17	17
Unallocated Groundwater Supply		181	181	181	181	181	181	181
Total Colorado-Lavaca Basin Supply		34,080	34,080	34,080	34,080	34,080	34,080	34,080
Lavaca-Guadalupe								
Municipal		3,813	3,813	3,813	3,813	3,813	3,813	3,813
Industrial		56,479	56,479	56,479	56,479	56,479	56,479	56,479
Steam-Electric		0	0	0	0	0	0	0
Irrigation		23,058	23,058	23,058	23,058	23,058	23,058	23,058
Mining		6	7	8	8	8	8	8
Livestock		322	322	322	322	322	322	322
Unallocated Groundwater Supply		494	493	492	492	492	492	492
Total Lavaca-Guadalupe Basin Supply		84,172	84,172	84,172	84,172	84,172	84,172	84,172
San Antonio-Nueces								
Municipal		9	9	9	9	9	9	9
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		8	9	10	10	11	11	11
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		80	79	78	78	77	77	77
Total San Antonio-Nueces Basin Supply		97	97	97	97	97	97	97
Total Basin Surplus/Shortage								
Guadalupe								
Municipal		69,162	69,162	69,162	69,162	69,162	69,162	69,162
Industrial		1,398	1,374	1,358	1,344	1,330	1,318	1,302
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		28	26	25	24	24	23	23
Total Guadalupe Basin Surplus/Shortage		70,588	70,562	70,545	70,530	70,516	70,503	70,487

Table C-4
Projected Water Demands, Supplies, and Needs
Calhoun County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Colorado-Lavaca									
Municipal			66	28	-45	-206	-374	-358	-355
Industrial			13,500	10,159	7,865	5,885	3,922	2,189	4
Steam-Electric			205	320	435	359	265	151	12
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			181	181	181	181	181	181	181
Total Colorado-Lavaca Basin Surplus/Shortage			13,952	10,688	8,436	6,219	3,994	2,163	-158
Lavaca-Guadalupe									
Municipal			1,366	1,158	955	781	635	481	314
Industrial			33,393	29,371	26,608	24,224	21,861	19,775	17,144
Steam-Electric			0	0	0	0	0	0	0
Irrigation			14,981	7,490	9,404	10,962	12,017	12,773	13,477
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			494	493	492	492	492	492	492
Total Lavaca-Guadalupe Basin Surplus/Shortage			50,234	38,512	37,459	36,459	35,005	33,521	31,427
San Antonio-Nueces									
Municipal			2	5	7	8	8	9	9
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			80	79	78	78	77	77	77
Total San Antonio-Nueces Basin Surplus/Shortage			82	84	85	86	85	86	86
Groundwater Supplies									
	Available								
	Guadalupe	Gulf Coast	42	42	42	42	42	42	42
	Lavaca-Guadalupe	Gulf Coast	1,334	1,334	1,334	1,334	1,334	1,334	1,334
	Colorado-Lavaca	Gulf Coast	1,467	1,467	1,467	1,467	1,467	1,467	1,467
	San Antonio-Nueces	Gulf Coast	97	97	97	97	97	97	97
	Total Available		2,940	2,940	2,940	2,940	2,940	2,940	2,940
	Allocated								
	Guadalupe	Gulf Coast	14	16	17	18	18	19	19
	Lavaca-Guadalupe	Gulf Coast	840	841	842	842	842	842	842
	Colorado-Lavaca	Gulf Coast	1,286	1,286	1,286	1,286	1,286	1,286	1,286
	San Antonio-Nueces	Gulf Coast	17	18	19	19	20	20	20
	Total Allocated		2,157	2,161	2,164	2,165	2,166	2,167	2,167
	Total Unallocated		783	779	776	775	774	773	773

Table C-5 Projected Water Demands, Supplies, and Needs Comal County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand								
San Antonio Basin								
Bexar Met Water District		214	429	695	984	1,249	1,537	1,860
Bulverde City		501	1,044	1,728	2,507	3,283	4,089	4,954
Fair Oaks Ranch		58	58	58	58	58	58	59
Garden Ridge		185	228	284	347	411	477	549
Schertz (part)		7	11	16	23	28	35	42
Selma		6	77	129	193	222	248	274
Water Service Inc. (Apex Water Ser)		236	308	402	509	615	723	845
Rural		109	118	145	172	209	250	298
Subtotal		1,316	2,273	3,457	4,793	6,075	7,417	8,881
Guadalupe Basin								
Bexar Met Water District		16	33	53	75	95	117	141
Bulverde City		4	9	14	21	27	34	41
Canyon Lake WSC		1,495	2,928	4,769	6,838	8,898	11,034	13,331
Crystal Clear WSC		174	240	325	426	516	619	731
Garden Ridge		273	337	419	513	607	704	811
Green Valley SUD		173	235	314	409	493	591	696
New Braunfels		8,073	10,042	12,510	15,390	18,241	21,168	24,416
Schertz		44	71	107	146	185	226	270
Rural		2,487	2,603	2,785	2,987	3,167	3,408	3,700
Subtotal		12,739	16,498	21,296	26,805	32,229	37,901	44,137
Total Municipal Demand		14,055	18,771	24,753	31,598	38,304	45,318	53,018
Municipal Existing Supply								
San Antonio Basin								
Bexar Met Water District	Trinity	43	43	43	43	43	35	35
Bulverde City	Canyon (GBRA)	0	396	396	396	396	396	396
Fair Oaks Ranch	Trinity	13	13	13	13	13	11	11
	Canyon (GBRA)	0	48	65	70	70	70	70
Fair Oaks Ranch Subtotal		13	61	78	83	83	81	81
Garden Ridge	Edwards	113	113	113	113	113	113	113
Schertz (part)	Edwards	3	3	3	3	3	3	3
	Carrizo (Gonzales) - S/S	13	13	13	13	13	13	13
Schertz Subtotal		16	16	16	16	16	16	16
Selma	Edwards (Bexar)	2	2	2	2	2	2	2
	Carrizo (Gonzales)	18	18	18	18	18	18	18
Selma Subtotal		20	20	20	20	20	20	20
Water Service Inc. (Apex Water Ser)	Edwards	14	14	14	14	14	14	14
Rural	Trinity	20	20	20	20	20	16	16
	Canyon (GBRA)	0	45	400	400	400	400	400
Rural Subtotal		20	65	420	420	420	416	416
Subtotal		239	728	1,100	1,105	1,105	1,091	1,091
Guadalupe Basin								
Bexar Met Water District		0	0	0	0	0	0	0
Bulverde City	Canyon (GBRA)	0	4	4	4	4	4	4
Canyon Lake WSC	Canyon (GBRA)	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Crystal Clear WSC	Edwards	59	59	59	59	59	59	59
	ROR (Guadalupe) - CRWA	10	10	10	10	10	10	10
	Canyon (CRWA)	33	33	33	33	33	33	33
	Canyon (CRWA) - Springs Hill	28	28	28	28	28	28	28
	Canyon (New Braunfels)	102	102	102	102	102	102	102
	Canyon (GBRA)	90	90	90	90	90	90	90
Crystal Clear WSC		323	323	323	323	323	323	323
Garden Ridge	Edwards	167	167	167	167	167	167	167
Green Valley SUD	Edwards	48	48	48	48	48	48	48
	Edwards (East Central)	15	15	15	15	15	15	15
	Canyon (GBRA)	15	15	23	23	53	53	53
	Canyon (CRWA)	135	135	128	128	128	128	128
Green Valley SUD Subtotal		213	213	213	213	243	243	243

Table C-5 Projected Water Demands, Supplies, and Needs Comal County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
New Braunfels		Edwards	4,102	4,102	4,102	4,102	4,102	4,102	4,102
		Canyon (GBRA)	5,634	5,634	5,634	5,634	5,634	5,634	5,634
		ROR (Guadalupe)	1,639	1,639	1,639	1,639	1,639	1,639	1,639
New Braunfels Subtotal			11,375	11,375	11,375	11,375	11,375	11,375	11,375
Schertz		Edwards	14	14	14	14	14	14	14
		Carrizo (Gonzales) - S/S	79	79	79	79	79	79	79
Schertz Subtotal			93	93	93	93	93	93	93
Rural		Edwards	61	61	61	61	61	61	61
		Trinity	746	681	653	637	623	499	490
		Run-of-River	7	7	7	7	7	7	7
		Canyon (GBRA)	155	155	572	1,071	1,071	1,071	1,071
Rural Subtotal			969	904	1,293	1,776	1,762	1,638	1,629
	Subtotal		17,139	17,078	17,467	17,950	17,966	17,842	17,833
Total Municipal Existing Supply			17,378	17,806	18,567	19,055	19,071	18,933	18,924
Municipal Surplus/Shortage									
San Antonio Basin									
Bexar Met Water District			-171	-386	-652	-941	-1,206	-1,502	-1,825
Bulverde City			-501	-648	-1,332	-2,111	-2,887	-3,693	-4,558
Fair Oaks Ranch			-45	3	20	25	25	23	22
Garden Ridge			-72	-115	-171	-234	-298	-364	-436
Schertz (part)			9	5	0	-7	-12	-19	-26
Selma			14	-57	-109	-173	-202	-228	-254
Water Service Inc. (Apex Water Ser)			-222	-294	-388	-495	-601	-709	-831
Rural			-89	-53	275	248	211	166	118
	Subtotal		-1,077	-1,545	-2,357	-3,688	-4,970	-6,326	-7,790
Guadalupe Basin									
Bexar Met Water District			-16	-33	-53	-75	-95	-117	-141
Bulverde City			-4	-5	-10	-17	-23	-30	-37
Canyon Lake WSC			2,505	1,072	-769	-2,838	-4,898	-7,034	-9,331
Crystal Clear WSC			149	83	-2	-103	-193	-296	-408
Garden Ridge			-106	-170	-252	-346	-440	-537	-644
Green Valley SUD			40	-22	-101	-196	-250	-348	-453
New Braunfels			3,302	1,333	-1,135	-4,015	-6,866	-9,793	-13,041
Schertz			49	22	-14	-53	-92	-133	-177
Rural			-1,518	-1,699	-1,492	-1,211	-1,405	-1,770	-2,071
	Subtotal		4,400	580	-3,829	-8,855	-14,263	-20,059	-26,304
Total Municipal Surplus/Shortage			3,323	-965	-6,186	-12,543	-19,233	-26,385	-34,094
Municipal New Supply Need									
San Antonio Basin									
Bexar Met Water District			171	386	652	941	1,206	1,502	1,825
Bulverde City			501	648	1,332	2,111	2,887	3,693	4,558
Fair Oaks Ranch			45	0	0	0	0	0	0
Garden Ridge			72	115	171	234	298	364	436
Schertz (part)			0	0	0	7	12	19	26
Selma			0	57	109	173	202	228	254
Water Service Inc. (Apex Water Ser)			222	294	388	495	601	709	831
Rural			89	53	0	0	0	0	0
	Subtotal		1,100	1,553	2,652	3,961	5,206	6,515	7,930

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Table C-5									
Projected Water Demands, Supplies, and Needs									
Comal County									
South Central Texas Region									
Guadalupe Basin									
Bexar Met Water District			16	33	53	75	95	117	141
Bulverde City			4	5	10	17	23	30	37
Canyon Lake WSC			0	0	769	2,838	4,898	7,034	9,331
Crystal Clear WSC			0	0	2	103	193	296	408
Garden Ridge			106	170	252	346	440	537	644
Green Valley SUD			0	22	101	196	250	348	453
New Braunfels			0	0	1,135	4,015	6,866	9,793	13,041
Schertz			0	0	14	53	92	133	177
Rural			1,518	1,699	1,492	1,211	1,405	1,770	2,071
	Subtotal		1,644	1,929	3,829	8,855	14,263	20,059	26,304
Total Municipal New Supply Need			2,744	3,482	6,481	12,816	19,469	26,574	34,234
Industrial Demand									
San Antonio Basin			1	1	1	1	2	2	2
Guadalupe Basin			6,282	7,728	8,562	9,313	10,043	10,670	11,551
Total Industrial Demand			6,283	7,729	8,563	9,314	10,045	10,672	11,553
Industrial Existing Supply									
San Antonio Basin		Edwards	369	369	369	369	369	369	369
Guadalupe Basin		Edwards	5,686	5,686	5,686	5,686	5,686	5,686	5,686
		Run-of-River	3,559	3,559	3,559	3,559	3,559	3,559	3,559
		Canyon (GBRA)	9	9	9	9	9	9	9
Guadalupe Basin Subtotal			9,254	9,254	9,254	9,254	9,254	9,254	9,254
Total Industrial Existing Supply			9,623	9,623	9,623	9,623	9,623	9,623	9,623
Industrial Surplus/Shortage									
San Antonio Basin			368	368	368	368	367	367	367
Guadalupe Basin			2,972	1,526	692	-59	-789	-1,416	-2,297
Total Industrial Surplus/Shortage			3,340	1,894	1,060	309	-422	-1,049	-1,930
Industrial New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	59	789	1,416	2,297
Total Industrial New Supply Need			0	0	0	59	789	1,416	2,297
Steam-Electric Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0
Steam-Electric Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Steam-Electric Existing Supply			0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage			0	0	0	0	0	0	0
Steam-Electric New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	0	0

Table C-5
Projected Water Demands, Supplies, and Needs
Comal County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Irrigation Demand									
San Antonio Basin			7	30	28	23	22	20	18
Guadalupe Basin			43	174	158	146	130	115	101
Total Irrigation Demand			50	204	186	169	152	135	119
Irrigation Supply									
San Antonio Basin		Edwards	43	43	43	43	43	43	43
San Antonio Basin Subtotal			43	43	43	43	43	43	43
Guadalupe Basin		Edwards	665	665	665	665	665	665	665
		Canyon (GBRA)	269	269	269	269	269	269	269
		Run-of-River	106	106	106	106	106	106	106
Guadalupe Basin Subtotal			1,040	1,040	1,040	1,040	1,040	1,040	1,040
Total Irrigation Supply			1,083	1,083	1,083	1,083	1,083	1,083	1,083
Irrigation Surplus/Shortage									
San Antonio Basin			36	13	15	20	21	23	25
Guadalupe Basin			997	866	882	894	910	925	939
Total Irrigation Surplus/Shortage			1,033	879	897	914	931	948	964
Irrigation New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			0	0	0	0	0	0	0
Mining Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			2,224	2,678	2,897	3,029	3,159	3,287	3,401
Total Mining Demand			2,224	2,678	2,897	3,029	3,159	3,287	3,401
Mining Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin		Trinity	704	773	803	819	835	697	707
Total Mining Supply			704	773	803	819	835	697	707
Mining Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			-1,520	-1,905	-2,094	-2,210	-2,324	-2,590	-2,694
Total Mining Surplus/Shortage			-1,520	-1,905	-2,094	-2,210	-2,324	-2,590	-2,694
Mining New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			1,520	1,905	2,094	2,210	2,324	2,590	2,694
Total Mining New Supply Need			1,520	1,905	2,094	2,210	2,324	2,590	2,694
Livestock Demand									
San Antonio Basin			42	42	42	42	42	42	42
Guadalupe Basin			256	256	256	256	256	256	256
Total Livestock Demand			298	298	298	298	298	298	298
Livestock Supply									
San Antonio Basin		Trinity	3	3	3	3	3	2	2
		Local	21	21	21	21	21	21	21
	Subtotal		24	24	24	24	24	23	23
Guadalupe Basin		Trinity	41	37	35	35	34	27	27
		Local	128	128	128	128	128	128	128
	Subtotal		169	165	163	163	162	155	155
Total Livestock Supply			193	189	187	187	186	178	178

Table C-5 Projected Water Demands, Supplies, and Needs Comal County South Central Texas Region								
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock Surplus/Shortage									
San Antonio Basin			-18	-18	-18	-18	-18	-19	-19
Guadalupe Basin			-87	-91	-93	-93	-94	-101	-101
Total Livestock Surplus/Shortage[1]			-105	-109	-111	-111	-112	-120	-120
Livestock New Supply Need									
San Antonio Basin			18	18	18	18	18	19	19
Guadalupe Basin			87	91	93	93	94	101	101
Total Livestock New Supply Need			105	109	111	111	112	120	120
Total Comal County Demand									
Municipal			14,055	18,771	24,753	31,598	38,304	45,318	53,018
Industrial			6,283	7,729	8,563	9,314	10,045	10,672	11,553
Steam-Electric			0	0	0	0	0	0	0
Irrigation			50	204	186	169	152	135	119
Mining			2,224	2,678	2,897	3,029	3,159	3,287	3,401
Livestock			298	298	298	298	298	298	298
Total County Demand			22,910	29,680	36,697	44,408	51,958	59,710	68,389
Total Comal County Supply									
Municipal			17,378	17,806	18,567	19,055	19,071	18,933	18,924
Industrial			9,623	9,623	9,623	9,623	9,623	9,623	9,623
Steam-Electric			0	0	0	0	0	0	0
Irrigation			1,083	1,083	1,083	1,083	1,083	1,083	1,083
Mining			704	773	803	819	835	697	707
Livestock			193	189	187	187	186	178	178
Total County Supply			28,981	29,474	30,263	30,767	30,798	30,514	30,515
Total Comal County Surplus/Shortage									
Municipal			3,323	-965	-6,186	-12,543	-19,233	-26,385	-34,094
Industrial			3,340	1,894	1,060	309	-422	-1,049	-1,930
Steam-Electric			0	0	0	0	0	0	0
Irrigation			1,033	879	897	914	931	948	964
Mining			-1,520	-1,905	-2,094	-2,210	-2,324	-2,590	-2,694
Livestock			-105	-109	-111	-111	-112	-120	-120
Total County Surplus/Shortage			6,071	-206	-6,434	-13,641	-21,160	-29,196	-37,874
Total Basin Demand									
San Antonio									
Municipal			1,316	2,273	3,457	4,793	6,075	7,417	8,881
Industrial			1	1	1	1	2	2	2
Steam-Electric			0	0	0	0	0	0	0
Irrigation			7	30	28	23	22	20	18
Mining			0	0	0	0	0	0	0
Livestock			42	42	42	42	42	42	42
Total San Antonio Basin Demand			1,366	2,346	3,528	4,859	6,141	7,481	8,943
Guadalupe									
Municipal			12,739	16,498	21,296	26,805	32,229	37,901	44,137
Industrial			6,282	7,728	8,562	9,313	10,043	10,670	11,551
Steam-Electric			0	0	0	0	0	0	0
Irrigation			43	174	158	146	130	115	101
Mining			2,224	2,678	2,897	3,029	3,159	3,287	3,401
Livestock			256	256	256	256	256	256	256
Total Guadalupe Basin Demand			21,544	27,334	33,169	39,549	45,817	52,229	59,446

Table C-5 Projected Water Demands, Supplies, and Needs Comal County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Total Basin Supply									
San Antonio									
Municipal			239	728	1,100	1,105	1,105	1,091	1,091
Industrial			369	369	369	369	369	369	369
Steam-Electric			0	0	0	0	0	0	0
Irrigation			43	43	43	43	43	43	43
Mining			0	0	0	0	0	0	0
Livestock			24	24	24	24	24	23	23
Total San Antonio Basin Supply			675	1,164	1,536	1,541	1,541	1,526	1,526
Guadalupe									
Municipal			17,139	17,078	17,467	17,950	17,966	17,842	17,833
Industrial			9,254	9,254	9,254	9,254	9,254	9,254	9,254
Steam-Electric			0	0	0	0	0	0	0
Irrigation			1,040	1,040	1,040	1,040	1,040	1,040	1,040
Mining			704	773	803	819	835	697	707
Livestock			169	165	163	163	162	155	155
Total Guadalupe Basin Supply			28,306	28,310	28,727	29,226	29,257	28,988	28,989
Total Basin Surplus/Shortage									
San Antonio									
Municipal			-1,077	-1,545	-2,357	-3,688	-4,970	-6,326	-7,790
Industrial			368	368	368	368	367	367	367
Steam-Electric			0	0	0	0	0	0	0
Irrigation			36	13	15	20	21	23	25
Mining			0	0	0	0	0	0	0
Livestock			-18	-18	-18	-18	-18	-19	-19
Total San Antonio Basin Surplus/Shortage			-691	-1,182	-1,992	-3,318	-4,600	-5,955	-7,417
Guadalupe									
Municipal			4,400	580	-3,829	-8,855	-14,263	-20,059	-26,304
Industrial			2,972	1,526	692	-59	-789	-1,416	-2,297
Steam-Electric			0	0	0	0	0	0	0
Irrigation			997	866	882	894	910	925	939
Mining			-1,520	-1,905	-2,094	-2,210	-2,324	-2,590	-2,694
Livestock			-87	-91	-93	-93	-94	-101	-101
Total Guadalupe Basin Surplus/Shortage			6,762	976	-4,442	-10,323	-16,560	-23,241	-30,457
Groundwater Supplies									
	Available								
	San Antonio	Edwards	412	412	412	412	412	412	412
	Guadalupe	Edwards	11,657	11,657	11,657	11,657	11,657	11,657	11,657
	San Antonio	Trinity	309	309	309	309	309	253	253
	Guadalupe	Trinity	1,491	1,491	1,491	1,491	1,491	1,223	1,223
	Total Available		13,869	13,869	13,869	13,869	13,869	13,545	13,545
	Allocated								
	San Antonio	Edwards	412	412	412	412	412	412	412
	Guadalupe	Edwards	11,657	11,657	11,657	11,657	11,657	11,657	11,657
	San Antonio	Trinity	309	309	309	309	309	253	253
	Guadalupe	Trinity	1,491	1,491	1,491	1,491	1,491	1,223	1,223
	Total Allocated		13,869	13,869	13,869	13,869	13,869	13,545	13,545
	Total Unallocated		0	0	0	0	0	0	0
Notes:									
[1] There is insufficient groundwater available in the county to meet all of the projected livestock demand.									

Table C-6 Projected Water Demands, Supplies, and Needs DeWitt County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
San Antonio Basin									
Rural			67	67	66	65	63	61	60
	Subtotal		67	67	66	65	63	61	60
Guadalupe Basin									
Cuero			1,244	1,249	1,257	1,250	1,232	1,198	1,177
Gonzales County WSC			106	107	108	108	108	106	104
Yorktown			343	343	344	340	334	323	318
Rural			807	801	797	783	762	734	721
	Subtotal		2,500	2,500	2,506	2,481	2,436	2,361	2,320
Lavaca Basin									
Yoakum			352	352	354	351	345	334	328
Rural			146	145	145	142	138	133	131
	Subtotal		498	497	499	493	483	467	459
Lavaca-Guadalupe Coastal Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal Demand			3,065	3,064	3,071	3,039	2,982	2,889	2,839
Municipal Existing Supply									
San Antonio Basin									
Rural		Gulf Coast	84	84	84	84	84	84	84
	Subtotal		84	84	84	84	84	84	84
Guadalupe Basin									
Cuero		Gulf Coast	5,344	5,344	5,344	5,344	5,344	5,344	5,344
Gonzales County WSC		Carrizo	102	102	102	102	102	102	102
		Canyon (GBRA)	49	49	49	49	49	49	49
Gonzales County WSC Subtotal			151	151	151	151	151	151	151
Yorktown		Gulf Coast	1,210	1,210	1,210	1,210	1,210	1,210	1,210
Rural		Gulf Coast	1,009	1,009	1,009	1,009	1,009	1,009	1,009
	Subtotal		7,714	7,714	7,714	7,714	7,714	7,714	7,714
Lavaca Basin									
Yoakum		Gulf Coast	1,026	1,026	1,026	1,026	1,026	1,026	1,026
Rural		Gulf Coast	183	183	183	183	183	183	183
	Subtotal		1,209	1,209	1,209	1,209	1,209	1,209	1,209
Lavaca-Guadalupe Coastal Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal Existing Supply			9,007	9,007	9,007	9,007	9,007	9,007	9,007
Municipal Surplus/Shortage									
San Antonio Basin									
Rural			17	17	18	19	21	23	24
	Subtotal		17	17	18	19	21	23	24
Guadalupe Basin									
Cuero			4,100	4,095	4,087	4,094	4,112	4,146	4,167
Gonzales County WSC			45	44	43	43	43	45	47
Yorktown			867	867	866	870	876	887	892
Rural			202	208	212	226	247	275	288
	Subtotal		5,214	5,214	5,208	5,233	5,278	5,353	5,394

Table C-6 Projected Water Demands, Supplies, and Needs DeWitt County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Lavaca Basin									
Yoakum			674	674	672	675	681	692	698
Rural			37	38	38	41	45	50	52
	Subtotal		711	712	710	716	726	742	750
Lavaca-Guadalupe Coastal Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal Surplus/Shortage			5,942	5,943	5,936	5,968	6,025	6,118	6,168
Municipal New Supply Need									
San Antonio Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Guadalupe Basin									
Cuero			0	0	0	0	0	0	0
Gonzales County WSC			0	0	0	0	0	0	0
Yorktown			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Lavaca Basin									
Yoakum			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			147	176	190	202	215	225	242
Lavaca Basin			7	8	9	10	10	11	12
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial Demand			154	184	199	212	225	236	254
Industrial Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin		Gulf Coast	245	245	245	245	245	245	245
Lavaca Basin		Gulf Coast	15	15	15	15	15	15	15
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			260	260	260	260	260	260	260
Industrial Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			98	69	55	43	30	20	3
Lavaca Basin			8	7	6	5	5	4	3
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			106	76	61	48	35	24	6

Table C-6
Projected Water Demands, Supplies, and Needs
DeWitt County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0
Steam-Electric Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0
Steam-Electric Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Steam-Electric Existing Supply			0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage			0	0	0	0	0	0	0
Steam-Electric New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	0	0
Irrigation Demand									
San Antonio Basin			8	12	10	8	7	5	5
Guadalupe Basin			94	147	122	100	80	64	49
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Irrigation Demand			102	159	132	108	87	69	54
Irrigation Supply									
San Antonio Basin		Gulf Coast	8	12	10	8	7	5	5
Guadalupe Basin		Run-of-River	299	299	299	299	299	299	299
		Gulf Coast	23	35	29	24	19	15	12
	Subtotal		322	334	328	323	318	314	311
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Irrigation Supply			330	346	338	331	325	319	316

Table C-6 Projected Water Demands, Supplies, and Needs DeWitt County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Irrigation Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		228	187	206	223	238	250	262
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage		228	187	206	223	238	250	262
Irrigation New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0
Mining Demand								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		9	10	10	10	10	10	11
Lavaca Basin		34	37	39	40	40	41	41
Lavaca-Guadalupe Coastal Basin		15	17	18	18	18	19	19
Total Mining Demand		58	64	67	68	68	70	71
Mining Supply								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin	Gulf Coast	9	10	10	10	10	10	11
Lavaca Basin	Gulf Coast	34	37	39	40	40	41	41
Lavaca-Guadalupe Coastal Basin	Gulf Coast	15	17	18	18	18	19	19
Total Mining Supply		58	64	67	68	68	70	71
Mining Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		0	0	0	0	0	0	0
Mining New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0
Livestock Demand								
San Antonio Basin		135	135	135	135	135	135	135
Guadalupe Basin		1,267	1,267	1,267	1,267	1,267	1,267	1,267
Lavaca Basin		253	253	253	253	253	253	253
Lavaca-Guadalupe Coastal Basin		34	34	34	34	34	34	34
Total Livestock Demand		1,689	1,689	1,689	1,689	1,689	1,689	1,689

Table C-6									
Projected Water Demands, Supplies, and Needs									
DeWitt County									
South Central Texas Region									
			Total in	**Projections**					
Basin		**Source**	**2000 (acft)**	**2010 (acft)**	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**	**2060 (acft)**
Livestock Supply									
San Antonio Basin		Gulf Coast	67	67	67	67	67	67	67
		Local	68	68	68	68	68	68	68
	Subtotal		135	135	135	135	135	135	135
Guadalupe Basin		Gulf Coast	633	633	633	633	633	633	633
		Local	634	634	634	634	634	634	634
	Subtotal		1,267	1,267	1,267	1,267	1,267	1,267	1,267
Lavaca Basin		Gulf Coast	126	126	126	126	126	126	126
		Local	127	127	127	127	127	127	127
	Subtotal		253	253	253	253	253	253	253
Lavaca-Guadalupe Coastal Basin		Gulf Coast	17	17	17	17	17	17	17
		Local	17	17	17	17	17	17	17
	Subtotal		34	34	34	34	34	34	34
Total Livestock Supply			1,689	1,689	1,689	1,689	1,689	1,689	1,689
Livestock Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total DeWitt County Demand									
Municipal			3,065	3,064	3,071	3,039	2,982	2,889	2,839
Industrial			154	184	199	212	225	236	254
Steam-Electric			0	0	0	0	0	0	0
Irrigation			102	159	132	108	87	69	54
Mining			58	64	67	68	68	70	71
Livestock			1,689	1,689	1,689	1,689	1,689	1,689	1,689
Total County Demand			5,068	5,160	5,158	5,116	5,051	4,953	4,907
Total DeWitt County Supply									
Municipal			9,007	9,007	9,007	9,007	9,007	9,007	9,007
Industrial			260	260	260	260	260	260	260
Steam-Electric			0	0	0	0	0	0	0
Irrigation			330	346	338	331	325	319	316
Mining			58	64	67	68	68	70	71
Livestock			1,689	1,689	1,689	1,689	1,689	1,689	1,689
Total County Supply			11,344	11,366	11,361	11,355	11,349	11,345	11,343
Total DeWitt County Surplus/Shortage									
Municipal			5,942	5,943	5,936	5,968	6,025	6,118	6,168
Industrial			106	76	61	48	35	24	6
Steam-Electric			0	0	0	0	0	0	0
Irrigation			228	187	206	223	238	250	262
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			6,276	6,206	6,203	6,239	6,298	6,392	6,436

Table C-6 Projected Water Demands, Supplies, and Needs DeWitt County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Demand								
San Antonio								
Municipal		67	67	66	65	63	61	60
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		8	12	10	8	7	5	5
Mining		0	0	0	0	0	0	0
Livestock		135	135	135	135	135	135	135
Total San Antonio Basin Demand		210	214	211	208	205	201	200
Guadalupe								
Municipal		2,500	2,500	2,506	2,481	2,436	2,361	2,320
Industrial		147	176	190	202	215	225	242
Steam-Electric		0	0	0	0	0	0	0
Irrigation		94	147	122	100	80	64	49
Mining		9	10	10	10	10	10	11
Livestock		1,267	1,267	1,267	1,267	1,267	1,267	1,267
Total Guadalupe Basin Demand		4,017	4,100	4,095	4,060	4,008	3,927	3,889
Lavaca								
Municipal		498	497	499	493	483	467	459
Industrial		7	8	9	10	10	11	12
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		34	37	39	40	40	41	41
Livestock		253	253	253	253	253	253	253
Total Lavaca Basin Demand		792	795	800	796	786	772	765
Lavaca-Guadalupe								
Municipal		0	0	0	0	0	0	0
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		15	17	18	18	18	19	19
Livestock		34	34	34	34	34	34	34
Total Lavaca-Guadalupe Basin Demand		49	51	52	52	52	53	53
Total Basin Supply								
San Antonio								
Municipal		84	84	84	84	84	84	84
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		8	12	10	8	7	5	5
Mining		0	0	0	0	0	0	0
Livestock		135	135	135	135	135	135	135
Unallocated Groundwater Supply		1,041	1,037	1,039	1,041	1,042	1,044	1,044
Total San Antonio Basin Supply		1,268	1,268	1,268	1,268	1,268	1,268	1,268

Table C-6 Projected Water Demands, Supplies, and Needs DeWitt County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe								
Municipal		7,714	7,714	7,714	7,714	7,714	7,714	7,714
Industrial		245	245	245	245	245	245	245
Steam-Electric		0	0	0	0	0	0	0
Irrigation		322	334	328	323	318	314	311
Mining		9	10	10	10	10	10	11
Livestock		1,267	1,267	1,267	1,267	1,267	1,267	1,267
Unallocated Groundwater Supply		3,625	3,611	3,617	3,622	3,627	3,631	3,633
Total Guadalupe Basin Supply		13,182	13,181	13,181	13,181	13,181	13,181	13,181
Lavaca								
Municipal		1,209	1,209	1,209	1,209	1,209	1,209	1,209
Industrial		15	15	15	15	15	15	15
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		34	37	39	40	40	41	41
Livestock		253	253	253	253	253	253	253
Unallocated Groundwater Supply		1,085	1,082	1,080	1,079	1,079	1,078	1,078
Total Lavaca Basin Supply		2,596	2,596	2,596	2,596	2,596	2,596	2,596
Lavaca-Guadalupe								
Municipal		0	0	0	0	0	0	0
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		15	17	18	18	18	19	19
Livestock		34	34	34	34	34	34	34
Unallocated Groundwater Supply		69	67	66	66	66	65	65
Total Lavaca-Guadalupe Basin Supply		118	118	118	118	118	118	118
Total Basin Surplus/Shortage								
San Antonio								
Municipal		17	17	18	19	21	23	24
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		1,041	1,037	1,039	1,041	1,042	1,044	1,044
Total San Antonio Basin Surplus/Shortage		1,058	1,054	1,057	1,060	1,063	1,067	1,068
Guadalupe								
Municipal		5,214	5,214	5,208	5,233	5,278	5,353	5,394
Industrial		98	69	55	43	30	20	3
Steam-Electric		0	0	0	0	0	0	0
Irrigation		228	187	206	223	238	250	262
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		3,625	3,611	3,617	3,622	3,627	3,631	3,633
Total Guadalupe Basin Surplus/Shortage		9,165	9,081	9,086	9,121	9,173	9,254	9,292

Table C-6 Projected Water Demands, Supplies, and Needs DeWitt County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lavaca									
Municipal			711	712	710	716	726	742	750
Industrial			8	7	6	5	5	4	3
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			1,085	1,082	1,080	1,079	1,079	1,078	1,078
Total Lavaca Basin Surplus/Shortage			1,804	1,801	1,796	1,800	1,810	1,824	1,831
Lavaca-Guadalupe									
Municipal			0	0	0	0	0	0	0
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			69	67	66	66	66	65	65
Total Lavaca-Guadalupe Basin Surplus/Shortage			69	67	66	66	66	65	65
Groundwater Supplies									
	Available								
	San Antonio	Gulf Coast	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Guadalupe	Gulf Coast	12,097	12,097	12,097	12,097	12,097	12,097	12,097
	Lavaca	Gulf Coast	2,468	2,468	2,468	2,468	2,468	2,468	2,468
	Lavaca-Guadalupe	Gulf Coast	101	101	101	101	101	101	101
	Total Available		15,866	15,866	15,866	15,866	15,866	15,866	15,866
	Allocated								
	San Antonio	Gulf Coast	159	163	161	159	158	156	156
	Guadalupe	Gulf Coast	8,472	8,486	8,480	8,475	8,470	8,466	8,464
	Lavaca	Gulf Coast	1,384	1,387	1,389	1,390	1,390	1,391	1,391
	Lavaca-Guadalupe	Gulf Coast	32	34	35	35	35	36	36
	Total Allocated		10,047	10,069	10,064	10,058	10,052	10,048	10,046
	Total Unallocated		5,819	5,797	5,802	5,808	5,814	5,818	5,820

Table C-7 Projected Water Demands, Supplies, and Needs Dimmit County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Rio Grande Basin									
Rural			2	2	2	2	2	2	2
	Subtotal		2	2	2	2	2	2	2
Nueces Basin									
Asherton			274	286	299	306	301	293	279
Big Wells			142	149	156	159	157	153	145
Carrizo Springs			1,742	1,842	1,943	1,996	1,981	1,930	1,836
Rural			272	282	292	293	284	274	261
	Subtotal		2,430	2,559	2,690	2,754	2,723	2,650	2,521
Total Municipal Demand			2,432	2,561	2,692	2,756	2,725	2,652	2,523
Municipal Existing Supply									
Rio Grande Basin									
Rural		Carrizo	3	3	3	3	3	3	3
	Subtotal		3	3	3	3	3	3	3
Nueces Basin									
Asherton		Carrizo	645	645	645	645	645	645	645
Big Wells		Carrizo	928	928	928	928	928	928	928
Carrizo Springs		Carrizo	2,327	2,327	2,327	2,327	2,327	2,327	2,327
Rural		Carrizo	340	340	340	340	340	340	340
	Subtotal		4,240	4,240	4,240	4,240	4,240	4,240	4,240
Total Municipal Existing Supply			4,243	4,243	4,243	4,243	4,243	4,243	4,243
Municipal Surplus/Shortage									
Rio Grande Basin									
Rural			1	1	1	1	1	1	1
	Subtotal		1	1	1	1	1	1	1
Nueces Basin									
Asherton			371	359	346	339	344	352	366
Big Wells			786	779	772	769	771	775	783
Carrizo Springs			585	485	384	331	346	397	491
Rural			68	58	48	47	56	66	79
	Subtotal		1,810	1,681	1,550	1,486	1,517	1,590	1,719
Total Municipal Surplus/Shortage			1,811	1,682	1,551	1,487	1,518	1,591	1,720
Municipal New Supply Need									
Rio Grande Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Nueces Basin									
Asherton			0	0	0	0	0	0	0
Big Wells			0	0	0	0	0	0	0
Carrizo Springs			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0

Table C-7 Projected Water Demands, Supplies, and Needs Dimmit County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial Demand									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0
Industrial Existing Supply									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			0	0	0	0	0	0	0
Industrial Surplus/Shortage									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			0	0	0	0	0	0	0
Industrial New Supply Need									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0
Steam-Electric Demand									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0
Steam-Electric Existing Supply									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Existing Supply			0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage			0	0	0	0	0	0	0
Steam-Electric New Supply Need									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	0	0
Irrigation Demand									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			6,750	10,611	10,333	10,225	9,813	9,391	8,987
Total Irrigation Demand			6,750	10,611	10,333	10,225	9,813	9,391	8,987
Irrigation Supply									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin		Run-of-River	4,101	4,101	4,101	4,101	4,101	4,101	4,101
		Carrizo	4,253	6,685	6,510	6,442	6,182	5,916	5,662
Nueces Basin Subtotal			8,354	10,786	10,611	10,543	10,283	10,017	9,763
Total Irrigation Supply			8,354	10,786	10,611	10,543	10,283	10,017	9,763

Table C-7 Projected Water Demands, Supplies, and Needs Dimmit County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Irrigation Surplus/Shortage									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			1,604	175	278	318	470	626	776
Total Irrigation Surplus/Shortage			1,604	175	278	318	470	626	776
Irrigation New Supply Need									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			0	0	0	0	0	0	0
Mining Demand									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			919	1,003	1,034	1,051	1,067	1,082	1,095
Total Mining Demand			919	1,003	1,034	1,051	1,067	1,082	1,095
Mining Supply									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin		Run-of-River	1	1	1	1	1	1	1
		Carrizo	919	1,003	1,034	1,051	1,067	1,082	1,095
Nueces Basin Subtotal			920	1,004	1,035	1,052	1,068	1,083	1,096
Total Mining Supply			920	1,004	1,035	1,052	1,068	1,083	1,096
Mining Surplus/Shortage									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			1	1	1	1	1	1	1
Total Mining Surplus/Shortage			1	1	1	1	1	1	1
Mining New Supply Need									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
Rio Grande			105	105	105	105	105	105	105
Nueces Basin			447	447	447	447	447	447	447
Total Livestock Demand			552	552	552	552	552	552	552
Livestock Supply									
Rio Grande		Carrizo	52	52	52	52	52	52	52
		Local	53	53	53	53	53	53	53
	Subtotal		105	105	105	105	105	105	105
Nueces Basin		Carrizo	223	223	223	223	223	223	223
		Local	224	224	224	224	224	224	224
	Subtotal		447	447	447	447	447	447	447
Total Livestock Supply			552	552	552	552	552	552	552
Livestock Surplus/Shortage									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Rio Grande			0	0	0	0	0	0	0
Nueces Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0

Table C-7 Projected Water Demands, Supplies, and Needs Dimmit County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Dimmit County Demand								
Municipal		2,432	2,561	2,692	2,756	2,725	2,652	2,523
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		6,750	10,611	10,333	10,225	9,813	9,391	8,987
Mining		919	1,003	1,034	1,051	1,067	1,082	1,095
Livestock		552	552	552	552	552	552	552
Total County Demand		10,653	14,727	14,611	14,584	14,157	13,677	13,157
Total Dimmit County Supply								
Municipal		4,243	4,243	4,243	4,243	4,243	4,243	4,243
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		8,354	10,786	10,611	10,543	10,283	10,017	9,763
Mining		920	1,004	1,035	1,052	1,068	1,083	1,096
Livestock		552	552	552	552	552	552	552
Total County Supply		14,069	16,585	16,441	16,390	16,146	15,895	15,654
Total Dimmit County Surplus/Shortage								
Municipal		1,811	1,682	1,551	1,487	1,518	1,591	1,720
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,604	175	278	318	470	626	776
Mining		1	1	1	1	1	1	1
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		3,416	1,858	1,830	1,806	1,989	2,218	2,497
Total Basin Demand								
Rio Grande								
Municipal		2	2	2	2	2	2	2
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		105	105	105	105	105	105	105
Total Rio Grande Basin Demand		107	107	107	107	107	107	107
Nueces								
Municipal		2,430	2,559	2,690	2,754	2,723	2,650	2,521
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		6,750	10,611	10,333	10,225	9,813	9,391	8,987
Mining		919	1,003	1,034	1,051	1,067	1,082	1,095
Livestock		447	447	447	447	447	447	447
Total Nueces Basin Demand		10,546	14,620	14,504	14,477	14,050	13,570	13,050
Total Basin Supply								
Rio Grande								
Municipal		3	3	3	3	3	3	3
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		105	105	105	105	105	105	105
Unallocated Groundwater Supply		3,801	3,801	3,801	3,801	3,801	3,801	3,801
Total Rio Grande Basin Supply		3,909	3,909	3,909	3,909	3,909	3,909	3,909

Table C-7 Projected Water Demands, Supplies, and Needs Dimmit County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Nueces									
Municipal			4,240	4,240	4,240	4,240	4,240	4,240	4,240
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			8,354	10,786	10,611	10,543	10,283	10,017	9,763
Mining			920	1,004	1,035	1,052	1,068	1,083	1,096
Livestock			447	447	447	447	447	447	447
Unallocated Groundwater Supply			16,788	14,271	14,415	14,466	14,710	14,961	15,202
Total Nueces Basin Supply			30,749	30,748	30,748	30,748	30,748	30,748	30,748
Total Basin Surplus/Shortage									
Rio Grande									
Municipal			1	1	1	1	1	1	1
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			3,801	3,801	3,801	3,801	3,801	3,801	3,801
Total Rio Grande Basin Surplus/Shortage			3,802	3,802	3,802	3,802	3,802	3,802	3,802
Nueces									
Municipal			1,810	1,681	1,550	1,486	1,517	1,590	1,719
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			1,604	175	278	318	470	626	776
Mining			1	1	1	1	1	1	1
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			16,788	14,271	14,415	14,466	14,710	14,961	15,202
Total Nueces Basin Surplus/Shortage			20,203	16,128	16,244	16,271	16,698	17,178	17,698
Groundwater Supplies									
	Available								
	Rio Grande	Carrizo	3,855	3,855	3,855	3,855	3,855	3,855	3,855
	Nueces	Carrizo	26,422	26,422	26,422	26,422	26,422	26,422	26,422
	Total Available		30,277	30,277	30,277	30,277	30,277	30,277	30,277
	Allocated								
	Rio Grande	Carrizo	55	55	55	55	55	55	55
	Nueces	Carrizo	9,635	12,151	12,007	11,956	11,712	11,461	11,220
	Total Allocated		9,689	12,205	12,061	12,010	11,767	11,516	11,274
	Total Unallocated		20,588	18,072	18,216	18,267	18,510	18,761	19,003

Table C-8 Projected Water Demands, Supplies, and Needs Frio County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Nueces Basin									
Benton City WSC			2	3	4	5	6	6	6
Dilley			1,041	1,229	1,409	1,555	1,683	1,774	1,825
Pearsall			1,435	1,443	1,448	1,449	1,435	1,442	1,449
Rural			636	727	807	881	937	980	1,007
	Subtotal		3,114	3,402	3,668	3,890	4,061	4,202	4,287
Total Municipal Demand			3,114	3,402	3,668	3,890	4,061	4,202	4,287
Municipal Existing Supply									
Nueces Basin									
Benton City WSC		Carrizo	6	6	6	6	6	6	6
Dilley		Carrizo	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Pearsall		Carrizo	2,880	2,880	2,880	2,880	2,880	2,880	2,880
Rural		Carrizo	1,020	1,020	1,020	1,020	1,020	1,020	1,020
Total Municipal Existing Supply			6,286	6,286	6,286	6,286	6,286	6,286	6,286
Municipal Surplus/Shortage									
Nueces Basin									
Benton City WSC			4	3	2	1	0	0	0
Dilley			1,339	1,151	971	825	697	606	555
Pearsall			1,445	1,437	1,432	1,431	1,445	1,438	1,431
Rural			384	293	213	139	83	40	13
	Subtotal		3,172	2,884	2,618	2,396	2,225	2,084	1,999
Total Municipal Surplus/Shortage			3,172	2,884	2,618	2,396	2,225	2,084	1,999
Municipal New Supply Need									
Nueces Basin									
Benton City WSC			0	0	0	0	0	0	0
Dilley			0	0	0	0	0	0	0
Pearsall			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0
Industrial Existing Supply									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			0	0	0	0	0	0	0
Industrial Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			0	0	0	0	0	0	0
Industrial New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0

Table C-8 Projected Water Demands, Supplies, and Needs Frio County South Central Texas Region									
Basin		**Source**	**Total in 2000 (acft)**	**Projections 2010 (acft)**	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**	**2060 (acft)**
Steam-Electric Demand									
Nueces Basin			129	107	85	100	117	139	165
Total Steam-Electric Demand			129	107	85	100	117	139	165
Steam-Electric Existing Supply									
Nueces Basin		Carrizo	168	168	168	168	168	168	168
Total Steam-Electric Existing Supply			168	168	168	168	168	168	168
Steam-Electric Surplus/Shortage									
Nueces Basin			39	61	83	68	51	29	3
Total Steam-Electric Surplus/Shortage			39	61	83	68	51	29	3
Steam-Electric New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	0	0
Irrigation Demand									
Nueces Basin			117,098	82,017	79,098	76,302	73,627	71,065	68,592
Total Irrigation Demand			117,098	82,017	79,098	76,302	73,627	71,065	68,592
Irrigation Supply									
Nueces Basin		Run-of-River	110	110	110	110	110	110	110
		Queen City	6,675	4,675	4,509	4,349	4,197	4,051	3,910
		Sparta	1,054	738	712	687	663	640	617
		Carrizo	109,252	76,522	73,798	71,190	68,694	66,304	63,996
Total Irrigation Supply			117,091	82,045	79,129	76,336	73,664	71,105	68,633
Irrigation Surplus/Shortage									
Nueces Basin			-7	28	31	34	37	40	41
Total Irrigation Surplus/Shortage			-7	28	31	34	37	40	41
Irrigation New Supply Need									
Nueces Basin			7	0	0	0	0	0	0
Total Irrigation New Supply Need			7	0	0	0	0	0	0
Mining Demand									
Nueces Basin			139	109	104	102	100	98	96
Total Mining Demand			139	109	104	102	100	98	96
Mining Supply									
Nueces Basin									
		Carrizo	139	109	104	102	100	98	96
Total Mining Supply			139	109	104	102	100	98	96
Mining Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
Nueces Basin			1,209	1,209	1,209	1,209	1,209	1,209	1,209
Total Livestock Demand			1,209	1,209	1,209	1,209	1,209	1,209	1,209

Table C-8 Projected Water Demands, Supplies, and Needs Frio County South Central Texas Region								
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock Supply									
Nueces Basin		Carrizo	503	503	503	503	503	503	503
		Queen City	101	101	101	101	101	101	101
		Local	605	605	605	605	605	605	605
Total Livestock Supply			1,209	1,209	1,209	1,209	1,209	1,209	1,209
Livestock Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Frio County Demand									
Municipal			3,114	3,402	3,668	3,890	4,061	4,202	4,287
Industrial			0	0	0	0	0	0	0
Steam-Electric			129	107	85	100	117	139	165
Irrigation			117,098	82,017	79,098	76,302	73,627	71,065	68,592
Mining			139	109	104	102	100	98	96
Livestock			1,209	1,209	1,209	1,209	1,209	1,209	1,209
Total County Demand			121,689	86,844	84,164	81,603	79,114	76,713	74,349
Total Frio County Supply									
Municipal			6,286	6,286	6,286	6,286	6,286	6,286	6,286
Industrial			0	0	0	0	0	0	0
Steam-Electric			168	168	168	168	168	168	168
Irrigation			117,091	82,045	79,129	76,336	73,664	71,105	68,633
Mining			139	109	104	102	100	98	96
Livestock			1,209	1,209	1,209	1,209	1,209	1,209	1,209
Total County Supply			124,893	89,817	86,896	84,101	81,427	78,866	76,392
Total Frio County Surplus/Shortage									
Municipal			3,172	2,884	2,618	2,396	2,225	2,084	1,999
Industrial			0	0	0	0	0	0	0
Steam-Electric			39	61	83	68	51	29	3
Irrigation			-7	28	31	34	37	40	41
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			3,204	2,973	2,732	2,498	2,313	2,153	2,043
Total Basin Demand									
Nueces									
Municipal			3,114	3,402	3,668	3,890	4,061	4,202	4,287
Industrial			0	0	0	0	0	0	0
Steam-Electric			129	107	85	100	117	139	165
Irrigation			117,098	82,017	79,098	76,302	73,627	71,065	68,592
Mining			139	109	104	102	100	98	96
Livestock			1,209	1,209	1,209	1,209	1,209	1,209	1,209
Total Nueces Basin Demand			121,689	86,844	84,164	81,603	79,114	76,713	74,349

Table C-8 Projected Water Demands, Supplies, and Needs Frio County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Total Basin Supply									
Nueces									
Municipal			6,286	6,286	6,286	6,286	6,286	6,286	6,286
Industrial			0	0	0	0	0	0	0
Steam-Electric			168	168	168	168	168	168	168
Irrigation			117,091	82,045	79,129	76,336	73,664	71,105	68,633
Mining			139	109	104	102	100	98	96
Livestock			1,209	1,209	1,209	1,209	1,209	1,209	1,209
Total Nueces Basin Supply			124,893	89,817	86,896	84,101	81,427	78,866	76,392
Total Basin Surplus/Shortage									
Nueces									
Municipal			3,172	2,884	2,618	2,396	2,225	2,084	1,999
Industrial			0	0	0	0	0	0	0
Steam-Electric			39	61	83	68	51	29	3
Irrigation			-7	28	31	34	37	40	41
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage			3,204	2,973	2,732	2,498	2,313	2,153	2,043
Groundwater Supplies									
	Available								
	Nueces	Carrizo	130,765	130,765	130,765	130,765	130,765	130,765	130,765
	Nueces	Sparta	1,260	1,260	1,260	1,260	1,260	1,260	1,260
	Nueces	Queen City	8,000	8,000	8,000	8,000	8,000	8,000	8,000
	Total Available		140,025	140,025	140,025	140,025	140,025	140,025	140,025
	Allocated								
	Nueces	Carrizo	116,342	83,582	80,853	78,242	75,745	73,352	71,043
	Nueces	Sparta	1,054	738	712	687	663	640	617
	Nueces	Queen City	6,776	4,776	4,610	4,450	4,298	4,152	4,011
	Total Allocated		124,172	89,096	86,175	83,379	80,705	78,144	75,671
	Total Unallocated		15,853	50,929	53,850	56,646	59,320	61,881	64,354

Table C-9									
Projected Water Demands, Supplies, and Needs									
Goliad County									
South Central Texas Region									
			Total in	**Projections**					
Basin		**Source**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
			(acft)	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**
Municipal Demand									
San Antonio Basin									
Goliad			365	416	480	527	553	577	594
Rural			225	225	225	225	225	225	225
	Subtotal		590	641	705	752	778	802	819
Guadalupe Basin									
Rural			256	313	396	447	478	505	526
	Subtotal		256	313	396	447	478	505	526
San Antonio-Nueces Coastal Basin									
Rural			62	70	80	87	91	94	97
	Subtotal		62	70	80	87	91	94	97
Total Municipal Demand			908	1,024	1,181	1,286	1,347	1,401	1,442
Municipal Existing Supply									
San Antonio Basin									
Goliad		Gulf Coast	1,008	1,008	1,008	1,008	1,008	1,008	1,008
Rural		Gulf Coast	273	273	273	273	273	273	273
	Subtotal		1,281	1,281	1,281	1,281	1,281	1,281	1,281
Guadalupe Basin									
Rural		Gulf Coast	527	527	527	527	527	527	527
	Subtotal		527	527	527	527	527	527	527
San Antonio-Nueces Coastal Basin									
Rural		Gulf Coast	100	100	100	100	100	100	100
	Subtotal		100	100	100	100	100	100	100
Total Municipal Existing Supply			1,908	1,908	1,908	1,908	1,908	1,908	1,908
Municipal Surplus/Shortage									
San Antonio Basin									
Goliad			643	592	528	481	455	431	414
Rural			48	48	48	48	48	48	48
	Subtotal		691	640	576	529	503	479	462
Guadalupe Basin									
Rural			271	214	131	80	49	22	1
	Subtotal		271	214	131	80	49	22	1
San Antonio-Nueces Coastal Basin									
Rural			38	30	20	13	9	6	3
	Subtotal		38	30	20	13	9	6	3
Total Municipal Surplus/Shortage			1,000	884	727	622	561	507	466
Municipal New Supply Need									
San Antonio Basin									
Goliad			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Guadalupe Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
San Antonio-Nueces Coastal Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
San Antonio Basin			0	4	8	12	16	20	24

Table C-9 Projected Water Demands, Supplies, and Needs Goliad County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			0	4	8	12	16	20	24
Industrial Existing Supply									
San Antonio Basin		Gulf Coast	24	24	24	24	24	24	24
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			24	24	24	24	24	24	24
Industrial Surplus/Shortage									
San Antonio Basin			24	20	16	12	8	4	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			24	20	16	12	8	4	0
Industrial New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0
Steam-Electric Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			9,027	9,136	9,245	10,808	12,714	15,038	17,870
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			9,027	9,136	9,245	10,808	12,714	15,038	17,870
Steam-Electric Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin		Gulf Coast	528	528	528	528	528	528	528
		Coleto Creek Reservoir[1]	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Guadalupe Basin Subtotal			13,028	13,028	13,028	13,028	13,028	13,028	13,028
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Existing Supply			13,028	13,028	13,028	13,028	13,028	13,028	13,028
Steam-Electric Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			4,001	3,892	3,783	2,220	314	-2,010	-4,842
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage			4,001	3,892	3,783	2,220	314	-2,010	-4,842
Steam-Electric New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	2,010	4,842
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	2,010	4,842
Irrigation Demand									
San Antonio Basin			298	257	222	193	166	144	124
Guadalupe Basin			50	43	38	32	28	24	21
San Antonio-Nueces Basin			11	9	8	7	6	5	4
Total Irrigation Demand			359	309	268	232	200	173	149
Irrigation Supply									
San Antonio Basin		Run-of-River	3,016	3,016	3,016	3,016	3,016	3,016	3,016
		Gulf Coast	40	34	30	26	22	19	17
	Subtotal		3,056	3,050	3,046	3,042	3,038	3,035	3,033

Table C-9 Projected Water Demands, Supplies, and Needs Goliad County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Guadalupe Basin		Gulf Coast	50	43	38	32	28	24	21
San Antonio-Nueces Basin		Gulf Coast	11	9	8	7	6	5	4
Total Irrigation Supply			3,117	3,102	3,092	3,081	3,072	3,064	3,058
Irrigation Surplus/Shortage									
San Antonio Basin			2,758	2,793	2,824	2,849	2,872	2,891	2,909
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage			2,758	2,793	2,824	2,849	2,872	2,891	2,909
Irrigation New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			0	0	0	0	0	0	0
Mining Demand									
San Antonio Basin			0	129	91	64	43	21	11
Guadalupe Basin			9	137	98	73	51	30	20
San Antonio-Nueces Basin			4	132	93	68	46	25	15
Total Mining Demand			13	398	282	205	140	76	46
Mining Supply									
San Antonio Basin		Gulf Coast	0	129	91	64	43	21	11
Guadalupe Basin		Gulf Coast	9	137	98	73	51	30	20
San Antonio-Nueces Basin		Gulf Coast	4	132	93	68	46	25	15
Total Mining Supply			13	398	282	205	140	76	46
Mining Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
San Antonio Basin			359	359	359	359	359	359	359
Guadalupe Basin			202	202	202	202	202	202	202
San Antonio-Nueces Basin			359	359	359	359	359	359	359
Total Livestock Demand			920	920	920	920	920	920	920
Livestock Supply									
San Antonio Basin		Gulf Coast	179	179	179	179	179	179	179
		Local	180	180	180	180	180	180	180
	Subtotal		359	359	359	359	359	359	359
Guadalupe Basin		Gulf Coast	101	101	101	101	101	101	101
		Local	101	101	101	101	101	101	101
	Subtotal		202	202	202	202	202	202	202
San Antonio-Nueces Basin		Gulf Coast	179	179	179	179	179	179	179
		Local	180	180	180	180	180	180	180
	Subtotal		359	359	359	359	359	359	359
Total Livestock Supply			920	920	920	920	920	920	920
Livestock Surplus/Shortage									

Table C-9 Projected Water Demands, Supplies, and Needs Goliad County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0
Livestock New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Livestock New Supply Need		0	0	0	0	0	0	0
Total Goliad County Demand								
Municipal		908	1,024	1,181	1,286	1,347	1,401	1,442
Industrial		0	4	8	12	16	20	24
Steam-Electric		9,027	9,136	9,245	10,808	12,714	15,038	17,870
Irrigation		359	309	268	232	200	173	149
Mining		13	398	282	205	140	76	46
Livestock		920	920	920	920	920	920	920
Total County Demand		11,227	11,791	11,904	13,463	15,337	17,628	20,451
Total Goliad County Supply								
Municipal		1,908	1,908	1,908	1,908	1,908	1,908	1,908
Industrial		24	24	24	24	24	24	24
Steam-Electric		13,028	13,028	13,028	13,028	13,028	13,028	13,028
Irrigation		3,117	3,102	3,092	3,081	3,072	3,064	3,058
Mining		13	398	282	205	140	76	46
Livestock		920	920	920	920	920	920	920
Total County Supply		19,010	19,380	19,254	19,166	19,092	19,020	18,984
Total Goliad County Surplus/Shortage								
Municipal		1,000	884	727	622	561	507	466
Industrial		24	20	16	12	8	4	0
Steam-Electric		4,001	3,892	3,783	2,220	314	-2,010	-4,842
Irrigation		2,758	2,793	2,824	2,849	2,872	2,891	2,909
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		7,783	7,589	7,350	5,703	3,755	1,392	-1,467
Total Basin Demand								
San Antonio								
Municipal		590	641	705	752	778	802	819
Industrial		0	4	8	12	16	20	24
Steam-Electric		0	0	0	0	0	0	0
Irrigation		298	257	222	193	166	144	124
Mining		0	129	91	64	43	21	11
Livestock		359	359	359	359	359	359	359
Total San Antonio Basin Demand		1,247	1,390	1,385	1,380	1,362	1,346	1,337
Guadalupe								
Municipal		256	313	396	447	478	505	526
Industrial		0	0	0	0	0	0	0
Steam-Electric		9,027	9,136	9,245	10,808	12,714	15,038	17,870
Irrigation		50	43	38	32	28	24	21
Mining		9	137	98	73	51	30	20
Livestock		202	202	202	202	202	202	202
Total Guadalupe Basin Demand		9,544	9,831	9,979	11,562	13,473	15,799	18,639

Table C-9
Projected Water Demands, Supplies, and Needs
Goliad County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio-Nueces								
Municipal		62	70	80	87	91	94	97
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		11	9	8	7	6	5	4
Mining		4	132	93	68	46	25	15
Livestock		359	359	359	359	359	359	359
Total San Antonio-Nueces Basin Demand		436	570	540	521	502	483	475
Total Basin Supply								
San Antonio								
Municipal		1,281	1,281	1,281	1,281	1,281	1,281	1,281
Industrial		24	24	24	24	24	24	24
Steam-Electric		0	0	0	0	0	0	0
Irrigation		3,056	3,050	3,046	3,042	3,038	3,035	3,033
Mining		0	129	91	64	43	21	11
Livestock		359	359	359	359	359	359	359
Unallocated Groundwater Supply		3,423	3,300	3,342	3,373	3,398	3,423	3,435
Total San Antonio Basin Supply		8,143	8,143	8,143	8,143	8,143	8,143	8,143
Guadalupe								
Municipal		527	527	527	527	527	527	527
Industrial		0	0	0	0	0	0	0
Steam-Electric		13,028	13,028	13,028	13,028	13,028	13,028	13,028
Irrigation		50	43	38	32	28	24	21
Mining		9	137	98	73	51	30	20
Livestock		202	202	202	202	202	202	202
Total Guadalupe Basin Supply		13,816	13,937	13,893	13,862	13,836	13,811	13,798
San Antonio-Nueces								
Municipal		100	100	100	100	100	100	100
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		11	9	8	7	6	5	4
Mining		4	132	93	68	46	25	15
Livestock		359	359	359	359	359	359	359
Unallocated Groundwater Supply		4,529	4,403	4,443	4,469	4,492	4,514	4,525
Total San Antonio-Nueces Basin Supply		5,003	5,003	5,003	5,003	5,003	5,003	5,003
Total Basin Surplus/Shortage								
San Antonio								
Municipal		691	640	576	529	503	479	462
Industrial		24	20	16	12	8	4	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		2,758	2,793	2,824	2,849	2,872	2,891	2,909
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		3,423	3,300	3,342	3,373	3,398	3,423	3,435
Total San Antonio Basin Surplus/Shortage		6,896	6,753	6,758	6,763	6,781	6,797	6,806
Guadalupe								
Municipal		271	214	131	80	49	22	1
Industrial		0	0	0	0	0	0	0
Steam-Electric		4,001	3,892	3,783	2,220	314	-2,010	-4,842
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total Guadalupe Basin Surplus/Shortage		4,272	4,106	3,914	2,300	363	-1,988	-4,841

Table C-9 Projected Water Demands, Supplies, and Needs Goliad County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio-Nueces									
Municipal			38	30	20	13	9	6	3
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			4,529	4,403	4,443	4,469	4,492	4,514	4,525
Total San Antonio-Nueces Basin Surplus/Shortage			4,567	4,433	4,463	4,482	4,501	4,520	4,528
Groundwater Supplies									
	Available								
	San Antonio	Gulf Coast	5,074	5,074	5,074	5,074	5,074	5,074	5,074
	Guadalupe	Gulf Coast	2,913	2,913	2,913	2,913	2,913	2,913	2,913
	San Antonio-Nueces	Gulf Coast	4,823	4,823	4,823	4,823	4,823	4,823	4,823
	Total Available		12,810	12,810	12,810	12,810	12,810	12,810	12,810
	Allocated								
	San Antonio	Gulf Coast	1,651	1,774	1,732	1,701	1,676	1,651	1,639
	Guadalupe	Gulf Coast	1,088	1,209	1,165	1,134	1,108	1,083	1,070
	San Antonio-Nueces	Gulf Coast	294	420	380	354	331	309	298
	Total Allocated		3,033	3,404	3,277	3,189	3,115	3,043	3,007
	Total Unallocated		9,777	9,406	9,533	9,621	9,695	9,767	9,803

Note:

[1] Supply from Coleto Creek Reservoir is dependent upon a contract with GBRA for delivery of stored water from Canyon Reservoir.

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Guadalupe Basin									
Gonzales			1,460	1,545	1,644	1,710	1,756	1,765	1,759
Gonzales County WSC			1,364	1,578	1,805	1,982	2,101	2,133	2,120
Nixon			414	438	460	479	488	490	488
Waelder			133	154	175	190	202	204	203
Rural			447	384	313	257	212	197	199
	Subtotal		3,818	4,099	4,397	4,618	4,759	4,789	4,769
Lavaca Basin									
Rural			10	9	7	6	5	5	5
	Subtotal		10	9	7	6	5	5	5
Total Municipal Demand			3,828	4,108	4,404	4,624	4,764	4,794	4,774
Municipal Existing Supply									
Guadalupe Basin									
Gonzales		Run-of-River	2,240	2,240	2,240	2,240	2,240	2,240	2,240
		Carrizo	403	403	403	403	403	403	403
Gonzales Subtotal			2,643	2,643	2,643	2,643	2,643	2,643	2,643
Gonzales County WSC		Carrizo	1,306	1,306	1,306	1,306	1,306	1,306	1,306
		Canyon (GBRA)	630	630	630	630	630	630	630
Gonzales County WSC Subtotal			1,936	1,936	1,936	1,936	1,936	1,936	1,936
Nixon		Carrizo	600	600	600	600	600	600	600
Waelder		Queen City	665	665	665	665	665	665	665
Rural		Carrizo	559	559	559	559	559	559	559
	Subtotal		6,403	6,403	6,403	6,403	6,403	6,403	6,403
Lavaca Basin									
Rural		Carrizo	13	13	13	13	13	13	13
	Subtotal		13	13	13	13	13	13	13
Total Municipal Existing Supply			6,416	6,416	6,416	6,416	6,416	6,416	6,416
Municipal Surplus/Shortage									
Guadalupe Basin									
Gonzales			1,183	1,098	999	933	887	878	884
Gonzales County WSC			572	358	131	-46	-165	-197	-184
Nixon			186	162	140	121	112	110	112
Waelder			532	511	490	475	463	461	462
Rural			112	175	246	302	347	362	360
	Subtotal		2,585	2,304	2,006	1,785	1,644	1,614	1,634
Lavaca Basin									
Rural			3	4	6	7	8	8	8
	Subtotal		3	4	6	7	8	8	8
Total Municipal Surplus/Shortage			2,588	2,308	2,012	1,792	1,652	1,622	1,642
Municipal New Supply Need									
Guadalupe Basin									
Gonzales			0	0	0	0	0	0	0
Gonzales County WSC			0	0	0	46	165	197	184
Nixon			0	0	0	0	0	0	0
Waelder			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	46	165	197	184

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lavaca Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	46	165	197	184
Industrial Demand									
Guadalupe Basin			2,051	2,400	2,628	2,822	3,011	3,177	3,402
Lavaca Basin			0	0	0	0	0	0	0
Total Industrial Demand			2,051	2,400	2,628	2,822	3,011	3,177	3,402
Industrial Existing Supply									
Guadalupe Basin		Sparta	1,632	1,632	1,632	1,632	1,632	1,632	1,632
		Carrizo	1,786	1,786	1,786	1,786	1,786	1,786	1,786
Guadalupe Basin Subtotal			3,418	3,418	3,418	3,418	3,418	3,418	3,418
Lavaca Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			3,418	3,418	3,418	3,418	3,418	3,418	3,418
Industrial Surplus/Shortage									
Guadalupe Basin			1,367	1,018	790	596	407	241	16
Lavaca Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			1,367	1,018	790	596	407	241	16
Industrial New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0
Steam-Electric Demand									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0
Steam-Electric Existing Supply									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Steam-Electric Existing Supply			0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage			0	0	0	0	0	0	0
Steam-Electric New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Steam-Electric New Supply Need			0	0	0	0	0	0	0
Irrigation Demand									
Guadalupe Basin			2,438	1,304	1,124	969	835	720	621
Lavaca Basin			0	0	0	0	0	0	0
Total Irrigation Demand			2,438	1,304	1,124	969	835	720	621

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Irrigation Supply									
Guadalupe Basin		Canyon (GBRA)	7	7	7	7	7	7	7
		Run-of-River	2,048	2,048	2,048	2,048	2,048	2,048	2,048
		Carrizo	393	210	181	156	134	116	100
		Sparta	95	51	44	38	33	28	24
		Queen City	88	47	40	35	30	26	22
		Gulf Coast	34	18	16	14	12	10	9
Guadalupe Basin Subtotal			2,665	2,381	2,336	2,298	2,264	2,235	2,210
Lavaca Basin			0	0	0	0	0	0	0
Total Irrigation Supply			2,665	2,381	2,336	2,298	2,264	2,235	2,210
Irrigation Surplus/Shortage									
Guadalupe Basin			227	1,077	1,212	1,329	1,429	1,515	1,589
Lavaca Basin			0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage			227	1,077	1,212	1,329	1,429	1,515	1,589
Irrigation New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			0	0	0	0	0	0	0
Mining Demand									
Guadalupe Basin			30	25	24	23	23	22	22
Lavaca Basin			3	3	3	3	2	2	2
Total Mining Demand			33	28	27	26	25	24	24
Mining Supply									
Guadalupe Basin		Carrizo	17	14	13	13	13	12	12
		Sparta	6	5	5	5	5	5	5
		Queen City	7	6	6	6	6	5	5
Guadalupe Basin Subtotal			30	25	24	24	24	22	22
Lavaca Basin		Carrizo	3	3	3	3	2	2	2
Total Mining Supply			33	28	27	27	26	24	24
Mining Surplus/Shortage									
Guadalupe Basin			0	0	0	1	1	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	1	1	0	0
Mining New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
Guadalupe Basin			5,107	5,354	5,354	5,354	5,354	5,354	5,354
Lavaca Basin			52	99	99	99	99	99	99
Total Livestock Demand			5,159	5,453	5,453	5,453	5,453	5,453	5,453
Livestock Supply									
Guadalupe Basin		Carrizo	1,419	1,419	1,419	1,419	1,419	1,419	1,419
		Queen City	805	805	805	805	805	805	805
		Sparta	329	329	329	329	329	329	329
		Local	2,554	2,801	2,801	2,801	2,801	2,801	2,801
	Subtotal		5,107	5,354	5,354	5,354	5,354	5,354	5,354

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region									
			Total in	Projections					
Basin		**Source**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
			(acft)	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**
Lavaca Basin		Carrizo	26	26	26	26	26	26	26
		Local	26	73	73	73	73	73	73
	Subtotal		52	99	99	99	99	99	99
Total Livestock Supply			5,159	5,453	5,453	5,453	5,453	5,453	5,453

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock Surplus/Shortage									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Gonzales County Demand									
Municipal			3,828	4,108	4,404	4,624	4,764	4,794	4,774
Industrial			2,051	2,400	2,628	2,822	3,011	3,177	3,402
Steam-Electric			0	0	0	0	0	0	0
Irrigation			2,438	1,304	1,124	969	835	720	621
Mining			33	28	27	26	25	24	24
Livestock			5,159	5,453	5,453	5,453	5,453	5,453	5,453
Total County Demand			13,509	13,293	13,636	13,894	14,088	14,168	14,274
Total Gonzales County Supply									
Municipal			6,416	6,416	6,416	6,416	6,416	6,416	6,416
Industrial			3,418	3,418	3,418	3,418	3,418	3,418	3,418
Steam-Electric			0	0	0	0	0	0	0
Irrigation			2,665	2,381	2,336	2,298	2,264	2,235	2,210
Mining			33	28	27	27	26	24	24
Livestock			5,159	5,453	5,453	5,453	5,453	5,453	5,453
Total County Supply			17,691	17,696	17,650	17,612	17,577	17,546	17,521
Total Gonzales County Surplus/Shortage									
Municipal			2,588	2,308	2,012	1,792	1,652	1,622	1,642
Industrial			1,367	1,018	790	596	407	241	16
Steam-Electric			0	0	0	0	0	0	0
Irrigation			227	1,077	1,212	1,329	1,429	1,515	1,589
Mining			0	0	0	1	1	0	0
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			4,182	4,403	4,014	3,718	3,489	3,378	3,247
Total Basin Demand									
Guadalupe									
Municipal			3,818	4,099	4,397	4,618	4,759	4,789	4,769
Industrial			2,051	2,400	2,628	2,822	3,011	3,177	3,402
Steam-Electric			0	0	0	0	0	0	0
Irrigation			2,438	1,304	1,124	969	835	720	621
Mining			30	25	24	23	23	22	22
Livestock			5,107	5,354	5,354	5,354	5,354	5,354	5,354
Total Guadalupe Basin Demand			13,444	13,182	13,527	13,786	13,982	14,062	14,168
Lavaca									
Municipal			10	9	7	6	5	5	5
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			3	3	3	3	2	2	2
Livestock			52	99	99	99	99	99	99
Total Lavaca Basin Demand			65	111	109	108	106	106	106

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Supply								
Guadalupe								
Municipal		6,403	6,403	6,403	6,403	6,403	6,403	6,403
Industrial		3,418	3,418	3,418	3,418	3,418	3,418	3,418
Steam-Electric		0	0	0	0	0	0	0
Irrigation		2,665	2,381	2,336	2,298	2,264	2,235	2,210
Mining		30	25	24	24	24	22	22
Livestock		5,107	5,354	5,354	5,354	5,354	5,354	5,354
Unallocated Groundwater Supply		18,761	19,050	19,096	19,136	19,169	19,199	19,224
Total Guadalupe Basin Supply		36,384	36,631	36,631	36,633	36,632	36,631	36,631
Lavaca								
Municipal		13	13	13	13	13	13	13
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		3	3	3	3	2	2	2
Livestock		52	99	99	99	99	99	99
Unallocated Groundwater Supply		183	183	183	183	184	184	184
Total Lavaca Basin Supply		251	298	298	298	298	298	298
Total Basin Surplus/Shortage								
Guadalupe								
Municipal		2,585	2,304	2,006	1,785	1,644	1,614	1,634
Industrial		1,367	1,018	790	596	407	241	16
Steam-Electric		0	0	0	0	0	0	0
Irrigation		227	1,077	1,212	1,329	1,429	1,515	1,589
Mining		0	0	0	1	1	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		18,761	19,050	19,096	19,136	19,169	19,199	19,224
Total Guadalupe Basin Surplus/Shortage		22,940	23,449	23,104	22,847	22,650	22,569	22,463
Lavaca								
Municipal		3	4	6	7	8	8	8
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		183	183	183	183	184	184	184
Total Lavaca Basin Surplus/Shortage		186	187	189	190	192	192	192

Table C-10 Projected Water Demands, Supplies, and Needs Gonzales County South Central Texas Region									
			Total in	**Projections**					
Basin		**Source**	**2000 (acft)**	**2010 (acft)**	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**	**2060 (acft)**
Groundwater Supplies									
	Available								
	Guadalupe	Carrizo	28,900	28,900	28,900	28,900	28,900	28,900	28,900
	Guadalupe	Sparta	3,750	3,750	3,750	3,750	3,750	3,750	3,750
	Guadalupe	Queen City	7,500	7,500	7,500	7,500	7,500	7,500	7,500
	Guadalupe	Gulf Coast	1,901	1,901	1,901	1,901	1,901	1,901	1,901
	Lavaca	Carrizo	42	42	42	42	42	42	42
	Lavaca	Gulf Coast	182	182	182	182	182	182	182
	Total Available		42,275	42,275	42,275	42,275	42,275	42,275	42,275
	Allocated								
	Guadalupe	Carrizo	19,628	19,443	19,413	19,388	19,366	19,347	19,331
	Guadalupe	Sparta	2,062	2,017	2,010	2,003	1,998	1,994	1,990
	Guadalupe	Queen City	1,565	1,523	1,516	1,510	1,506	1,501	1,498
	Guadalupe	Gulf Coast	34	18	16	14	12	10	9
	Lavaca	Carrizo	42	42	42	42	41	41	41
	Lavaca	Gulf Coast	0	0	0	0	0	0	0
	Total Allocated		23,331	23,043	22,997	22,957	22,922	22,893	22,868
	Total Unallocated		18,944	19,232	19,278	19,318	19,353	19,382	19,407

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Demand									
San Antonio Basin									
Cibolo			598	866	1,190	1,546	1,898	2,298	2,730
East Central SUD			102	128	162	200	237	274	316
Green Valley SUD			546	691	873	1,084	1,271	1,510	1,768
Marion			154	164	179	194	209	229	251
Santa Clara			92	177	280	395	505	631	766
Schertz (part)			2,776	3,797	5,089	6,448	7,822	9,399	11,098
Selma			17	59	86	113	131	152	176
Springs Hill WSC			323	365	417	475	533	599	674
Water Service Inc. (Apex Water Ser)			25	30	37	45	53	61	71
Rural			58	50	39	27	17	9	2
	Subtotal		4,691	6,327	8,352	10,527	12,676	15,162	17,852
Guadalupe Basin									
Crystal Clear WSC			1,017	1,316	1,688	2,112	2,498	2,977	3,493
Green Valley SUD			1,337	1,691	2,136	2,651	3,109	3,695	4,326
Martindale WSC			26	47	64	84	111	128	150
New Braunfels			266	467	703	960	1,216	1,499	1,810
Santa Clara			23	43	69	97	124	155	188
Seguin			4,463	5,018	5,718	6,454	7,203	8,069	9,047
Springs Hill WSC			1,753	1,984	2,262	2,581	2,891	3,250	3,656
Rural			274	220	175	129	79	45	11
	Subtotal		9,159	10,786	12,815	15,068	17,231	19,818	22,681
Total Municipal Demand			13,850	17,113	21,167	25,595	29,907	34,980	40,533
Municipal Existing Supply									
San Antonio Basin									
Cibolo		Canyon (CRWA)	800	800	2,800	2,800	2,800	2,800	2,800
East Central SUD		Canyon (CRWA)	123	123	26	26	26	26	26
		Carrizo (Springs Hill/CRWA)	34	34	34	34	34	34	34
		Edwards (SAWS)	99	0	0	0	0	0	0
		Edwards (BMWD)	106	106	106	106	106	106	106
East Central Subtotal			361	263	166	166	166	166	166
Green Valley SUD		Edwards	154	154	154	154	154	154	154
		Edwards (East Central)	47	47	47	47	47	47	47
		Canyon (GBRA)	47	47	71	71	166	166	166
		Canyon (CRWA)	427	427	624	835	1,022	1,261	872
Green Valley SUD Subtotal			676	676	897	1,108	1,390	1,629	1,240
Marion		Edwards	81	81	81	81	81	81	81
		Canyon (CRWA)	100	100	100	100	100	100	100
Marion Subtotal			181	181	181	181	181	181	181
Santa Clara	estimated	Carrizo	115	115	115	115	115	115	115
Schertz (part)		Edwards	944	944	944	944	944	944	944
		Carrizo (Gonzales) - S/S	5,024	5,024	5,024	5,024	5,024	5,024	5,024
Schertz Subtotal			5,968	5,968	5,968	5,968	5,968	5,968	5,968
Selma		Edwards (Bexar County)	7	7	7	7	7	7	7
		Carrizo (Gonzales)	49	49	49	49	49	49	49
Selma Subtotal			56	56	56	56	56	56	56
Springs Hill WSC		Canyon (GBRA)	375	375	375	375	375	375	375
		Canyon (CRWA)	251	251	251	251	251	251	251
		Carrizo	95	95	95	95	95	95	95
		Carrizo (Gonzales) - S/S	87	87	87	87	87	87	87
Springs Hill WSC Subtotal			808	808	808	808	808	808	808
Water Service Inc. (Apex Water Ser)		Edwards	1	1	1	1	1	1	1
Rural		Edwards	2	2	2	2	2	2	2
	Subtotal		8,968	8,870	10,994	11,205	11,487	11,726	11,337

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe Basin									
Crystal Clear WSC		Edwards	342	342	342	342	342	342	342
		ROR (Guadalupe) - CRWA	59	59	59	59	59	59	59
		Canyon (CRWA)	193	193	193	193	193	193	193
		Canyon (CRWA) - Springs Hill	165	165	165	165	165	165	165
		Canyon (New Braunfels)	594	594	594	594	594	594	594
		Canyon (GBRA)	528	528	528	528	528	528	528
Crystal Clear WSC Subtotal			1,881	1,881	1,881	1,881	1,881	1,881	1,881
Green Valley SUD		Edwards	375	375	375	375	375	375	375
		Edwards (East Central)	116	116	116	116	116	116	116
		Canyon (GBRA)	116	116	174	174	407	407	407
		Canyon (CRWA)	1,045	1,045	3,966	3,755	3,568	3,329	3,718
Green Valley SUD Subtotal			1,653	1,653	4,632	4,421	4,466	4,227	4,616
Martindale WSC		Canyon (CRWA)	11	11	11	11	11	11	11
		ROR (Guadalupe) - CRWA	98	98	98	98	98	98	98
Martindale WSC Subtotal			109	109	109	109	109	109	109
New Braunfels		Edwards	136	136	136	136	136	136	136
		Run-of-River	54	54	54	54	54	54	54
		Canyon (GBRA)	186	186	186	186	186	186	186
New Braunfels Subtotal			376	376	376	376	376	376	376
Santa Clara	estimated	Carrizo	29	29	29	29	29	29	29
Seguin		Run-of-River	7,000	7,000	7,000	7,000	7,000	7,000	7,000
		Canyon (GBRA)	3,000	2,000	2,000	2,000	2,000	2,000	2,000
		Carrizo (Gonzales) - S/S	5,420	5,420	5,420	5,420	5,420	5,420	5,420
Seguin Subtotal			15,420	14,420	14,420	14,420	14,420	14,420	14,420
Springs Hill WSC		Canyon (GBRA)	2,125	2,125	2,125	2,125	2,125	2,125	2,125
		Canyon (CRWA)	1,424	1,424	1,424	1,424	1,424	1,424	1,424
		Carrizo	475	475	475	475	475	475	475
		Carrizo (Gonzales) - S/S	473	473	473	473	473	473	473
Springs Hill WSC Subtotal			4,497	4,497	4,497	4,497	4,497	4,497	4,497
Rural		Queen City	119	118	121	125	128	131	134
		Carrizo	207	207	207	207	207	207	207
		Run-of-River	134	134	134	134	134	134	134
		Canyon (GBRA)	10	10	10	10	10	10	10
Rural Subtotal			470	469	472	476	479	482	485
	Subtotal		24,435	23,434	26,416	26,209	26,257	26,021	26,413
Total Municipal Existing Supply			33,403	32,304	37,410	37,414	37,744	37,747	37,750
Municipal Surplus/Shortage									
San Antonio Basin									
Cibolo			202	-66	1,610	1,254	902	502	70
East Central SUD			259	135	4	-34	-71	-108	-150
Green Valley SUD			130	-15	24	24	119	119	-528
Marion			27	17	2	-13	-28	-48	-70
Santa Clara			23	-62	-165	-280	-390	-516	-651
Schertz (part)			3,192	2,171	879	-480	-1,854	-3,431	-5,130
Selma			39	-3	-30	-57	-75	-96	-120
Springs Hill WSC			485	443	391	333	275	209	134
Water Service Inc. (Apex Water Ser)			-24	-29	-36	-44	-52	-60	-70
Rural			-56	-48	-37	-25	-15	-7	0
	Subtotal		4,277	2,543	2,642	678	-1,189	-3,436	-6,515

Table C-11
Projected Water Demands, Supplies, and Needs
Guadalupe County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe Basin									
Crystal Clear WSC			864	565	193	-231	-617	-1,096	-1,612
Green Valley SUD			316	-38	2,496	1,770	1,357	532	290
Martindale WSC			83	62	45	25	-2	-19	-41
New Braunfels			110	-91	-327	-584	-840	-1,123	-1,434
Santa Clara			6	-14	-40	-68	-95	-126	-159
Seguin			10,957	9,402	8,702	7,966	7,217	6,351	5,373
Springs Hill WSC			2,744	2,513	2,235	1,916	1,606	1,247	841
Rural			196	249	297	347	400	437	474
	Subtotal		15,276	12,648	13,601	11,141	9,026	6,203	3,732
Total Municipal Surplus/Shortage			19,553	15,191	16,243	11,819	7,837	2,767	-2,783
Municipal New Supply Need									
San Antonio Basin									
Cibolo			0	66	0	0	0	0	0
East Central SUD			0	0	0	34	71	108	150
Green Valley SUD			0	15	0	0	0	0	528
Marion			0	0	0	13	28	48	70
Santa Clara			0	62	165	280	390	516	651
Schertz (part)			0	0	0	480	1,854	3,431	5,130
Selma			0	3	30	57	75	96	120
Springs Hill WSC			0	0	0	0	0	0	0
Water Service Inc. (Apex Water Ser)			24	29	36	44	52	60	70
Rural			56	48	37	25	15	7	0
	Subtotal		80	223	268	933	2,485	4,266	6,719
Guadalupe Basin									
Crystal Clear WSC			0	0	0	231	617	1,096	1,612
Green Valley SUD			0	38	0	0	0	0	0
Martindale WSC			0	0	0	0	2	19	41
New Braunfels			0	91	327	584	840	1,123	1,434
Santa Clara			0	14	40	68	95	126	159
Seguin			0	0	0	0	0	0	0
Springs Hill WSC			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	143	367	882	1,554	2,364	3,246
Total Municipal New Supply Need			80	366	635	1,816	4,039	6,630	9,965
Industrial Demand									
San Antonio Basin			3	4	4	5	5	5	6
Guadalupe Basin			2,094	2,634	2,953	3,244	3,525	3,766	4,091
Total Industrial Demand			2,097	2,638	2,957	3,249	3,530	3,771	4,097
Industrial Existing Supply									
San Antonio Basin		Carrizo	6	6	6	6	6	6	6
Guadalupe Basin		Edwards	150	150	150	150	150	150	150
		Carrizo	2,899	2,899	2,899	2,899	2,899	2,899	2,899
		Run-of-River	57	57	57	57	57	57	57
		Canyon (GBRA)	985	985	985	985	985	985	985
Guadalupe Basin Subtotal			4,091	4,091	4,091	4,091	4,091	4,091	4,091
Total Industrial Existing Supply			4,097	4,097	4,097	4,097	4,097	4,097	4,097
Industrial Surplus/Shortage									
San Antonio Basin			3	2	2	1	1	1	0
Guadalupe Basin			1,997	1,457	1,138	847	566	325	0
Total Industrial Surplus/Shortage			2,000	1,459	1,140	848	567	326	0
Industrial New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Steam-Electric Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			129	10,065	14,407	16,844	19,814	23,435	27,848
Total Steam-Electric Demand			129	10,065	14,407	16,844	19,814	23,435	27,848
Steam-Electric Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin		Canyon (GBRA)	6,840	6,840	5,720	5,720	5,720	5,720	5,720
		Reuse	0	0	1,120	1,120	1,120	1,120	1,120
Guadalupe Basin Subtotal			6,840	6,840	6,840	6,840	6,840	6,840	6,840
Total Steam-Electric Existing Supply			6,840	6,840	6,840	6,840	6,840	6,840	6,840
Steam-Electric Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			6,711	-3,225	-7,567	-10,004	-12,974	-16,595	-21,008
Total Steam-Electric Surplus/Shortage			6,711	-3,225	-7,567	-10,004	-12,974	-16,595	-21,008
Steam-Electric New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	3,225	7,567	10,004	12,974	16,595	21,008
Total Steam-Electric New Supply Need			0	3,225	7,567	10,004	12,974	16,595	21,008
Irrigation Demand									
San Antonio Basin			113	137	123	109	96	91	91
Guadalupe Basin			762	933	832	737	646	619	614
Total Irrigation Demand			875	1,070	955	846	742	710	705
Irrigation Supply									
San Antonio Basin		Carrizo	113	137	123	109	96	91	91
Guadalupe Basin		Run-of-River	1,167	1,167	1,167	1,167	1,167	1,167	1,167
		Canyon (GBRA)	390	390	390	390	390	390	390
		Carrizo	84	103	92	81	71	68	68
Guadalupe Basin Subtotal			1,641	1,660	1,649	1,638	1,628	1,625	1,625
Total Irrigation Supply			1,754	1,797	1,772	1,747	1,724	1,716	1,716
Irrigation Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			879	727	817	901	982	1,006	1,011
Total Irrigation Surplus/Shortage			879	727	817	901	982	1,006	1,011
Irrigation New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			0	0	0	0	0	0	0
Mining Demand									
San Antonio Basin			14	16	16	17	17	18	18
Guadalupe Basin			256	290	305	313	321	328	335
Total Mining Demand			270	306	321	330	338	346	353
Mining Supply									
San Antonio Basin		Carrizo	14	16	16	17	17	18	18
Guadalupe Basin		Carrizo	256	290	305	313	321	328	335
Total Mining Supply			270	306	321	330	338	346	353
Mining Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
San Antonio Basin			264	264	264	264	264	264	264
Guadalupe Basin			793	793	793	793	793	793	793
Total Livestock Demand			1,057	1,057	1,057	1,057	1,057	1,057	1,057
Livestock Supply									
San Antonio Basin		Carrizo	132	132	132	132	132	132	132
		Local	132	132	132	132	132	132	132
	Subtotal		264	264	264	264	264	264	264
Guadalupe Basin		Carrizo	396	396	396	396	396	396	396
		Local	397	397	397	397	397	397	397
	Subtotal		793	793	793	793	793	793	793
Total Livestock Supply			1,057	1,057	1,057	1,057	1,057	1,057	1,057
Livestock Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Guadalupe County Demand									
Municipal			13,850	17,113	21,167	25,595	29,907	34,980	40,533
Industrial			2,097	2,638	2,957	3,249	3,530	3,771	4,097
Steam-Electric			129	10,065	14,407	16,844	19,814	23,435	27,848
Irrigation			875	1,070	955	846	742	710	705
Mining			270	306	321	330	338	346	353
Livestock			1,057	1,057	1,057	1,057	1,057	1,057	1,057
Total County Demand			18,278	32,249	40,864	47,921	55,388	64,299	74,593
Total Guadalupe County Supply									
Municipal			33,403	32,304	37,410	37,414	37,744	37,747	37,750
Industrial			4,097	4,097	4,097	4,097	4,097	4,097	4,097
Steam-Electric			6,840	6,840	6,840	6,840	6,840	6,840	6,840
Irrigation			1,754	1,797	1,772	1,747	1,724	1,716	1,716
Mining			270	306	321	330	338	346	353
Livestock			1,057	1,057	1,057	1,057	1,057	1,057	1,057
Total County Supply			47,421	46,401	51,497	51,485	51,800	51,803	51,813
Total Guadalupe County Surplus/Shortage									
Municipal			19,553	15,191	16,243	11,819	7,837	2,767	-2,783
Industrial			2,000	1,459	1,140	848	567	326	0
Steam-Electric			6,711	-3,225	-7,567	-10,004	-12,974	-16,595	-21,008
Irrigation			879	727	817	901	982	1,006	1,011
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			29,143	14,152	10,633	3,564	-3,588	-12,496	-22,780

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Demand								
San Antonio								
Municipal		4,691	6,327	8,352	10,527	12,676	15,162	17,852
Industrial		3	4	4	5	5	5	6
Steam-Electric		0	0	0	0	0	0	0
Irrigation		113	137	123	109	96	91	91
Mining		14	16	16	17	17	18	18
Livestock		264	264	264	264	264	264	264
Total San Antonio Basin Demand		5,085	6,748	8,759	10,922	13,058	15,540	18,231
Guadalupe								
Municipal		9,159	10,786	12,815	15,068	17,231	19,818	22,681
Industrial		2,094	2,634	2,953	3,244	3,525	3,766	4,091
Steam-Electric		129	10,065	14,407	16,844	19,814	23,435	27,848
Irrigation		762	933	832	737	646	619	614
Mining		256	290	305	313	321	328	335
Livestock		793	793	793	793	793	793	793
Total Guadalupe Basin Demand		13,193	25,501	32,105	36,999	42,330	48,759	56,362
Total Basin Supply								
San Antonio								
Municipal		8,968	8,870	10,994	11,205	11,487	11,726	11,337
Industrial		6	6	6	6	6	6	6
Steam-Electric		0	0	0	0	0	0	0
Irrigation		113	137	123	109	96	91	91
Mining		14	16	16	17	17	18	18
Livestock		264	264	264	264	264	264	264
Total San Antonio Basin Supply		9,365	9,293	11,403	11,601	11,870	12,105	11,716
Guadalupe								
Municipal		24,435	23,434	26,416	26,209	26,257	26,021	26,413
Industrial		4,091	4,091	4,091	4,091	4,091	4,091	4,091
Steam-Electric		6,840	6,840	5,720	5,720	5,720	5,720	5,720
Irrigation		1,641	1,660	1,649	1,638	1,628	1,625	1,625
Mining		256	290	305	313	321	328	335
Livestock		793	793	793	793	793	793	793
Total Guadalupe Basin Supply		38,056	37,108	38,974	38,764	38,810	38,578	38,977
Total Basin Surplus/Shortage								
San Antonio								
Municipal		4,277	2,543	2,642	678	-1,189	-3,436	-6,515
Industrial		3	2	2	1	1	1	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage		4,280	2,545	2,644	679	-1,188	-3,435	-6,515
Guadalupe								
Municipal		15,276	12,648	13,601	11,141	9,026	6,203	3,732
Industrial		1,997	1,457	1,138	847	566	325	0
Steam-Electric		6,711	-3,225	-8,687	-11,124	-14,094	-17,715	-22,128
Irrigation		879	727	817	901	982	1,006	1,011
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total Guadalupe Basin Surplus/Shortage		24,863	11,607	6,869	1,765	-3,520	-10,181	-17,385

Table C-11 Projected Water Demands, Supplies, and Needs Guadalupe County South Central Texas Region									
			Total in	**Projections**					
Basin		**Source**	**2000 (acft)**	**2010 (acft)**	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**	**2060 (acft)**
Groundwater Supplies									
	Available								
	Guadalupe	Edwards	150	150	150	150	150	150	150
	San Antonio	Edwards	2	2	2	2	2	2	2
	Guadalupe	Carrizo	9,573	9,573	9,573	7,568	7,568	7,568	7,568
	San Antonio	Carrizo	3,010	3,010	3,010	2,379	2,379	2,379	2,379
	Total Available		12,735	12,735	12,735	10,099	10,099	10,099	10,099
	Allocated								
	Guadalupe	Edwards	150	150	150	150	150	150	150
	San Antonio	Edwards	2	2	2	2	2	2	2
	Guadalupe	Carrizo	5,446	5,499	5,503	5,501	5,499	5,503	5,509
	San Antonio	Carrizo	409	435	421	408	395	391	391
	Total Allocated		6,007	6,086	6,076	6,061	6,046	6,046	6,052
	Total Unallocated		6,728	6,649	6,659	4,038	4,053	4,053	4,047

Table C-12 Projected Water Demands, Supplies, and Needs Hays County (Part) South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Demand									
Guadalupe Basin									
County Line WSC			252	947	1,999	2,319	2,393	2,612	2,982
Creedmore-Maha WSC			8	10	12	15	17	20	23
Crystal Clear WSC			349	485	639	806	959	1,165	1,327
Goforth WSC			666	972	1,340	1,704	2,075	2,545	2,914
Kyle			702	2,740	3,940	4,217	4,377	4,874	5,203
Maxwell WSC			117	157	200	249	294	354	402
Mountain City			22	45	71	98	124	157	183
Niederwald			65	104	147	194	238	294	338
Plum Creek Water Company			392	566	762	963	1,168	1,427	1,630
San Marcos			5,914	8,038	11,198	14,371	17,824	21,559	24,439
Wimberley WSC			578	776	997	1,224	1,442	1,736	1,966
Woodcreek			188	246	315	385	452	540	610
Woodcreek Utilities			400	748	1,145	1,564	1,974	2,477	2,873
Rural			1,273	1,444	1,644	1,855	2,077	2,361	2,584
	Subtotal		10,926	17,278	24,409	29,964	35,414	42,121	47,474
Total Municipal Demand			10,926	17,278	24,409	29,964	35,414	42,121	47,474
Municipal Existing Supply									
Guadalupe Basin									
County Line WSC		Edwards	31	31	31	31	31	31	31
		ROR (Guadalupe) - CRWA	148	148	148	148	148	148	148
		Canyon (CRWA)	724	724	724	724	724	724	724
County Line WSC Subtotal			903	903	903	903	903	903	903
Creedmore-Maha WSC		Edwards (Barton Springs)	31	31	31	31	31	31	31
Crystal Clear WSC		Edwards	117	117	117	117	117	117	117
		ROR (Guadalupe) - CRWA	20	20	20	20	20	20	20
		Canyon (CRWA)	66	66	66	66	66	66	66
		Canyon (CRWA) - Springs Hill	57	57	57	57	57	57	57
		Canyon (New Braunfels)	204	204	204	204	204	204	204
		Canyon (GBRA)	182	182	182	182	182	182	182
Crystal Clear WSC Subtotal			646	646	646	646	646	646	646
Goforth WSC		Edwards (Barton Springs)	922	922	922	922	922	922	922
Kyle		Edwards	256	256	256	256	256	256	256
		Edwards (Barton Springs)	507	507	507	507	507	507	507
		Canyon (GBRA)	589	589	589	589	589	589	589
Kyle Subtotal			1,352	1,352	1,352	1,352	1,352	1,352	1,352
Maxwell WSC		Edwards	45	45	45	45	45	45	45
		Canyon (CRWA)	167	167	167	167	167	167	167
		ROR (Guadalupe) - CRWA	58	58	58	58	58	58	58
Maxwell WSC Subtotal			270	270	270	270	270	270	270
Mountain City		Edwards (Barton Springs)	133	133	133	133	133	133	133
Niederwald		Edwards (Barton Springs)	81	81	81	81	81	81	81
Plum Creek Water Company		Edwards (Barton Springs)	689	689	689	689	689	689	689
San Marcos		Edwards	3,051	3,051	3,051	3,051	3,051	3,051	3,051
		ROR (Guadalupe)	513	513	513	513	513	513	513
		Canyon (GBRA)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
San Marcos Subtotal			8,564	8,564	8,564	8,564	8,564	8,564	8,564
Wimberley WSC		Trinity	602	599	597	596	595	488	487
Woodcreek		Trinity	129	128	128	128	127	104	104
Woodcreek Utilities		Trinity	275	273	273	272	272	222	222
Rural		Edwards	259	259	259	259	259	259	259
		Trinity	153	152	152	152	151	124	124
Rural Subtotal			412	411	411	411	410	383	383
	Subtotal		15,008	15,001	14,999	14,997	14,994	14,787	14,786
Total Municipal Existing Supply			15,008	15,001	14,999	14,997	14,994	14,787	14,786

Table C-12 Projected Water Demands, Supplies, and Needs Hays County (Part) South Central Texas Region								
		Total in	Projections					
Basin	Source	2000	2010	2020	2030	2040	2050	2060
		(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Surplus/Shortage								
Guadalupe Basin								
County Line WSC		651	-44	-1,096	-1,416	-1,490	-1,709	-2,079
Creedmore-Maha WSC		23	21	19	16	14	11	8
Crystal Clear WSC		297	161	7	-160	-313	-519	-681
Goforth WSC		256	-50	-418	-782	-1,153	-1,623	-1,992
Kyle		650	-1,388	-2,588	-2,865	-3,025	-3,522	-3,851
Maxwell WSC		153	113	70	21	-24	-84	-132
Mountain City		111	88	62	35	9	-24	-50
Niederwald		16	-23	-66	-113	-157	-213	-257
Plum Creek Water Company		297	123	-73	-274	-479	-738	-941
San Marcos		2,650	526	-2,634	-5,807	-9,260	-12,995	-15,875
Wimberley WSC		24	-177	-400	-628	-847	-1,248	-1,479
Woodcreek		-59	-118	-187	-257	-325	-436	-506
Woodcreek Utilities		-125	-475	-872	-1,292	-1,702	-2,255	-2,651
Rural		-861	-1,033	-1,233	-1,444	-1,667	-1,978	-2,201
Subtotal		2,856	-2,364	-7,921	-12,624	-17,477	-23,493	-27,943
Total Municipal Surplus/Shortage		2,856	-2,364	-7,921	-12,624	-17,477	-23,493	-27,943
Municipal New Supply Need								
Guadalupe Basin								
County Line WSC		0	44	1,096	1,416	1,490	1,709	2,079
Creedmore-Maha WSC		0	0	0	0	0	0	0
Crystal Clear WSC		0	0	0	160	313	519	681
Goforth WSC		0	50	418	782	1,153	1,623	1,992
Kyle		0	1,388	2,588	2,865	3,025	3,522	3,851
Maxwell WSC		0	0	0	0	24	84	132
Mountain City		0	0	0	0	0	24	50
Niederwald		0	23	66	113	157	213	257
Plum Creek Water Company		0	0	73	274	479	738	941
San Marcos		0	0	2,634	5,807	9,260	12,995	15,875
Wimberley WSC		0	177	400	628	847	1,248	1,479
Woodcreek		59	118	187	257	325	436	506
Woodcreek Utilities		125	475	872	1,292	1,702	2,255	2,651
Rural		861	1,033	1,233	1,444	1,667	1,978	2,201
Subtotal		1,045	3,308	9,567	15,038	20,442	27,344	32,695
Total Municipal New Supply Need		1,045	3,308	9,567	15,038	20,442	27,344	32,695
Industrial Demand								
Guadalupe Basin		157	212	249	285	322	355	386
Total Industrial Demand		157	212	249	285	322	355	386
Industrial Existing Supply								
Guadalupe Basin	Edwards	1,752	1,752	1,752	1,752	1,752	1,752	1,752
	Run-of-River	571	571	571	571	571	571	571
Total Industrial Existing Supply		2,323	2,323	2,323	2,323	2,323	2,323	2,323
Industrial Surplus/Shortage								
Guadalupe Basin		2,166	2,111	2,074	2,038	2,001	1,968	1,937
Total Industrial Surplus/Shortage		2,166	2,111	2,074	2,038	2,001	1,968	1,937
Industrial New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0

Table C-12 Projected Water Demands, Supplies, and Needs Hays County (Part) South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Steam-Electric Demand								
Guadalupe Basin		0	5,331	7,631	8,922	10,495	12,413	14,751
Total Steam-Electric Demand		0	5,331	7,631	8,922	10,495	12,413	14,751
Steam-Electric Existing Supply								
Guadalupe Basin	Canyon (GBRA)	2,464	2,464	2,464	2,464	2,464	2,464	2,464
	San Marcos Reclaimed	0	3,936	3,936	3,936	3,936	3,936	3,936
Total Steam-Electric Existing Supply		2,464	6,400	6,400	6,400	6,400	6,400	6,400
Steam-Electric Surplus/Shortage								
Guadalupe Basin		2,464	1,069	-1,231	-2,522	-4,095	-6,013	-8,351
Total Steam-Electric Surplus/Shortage		2,464	1,069	-1,231	-2,522	-4,095	-6,013	-8,351
Steam-Electric New Supply Need								
Guadalupe Basin		0	0	1,231	2,522	4,095	6,013	8,351
Total Steam-Electric New Supply Need		0	0	1,231	2,522	4,095	6,013	8,351
Irrigation Demand								
Guadalupe Basin		162	353	350	347	344	341	338
Total Irrigation Demand		162	353	350	347	344	341	338
Irrigation Supply								
Guadalupe Basin	Edwards	500	500	500	500	500	500	500
	Run-of-River	344	344	344	344	344	344	344
Total Irrigation Supply		844	844	844	844	844	844	844
Irrigation Surplus/Shortage								
Guadalupe Basin		682	491	494	497	500	503	506
Total Irrigation Surplus/Shortage		682	491	494	497	500	503	506
Irrigation New Supply Need								
Guadalupe Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0
Mining Demand								
Guadalupe Basin		129	142	151	157	161	162	163
Total Mining Demand		129	142	151	157	161	162	163
Mining Supply								
Guadalupe Basin	Trinity	55	60	64	66	67	56	56
Total Mining Supply		55	60	64	66	67	56	56
Mining Surplus/Shortage								
Guadalupe Basin		-74	-82	-87	-91	-94	-106	-107
Total Mining Surplus/Shortage		-74	-82	-87	-91	-94	-106	-107
Mining New Supply Need								
Guadalupe Basin		74	82	87	91	94	106	107
Total Mining New Supply Need		74	82	87	91	94	106	107
Livestock Demand								
Guadalupe Basin		280	280	280	280	280	280	280
Total Livestock Demand		280	280	280	280	280	280	280
Livestock Supply								
Guadalupe Basin	Edwards[1]	58	58	58	58	58	58	58
	Local	140	140	140	140	140	140	140
Total Livestock Supply		198	198	198	198	198	198	198

Table C-12 Projected Water Demands, Supplies, and Needs Hays County (Part) South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Livestock Surplus/Shortage									
Guadalupe Basin			-82	-82	-82	-82	-82	-82	-82
Total Livestock Surplus/Shortage[2]			-82	-82	-82	-82	-82	-82	-82
Livestock New Supply Need									
Guadalupe Basin			82	82	82	82	82	82	82
Total Livestock New Supply Need			82	82	82	82	82	82	82
Total Hays County Demand									
Municipal			10,926	17,278	24,409	29,964	35,414	42,121	47,474
Industrial			157	212	249	285	322	355	386
Steam-Electric			0	5,331	7,631	8,922	10,495	12,413	14,751
Irrigation			162	353	350	347	344	341	338
Mining			129	142	151	157	161	162	163
Livestock			280	280	280	280	280	280	280
Total County Demand			11,654	23,596	33,070	39,955	47,016	55,672	63,392
Total Hays County Supply									
Municipal			15,008	15,001	14,999	14,997	14,994	14,787	14,786
Industrial			2,323	2,323	2,323	2,323	2,323	2,323	2,323
Steam-Electric			2,464	6,400	6,400	6,400	6,400	6,400	6,400
Irrigation			844	844	844	844	844	844	844
Mining			55	60	64	66	67	56	56
Livestock			198	198	198	198	198	198	198
Total County Supply			20,892	24,826	24,828	24,828	24,826	24,608	24,607
Total Hays County Surplus/Shortage									
Municipal			4,082	-2,277	-9,410	-14,967	-20,420	-27,334	-32,688
Industrial			2,166	2,111	2,074	2,038	2,001	1,968	1,937
Steam-Electric			2,464	1,069	-1,231	-2,522	-4,095	-6,013	-8,351
Irrigation			682	491	494	497	500	503	506
Mining			-74	-82	-87	-91	-94	-106	-107
Livestock			-82	-82	-82	-82	-82	-82	-82
Total County Surplus/Shortage			9,238	1,230	-8,242	-15,127	-22,190	-31,064	-38,785
Total Basin Demand									
Guadalupe									
Municipal			10,926	17,278	24,409	29,964	35,414	42,121	47,474
Industrial			157	212	249	285	322	355	386
Steam-Electric			0	5,331	7,631	8,922	10,495	12,413	14,751
Irrigation			162	353	350	347	344	341	338
Mining			129	142	151	157	161	162	163
Livestock			280	280	280	280	280	280	280
Total Guadalupe Basin Demand			11,654	23,596	33,070	39,955	47,016	55,672	63,392
Total Basin Supply									
Guadalupe									
Municipal			15,008	15,001	14,999	14,997	14,994	14,787	14,786
Industrial			2,323	2,323	2,323	2,323	2,323	2,323	2,323
Steam-Electric			2,464	6,400	6,400	6,400	6,400	6,400	6,400
Irrigation			844	844	844	844	844	844	844
Mining			55	60	64	66	67	56	56
Livestock			198	198	198	198	198	198	198
Total Guadalupe Basin Supply			20,892	24,826	24,828	24,828	24,826	24,608	24,607

Table C-12
Projected Water Demands, Supplies, and Needs
Hays County (Part)
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Surplus/Shortage									
Guadalupe									
Municipal			4,082	-2,277	-9,410	-14,967	-20,420	-27,334	-32,688
Industrial			2,166	2,111	2,074	2,038	2,001	1,968	1,937
Steam-Electric			2,464	1,069	-1,231	-2,522	-4,095	-6,013	-8,351
Irrigation			682	491	494	497	500	503	506
Mining			-74	-82	-87	-91	-94	-106	-107
Livestock			-82	-82	-82	-82	-82	-82	-82
Total Guadalupe Basin Surplus/Shortage			9,238	1,230	-8,242	-15,127	-22,190	-31,064	-38,785
Groundwater Supplies									
	Available								
	Guadalupe	Edwards	6,555	6,555	6,555	6,555	6,555	6,555	6,555
	Guadalupe	Trinity	1,213	1,213	1,213	1,213	1,213	994	994
	Total Available		7,768	7,768	7,768	7,768	7,768	7,549	7,549
	Allocated								
	Guadalupe	Edwards	6,555	6,555	6,555	6,555	6,555	6,555	6,555
	Guadalupe	Trinity	1,213	1,213	1,213	1,213	1,213	994	994
	Total Allocated		7,768	7,768	7,768	7,768	7,768	7,549	7,549
	Total Unallocated		0	0	0	0	0	0	0

Notes:
[1] There is limited supply from the Edwards Aquifer permitted for D&L; however, these values are not part of the 340,000 acft/yr allocated to other uses.
[2] There is insufficient groundwater available in the county to meet all of the projected livestock demand.

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Nueces Basin									
El Oso WSC			12	13	13	14	15	15	16
Rural			19	24	29	35	39	42	44
	Subtotal		31	37	42	49	54	57	60
San Antonio Basin									
El Oso WSC			458	482	514	547	573	590	601
Falls City			107	113	122	131	138	142	145
Karnes City			418	432	453	474	492	503	512
Kenedy			758	763	826	874	912	961	993
Runge			195	195	209	219	227	238	247
Sunko WSC			46	49	53	57	61	63	64
Rural (TDCJ)			478	500	500	500	500	500	500
Rural			208	324	433	569	672	714	732
	Subtotal		2,668	2,858	3,110	3,371	3,575	3,711	3,794
Guadalupe Basin									
El Oso WSC			5	5	5	6	6	6	6
Rural			13	16	20	24	27	30	31
	Subtotal		18	21	25	30	33	36	37
San Antonio-Nueces Coastal Basin									
El Oso WSC			2	3	3	3	3	3	3
Rural			7	8	10	12	14	15	15
	Subtotal		9	11	13	15	17	18	18
Total Municipal Demand			2,726	2,927	3,190	3,465	3,679	3,822	3,909
Municipal Existing Supply									
Nueces Basin									
El Oso WSC		Carrizo	16	16	16	16	16	16	16
Rural		Carrizo	50	50	50	50	50	50	50
	Subtotal		66	66	66	66	66	66	66
San Antonio Basin									
El Oso WSC		Carrizo	573	573	573	573	573	573	573
		Gulf Coast	609	609	609	609	609	609	609
El Oso WSC Subtotal			1,182	1,182	1,182	1,182	1,182	1,182	1,182
Falls City		Carrizo	145	145	145	145	145	145	145
Karnes City		Carrizo	512	512	512	512	512	512	512
Kenedy		Gulf Coast	598	576	576	576	576	576	576
Runge		Gulf Coast	492	492	492	492	492	492	492
Sunko WSC		Carrizo	64	64	64	64	64	64	64
Rural (TDCJ)		Gulf Coast	478	500	500	500	500	500	500
Rural		Carrizo	214	214	214	214	214	214	214
		Gulf Coast	880	880	880	880	880	880	880
Rural Subtotal			1,094	1,094	1,094	1,094	1,094	1,094	1,094
	Subtotal		4,565	4,565	4,565	4,565	4,565	4,565	4,565
Guadalupe Basin									
El Oso WSC		Carrizo	6	6	6	6	6	6	6
Rural		Carrizo	35	35	35	35	35	35	35
	Subtotal		41	41	41	41	41	41	41
San Antonio-Nueces Coastal Basin									
El Oso WSC		Carrizo	3	3	3	3	3	3	3
Rural		Gulf Coast	20	20	20	20	20	20	20
	Subtotal		23	23	23	23	23	23	23
Total Municipal Existing Supply			4,695	4,695	4,695	4,695	4,695	4,695	4,695

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Surplus/Shortage									
Nueces Basin									
El Oso WSC			4	3	3	2	1	1	0
Rural			31	26	21	15	11	8	6
	Subtotal		35	29	24	17	12	9	6
San Antonio Basin									
El Oso WSC			724	700	668	635	609	592	581
Falls City			38	32	23	14	7	3	0
Karnes City			94	80	59	38	20	9	0
Kenedy			-160	-187	-250	-298	-336	-385	-417
Runge			297	297	283	273	265	254	245
Sunko WSC			18	15	11	7	3	1	0
Rural (TDCJ)			0	0	0	0	0	0	0
Rural			886	770	661	525	422	380	362
	Subtotal		1,897	1,707	1,455	1,194	990	854	771
Guadalupe Basin									
El Oso WSC			1	1	1	0	0	0	0
Rural			22	19	15	11	8	5	4
	Subtotal		23	20	16	11	8	5	4
San Antonio-Nueces Coastal Basin									
El Oso WSC			1	0	0	0	0	0	0
Rural			13	12	10	8	6	5	5
	Subtotal		14	12	10	8	6	5	5
Total Municipal Surplus/Shortage			1,969	1,768	1,505	1,230	1,016	873	786
Municipal New Supply Need									
Nueces Basin									
El Oso WSC			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
San Antonio Basin									
El Oso WSC			0	0	0	0	0	0	0
Falls City			0	0	0	0	0	0	0
Karnes City			0	0	0	0	0	0	0
Kenedy			160	187	250	298	336	385	417
Runge			0	0	0	0	0	0	0
Sunko WSC			0	0	0	0	0	0	0
Rural (TDCJ)			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		160	187	250	298	336	385	417
Guadalupe Basin									
El Oso WSC			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
San Antonio-Nueces Coastal Basin									
El Oso WSC			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			160	187	250	298	336	385	417
Industrial Demand									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			107	118	122	125	128	130	137
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			107	118	122	125	128	130	137

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin	Gulf Coast	139	139	139	139	139	139	139
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Industrial Existing Supply		139	139	139	139	139	139	139
Industrial Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		32	21	17	14	11	9	2
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Industrial Surplus/Shortage		32	21	17	14	11	9	2
Industrial New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0
Steam-Electric Demand								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		1,916	1,382	1,250	1,131	1,023	925	836
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation Demand		1,916	1,382	1,250	1,131	1,023	925	836

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Irrigation Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin	Run-of-River	1,418	1,418	1,418	1,418	1,418	1,418	1,418
	Gulf Coast	1,150	829	750	679	614	555	502
San Antonio Basin Subtotal		2,568	2,247	2,168	2,097	2,032	1,973	1,920
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation Supply		2,568	2,247	2,168	2,097	2,032	1,973	1,920
Irrigation Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		652	865	918	966	1,009	1,048	1,084
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage		652	865	918	966	1,009	1,048	1,084
Irrigation New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0
Mining Demand								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		105	94	91	90	89	89	88
Guadalupe Basin		8	7	7	7	7	7	7
San Antonio-Nueces Basin		6	5	5	5	5	5	5
Total Mining Demand		119	106	103	102	101	101	100
Mining Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin	Carrizo	5	5	5	5	4	4	4
	Gulf Coast	105	94	91	90	89	89	88
San Antonio Basin Subtotal		110	99	96	95	93	93	92
Guadalupe Basin	Carrizo	8	7	7	7	7	7	7
San Antonio-Nueces Basin	Gulf Coast	6	5	5	5	5	5	5
Total Mining Supply		124	111	108	107	105	105	104
Mining Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		5	5	5	5	4	4	4
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		5	5	5	5	4	4	4
Mining New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0

Table C-13
Projected Water Demands, Supplies, and Needs
Karnes County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock Demand									
Nueces Basin			107	107	107	107	107	107	107
San Antonio Basin			936	936	936	936	936	936	936
Guadalupe Basin			83	83	83	83	83	83	83
San Antonio-Nueces Basin			59	59	59	59	59	59	59
Total Livestock Demand			1,185	1,185	1,185	1,185	1,185	1,185	1,185
Livestock Supply									
Nueces Basin		Carrizo	10	10	10	10	10	10	10
		Gulf Coast	44	44	44	44	44	44	44
		Local	53	53	53	53	53	53	53
	Subtotal		107	107	107	107	107	107	107
San Antonio Basin		Gulf Coast	468	468	468	468	468	468	468
		Local	468	468	468	468	468	468	468
	Subtotal		936	936	936	936	936	936	936
Guadalupe Basin		Carrizo	8	8	8	8	8	8	8
		Gulf Coast	34	34	34	34	34	34	34
		Local	41	41	41	41	41	41	41
	Subtotal		83	83	83	83	83	83	83
San Antonio-Nueces Basin		Carrizo	30	30	30	30	30	30	30
		Local	29	29	29	29	29	29	29
	Subtotal		59	59	59	59	59	59	59
Total Livestock Supply			1,185	1,185	1,185	1,185	1,185	1,185	1,185
Livestock Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Karnes County Demand									
Municipal			2,726	2,927	3,190	3,465	3,679	3,822	3,909
Industrial			107	118	122	125	128	130	137
Steam-Electric			0	0	0	0	0	0	0
Irrigation			1,916	1,382	1,250	1,131	1,023	925	836
Mining			119	106	103	102	101	101	100
Livestock			1,185	1,185	1,185	1,185	1,185	1,185	1,185
Total County Demand			6,053	5,718	5,850	6,008	6,116	6,163	6,167
Total Karnes County Supply									
Municipal			4,695	4,695	4,695	4,695	4,695	4,695	4,695
Industrial			139	139	139	139	139	139	139
Steam-Electric			0	0	0	0	0	0	0
Irrigation			2,568	2,247	2,168	2,097	2,032	1,973	1,920
Mining			124	111	108	107	105	105	104
Livestock			1,185	1,185	1,185	1,185	1,185	1,185	1,185
Total County Supply			8,711	8,377	8,295	8,223	8,156	8,097	8,043
Total Karnes County Surplus/Shortage									
Municipal			1,969	1,768	1,505	1,230	1,016	873	786

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Industrial			32	21	17	14	11	9	2
Steam-Electric			0	0	0	0	0	0	0
Irrigation			652	865	918	966	1,009	1,048	1,084
Mining			5	5	5	5	4	4	4
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			2,658	2,659	2,445	2,215	2,040	1,934	1,876

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Demand								
Nueces								
Municipal		31	37	42	49	54	57	60
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		107	107	107	107	107	107	107
Total Nueces Basin Demand		138	144	149	156	161	164	167
San Antonio								
Municipal		2,668	2,858	3,110	3,371	3,575	3,711	3,794
Industrial		107	118	122	125	128	130	137
Steam-Electric		0	0	0	0	0	0	0
Irrigation		1,916	1,382	1,250	1,131	1,023	925	836
Mining		105	94	91	90	89	89	88
Livestock		936	936	936	936	936	936	936
Total San Antonio Basin Demand		5,732	5,388	5,509	5,653	5,751	5,791	5,791
Guadalupe								
Municipal		18	21	25	30	33	36	37
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		8	7	7	7	7	7	7
Livestock		83	83	83	83	83	83	83
Total Guadalupe Basin Demand		109	111	115	120	123	126	127
San Antonio-Nueces								
Municipal		9	11	13	15	17	18	18
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		6	5	5	5	5	5	5
Livestock		59	59	59	59	59	59	59
Total San Antonio-Nueces Basin Demand		74	75	77	79	81	82	82
Total Basin Supply								
Nueces								
Municipal		66	66	66	66	66	66	66
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		107	107	107	107	107	107	107
Unallocated Groundwater Supply		1,696	1,696	1,696	1,696	1,696	1,696	1,696
Total Nueces Basin Supply		1,869	1,869	1,869	1,869	1,869	1,869	1,869
San Antonio								
Municipal		4,565	4,565	4,565	4,565	4,565	4,565	4,565
Industrial		139	139	139	139	139	139	139
Steam-Electric		0	0	0	0	0	0	0
Irrigation		2,568	2,247	2,168	2,097	2,032	1,973	1,920
Mining		110	99	96	95	93	93	92
Livestock		936	936	936	936	936	936	936
Unallocated Groundwater Supply		7,458	7,790	7,872	7,944	8,010	8,069	8,124
Total San Antonio Basin Supply		15,776	15,776	15,776	15,776	15,775	15,775	15,776

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe									
Municipal			41	41	41	41	41	41	41
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			8	7	7	7	7	7	7
Livestock			83	83	83	83	83	83	83
Unallocated Groundwater Supply			376	377	377	377	377	377	377
Total Guadalupe Basin Supply			508	508	508	508	508	508	508
San Antonio-Nueces									
Municipal			23	23	23	23	23	23	23
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			6	5	5	5	5	5	5
Livestock			59	59	59	59	59	59	59
Unallocated Groundwater Supply			733	734	734	734	734	734	734
Total San Antonio-Nueces Basin Supply			821	821	821	821	821	821	821
Total Basin Surplus/Shortage									
Nueces									
Municipal			35	29	24	17	12	9	6
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			1,696	1,696	1,696	1,696	1,696	1,696	1,696
Total Nueces Basin Surplus/Shortage			1,731	1,725	1,720	1,713	1,708	1,705	1,702
San Antonio									
Municipal			1,897	1,707	1,455	1,194	990	854	771
Industrial			32	21	17	14	11	9	2
Steam-Electric			0	0	0	0	0	0	0
Irrigation			652	865	918	966	1,009	1,048	1,084
Mining			5	5	5	5	4	4	4
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			7,458	7,790	7,872	7,944	8,010	8,069	8,124
Total San Antonio Basin Surplus/Shortage			10,044	10,388	10,267	10,123	10,024	9,984	9,985
Guadalupe									
Municipal			23	20	16	11	8	5	4
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			376	377	377	377	377	377	377
Total Guadalupe Basin Surplus/Shortage			399	397	393	388	385	382	381

Table C-13 Projected Water Demands, Supplies, and Needs Karnes County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio-Nueces									
Municipal			14	12	10	8	6	5	5
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			733	734	734	734	734	734	734
Total San Antonio-Nueces Basin Surplus/Shortage			747	746	744	742	740	739	739
Groundwater Supplies									
	Available								
	Guadalupe	Carrizo	91	91	91	91	91	91	91
	Nueces	Carrizo	135	135	135	135	135	135	135
	San Antonio	Carrizo	1,577	1,577	1,577	1,577	1,577	1,577	1,577
	San Antonio-Nueces	Gulf Coast	789	789	789	789	789	789	789
	Guadalupe	Gulf Coast	370	370	370	370	370	370	370
	Nueces	Gulf Coast	1,665	1,665	1,665	1,665	1,665	1,665	1,665
	San Antonio	Gulf Coast	12,376	12,376	12,376	12,376	12,376	12,376	12,376
	Total Available		17,003	17,003	17,003	17,003	17,003	17,003	17,003
	Allocated								
	Guadalupe	Carrizo	51	50	50	50	50	50	50
	Nueces	Carrizo	60	60	60	60	60	60	60
	San Antonio	Carrizo	1,577	1,576	1,576	1,576	1,576	1,576	1,576
	San Antonio-Nueces	Gulf Coast	56	55	55	55	55	55	55
	Guadalupe	Gulf Coast	34	34	34	34	34	34	34
	Nueces	Gulf Coast	44	44	44	44	44	44	44
	San Antonio	Gulf Coast	4,919	4,587	4,505	4,433	4,367	4,308	4,254
	Total Allocated		6,740	6,406	6,324	6,252	6,186	6,127	6,072
	Total Unallocated		10,263	10,597	10,679	10,751	10,817	10,876	10,931

Table C-14 Projected Water Demands, Supplies, and Needs Kendall County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Demand									
San Antonio Basin									
Boerne			1,170	1,570	2,188	2,843	3,370	3,831	4,282
Fair Oaks Ranch			152	286	296	300	305	310	316
Water Service Inc (Apex Water Ser)			37	43	52	61	69	75	81
Rural			748	1,080	1,506	1,939	2,304	2,620	2,930
	Subtotal		2,107	2,979	4,042	5,143	6,048	6,836	7,609
Guadalupe Basin									
Rural			1,131	1,635	2,279	2,936	3,487	3,966	4,434
	Subtotal		1,131	1,635	2,279	2,936	3,487	3,966	4,434
Lower Colorado Basin									
Rural			24	35	49	63	75	86	96
	Subtotal		24	35	49	63	75	86	96
Total Municipal Demand			3,262	4,649	6,370	8,142	9,610	10,888	12,139
Municipal Existing Supply									
San Antonio Basin									
Boerne		Boerne Lake	506	506	506	506	506	506	506
		Canyon (GBRA)	0	650	1,300	1,861	1,861	1,861	1,861
		Trinity	463	452	453	453	454	372	373
Boerne Subtotal			969	1,608	2,259	2,820	2,821	2,739	2,740
Fair Oaks Ranch		Trinity (Comal)	34	34	34	34	34	28	28
		Canyon (GBRA)	0	252	273	294	294	294	294
Fair Oaks Ranch Subtotal			34	286	307	328	328	322	322
Water Service Inc (Apex Water Ser)		Edwards	2	2	2	2	2	2	2
Rural		Trinity	357	348	349	349	350	287	287
		Canyon (GBRA)	0	732	1,160	1,500	1,500	1,500	1,500
Rural Subtotal			357	1,080	1,509	1,849	1,850	1,787	1,787
	Subtotal		1,362	2,976	4,077	4,999	5,001	4,850	4,851
Guadalupe Basin									
Rural		Edwards-Trinity	31	31	31	31	31	31	31
		Trinity	1,383	1,383	1,383	1,383	1,383	1,383	1,383
Rural Subtotal			1,414	1,414	1,414	1,414	1,414	1,414	1,414
	Subtotal		1,414	1,414	1,414	1,414	1,414	1,414	1,414
Lower Colorado Basin									
Rural		Edwards-Trinity	96	96	96	96	96	96	96
	Subtotal		96	96	96	96	96	96	96
Total Municipal Existing Supply			2,872	4,486	5,587	6,509	6,511	6,360	6,361
Municipal Surplus/Shortage									
San Antonio Basin									
Boerne			-201	38	71	-23	-549	-1,092	-1,542
Fair Oaks Ranch			-118	0	11	28	23	12	6
Water Service Inc (Apex Water Ser)			-35	-41	-50	-59	-67	-73	-79
Rural			-391	0	3	-90	-454	-833	-1,143
	Subtotal		-745	-3	35	-144	-1,047	-1,986	-2,758
Guadalupe Basin									
Rural			283	-221	-865	-1,522	-2,073	-2,552	-3,020
	Subtotal		283	-221	-865	-1,522	-2,073	-2,552	-3,020

Table C-14 Projected Water Demands, Supplies, and Needs Kendall County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lower Colorado Basin									
Rural			72	61	47	33	21	10	0
	Subtotal		72	61	47	33	21	10	0
Total Municipal Surplus/Shortage			-390	-163	-783	-1,633	-3,099	-4,528	-5,778
Municipal New Supply Need									
San Antonio Basin									
Boerne			201	0	0	23	549	1,092	1,542
Fair Oaks Ranch			118	0	0	0	0	0	0
Water Service Inc (Apex Water Ser)			35	41	50	59	67	73	79
Rural			391	0	0	90	454	833	1,143
	Subtotal		745	41	50	172	1,070	1,998	2,764
Guadalupe Basin									
Rural			0	221	865	1,522	2,073	2,552	3,020
	Subtotal		0	221	865	1,522	2,073	2,552	3,020
Lower Colorado Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			745	262	915	1,694	3,143	4,550	5,784
Industrial Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0
Industrial Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			0	0	0	0	0	0	0
Industrial Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			0	0	0	0	0	0	0
Industrial New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0
Steam-Electric Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0

Table C-14 Projected Water Demands, Supplies, and Needs Kendall County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000	2010	2020	2030	2040	2050	2060
		(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Steam-Electric Existing Supply								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
San Antonio Basin		107	194	189	185	181	177	174
Guadalupe Basin		289	520	510	500	490	481	472
Lower Colorado Basin		0	0	0	0	0	0	0
Total Irrigation Demand		396	714	699	685	671	658	646
Irrigation Supply								
San Antonio Basin	Trinity	26	46	44	44	43	34	34
Guadalupe Basin	Run-of-River	187	187	187	187	187	187	187
	Trinity	188	339	332	326	319	313	307
Guadalupe Basin Subtotal		375	526	519	513	506	500	494
Lower Colorado Basin		0	0	0	0	0	0	1
Total Irrigation Supply		401	572	563	557	549	534	529
Irrigation Surplus/Shortage								
San Antonio Basin		-81	-148	-145	-141	-138	-143	-140
Guadalupe Basin		86	6	9	13	16	19	22
Lower Colorado Basin		0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage		5	-142	-136	-128	-122	-124	-118
Irrigation New Supply Need								
San Antonio Basin		81	148	145	141	138	143	140
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		81	148	145	141	138	143	140
Mining Demand								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lower Colorado Basin		6	6	6	6	6	6	6
Total Mining Demand		6	6	6	6	6	6	6

Table C-14 Projected Water Demands, Supplies, and Needs Kendall County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin		Trinity	6	6	6	6	6	6	6
Lower Colorado Basin Subtotal			6	6	6	6	6	6	6
Total Mining Supply			6	6	6	6	6	6	6
Mining Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
San Antonio Basin			80	80	80	80	80	80	80
Guadalupe Basin			353	353	353	353	353	353	353
Lower Colorado Basin			13	13	13	13	13	13	13
Total Livestock Demand			446	446	446	446	446	446	446
Livestock Supply									
San Antonio Basin		Trinity	15	15	15	15	15	12	12
		Local	40	40	40	40	40	40	40
	Subtotal		55	55	55	55	55	52	52
Guadalupe Basin		Trinity	176	176	176	176	176	176	176
		Local	177	177	177	177	177	177	177
	Subtotal		353	353	353	353	353	353	353
Lower Colorado Basin		Trinity	6	6	6	6	6	6	6
		Local	7	7	7	7	7	7	7
	Subtotal		13	13	13	13	13	13	13
Total Livestock Supply			421	421	421	421	421	418	418
Livestock Surplus/Shortage									
San Antonio Basin			-25	-25	-25	-25	-25	-28	-28
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage[3]			-25	-25	-25	-25	-25	-28	-28
Livestock New Supply Need									
San Antonio Basin			25	25	25	25	25	28	28
Guadalupe Basin			0	0	0	0	0	0	0
Lower Colorado Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			25	25	25	25	25	28	28

Table C-14 Projected Water Demands, Supplies, and Needs Kendall County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Kendall County Demand								
Municipal		3,262	4,649	6,370	8,142	9,610	10,888	12,139
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		396	714	699	685	671	658	646
Mining		6	6	6	6	6	6	6
Livestock		446	446	446	446	446	446	446
Total County Demand		4,110	5,815	7,521	9,279	10,733	11,998	13,237
Total Kendall County Supply								
Municipal		2,872	4,486	5,587	6,509	6,511	6,360	6,361
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		401	572	563	557	549	534	529
Mining		6	6	6	6	6	6	6
Livestock		421	421	421	421	421	418	418
Total County Supply		3,700	5,485	6,577	7,493	7,487	7,318	7,314
Total Kendall County Surplus/Shortage								
Municipal		-390	-163	-783	-1,633	-3,099	-4,528	-5,778
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		5	-142	-136	-128	-122	-124	-117
Mining		0	0	0	0	0	0	0
Livestock		-25	-25	-25	-25	-25	-28	-28
Total County Surplus/Shortage		-410	-330	-944	-1,786	-3,246	-4,680	-5,923
Total Basin Demand								
San Antonio								
Municipal		2,107	2,979	4,042	5,143	6,048	6,836	7,609
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		107	194	189	185	181	177	174
Mining		0	0	0	0	0	0	0
Livestock		80	80	80	80	80	80	80
Total San Antonio Basin Demand		2,294	3,253	4,311	5,408	6,309	7,093	7,863
Guadalupe								
Municipal		1,131	1,635	2,279	2,936	3,487	3,966	4,434
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		289	520	510	500	490	481	472
Mining		0	0	0	0	0	0	0
Livestock		353	353	353	353	353	353	353
Total Guadalupe Basin Demand		1,773	2,508	3,142	3,789	4,330	4,800	5,259
Lower Colorado								
Municipal		24	35	49	63	75	86	96
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		6	6	6	6	6	6	6
Livestock		13	13	13	13	13	13	13
Total Lower Colorado Basin Demand		43	54	68	82	94	105	115

Table C-14
Projected Water Demands, Supplies, and Needs
Kendall County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Supply								
San Antonio								
Municipal		1,362	2,976	4,077	4,999	5,001	4,850	4,851
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		26	46	44	44	43	34	34
Mining		0	0	0	0	0	0	0
Livestock		55	55	55	55	55	52	52
Total San Antonio Basin Supply		1,443	3,077	4,176	5,098	5,099	4,936	4,937
Guadalupe								
Municipal		1,414	1,414	1,414	1,414	1,414	1,414	1,414
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		375	526	519	513	506	500	494
Mining		0	0	0	0	0	0	0
Livestock		353	353	353	353	353	353	353
Unallocated Groundwater Supply		1,943	1,793	1,799	1,806	1,812	1,274	1,280
Total Guadalupe Basin Supply		4,085	4,086	4,085	4,086	4,085	3,541	3,541
Lower Colorado								
Municipal		96	96	96	96	96	96	96
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	1
Mining		6	6	6	6	6	6	6
Livestock		13	13	13	13	13	13	13
Unallocated Groundwater Supply		150	150	150	150	150	140	140
Total Lower Colorado Basin Supply		265	265	265	265	265	255	256
Total Basin Surplus/Shortage								
San Antonio								
Municipal		-745	-3	35	-144	-1,047	-1,986	-2,758
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		-81	-148	-145	-141	-138	-143	-140
Mining		0	0	0	0	0	0	0
Livestock		-25	-25	-25	-25	-25	-28	-28
Total San Antonio Basin Surplus/Shortage		-851	-176	-135	-310	-1,210	-2,157	-2,926
Guadalupe								
Municipal		283	-221	-865	-1,522	-2,073	-2,552	-3,020
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		86	6	9	13	16	19	22
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		1,943	1,793	1,799	1,806	1,812	1,274	1,280
Total Guadalupe Basin Surplus/Shortage		2,312	1,578	943	297	-245	-1,259	-1,718

Table C-14 Projected Water Demands, Supplies, and Needs Kendall County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lower Colorado									
Municipal			72	61	47	33	21	10	0
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	1
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			150	150	150	150	150	140	140
Total Lower Colorado Basin Surplus/Shortage			222	211	197	183	171	150	141
Groundwater Supplies									
	Available								
	Colorado	Edwards-Trinity	207	207	207	207	207	207	207
	Guadalupe	Edwards-Trinity	698	698	698	698	698	698	698
	Colorado	Trinity	51	51	51	51	51	41	41
	Guadalupe	Trinity	3,023	3,023	3,023	3,023	3,023	2,479	2,479
	San Antonio	Trinity	861	861	861	861	861	706	706
	Total Available		4,840	4,840	4,840	4,840	4,840	4,131	4,131
	Allocated								
	Colorado	Edwards-Trinity	96	96	96	96	96	96	96
	Guadalupe	Edwards-Trinity	31	31	31	31	31	31	31
	Colorado	Trinity	12	12	12	12	12	12	12
	Guadalupe	Trinity	1,747	1,897	1,891	1,884	1,878	1,872	1,866
	San Antonio	Trinity	861	861	861	861	861	706	706
	Total Allocated		2,747	2,897	2,891	2,884	2,878	2,717	2,711
	Total Unallocated		2,093	1,943	1,949	1,956	1,962	1,414	1,420

Notes:
[1] There is insufficient groundwater available in the county to meet all of the projected livestock demand.

Table C-15 Projected Water Demands, Supplies, and Needs LaSalle County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Nueces Basin									
Cotulla			1,271	1,407	1,516	1,566	1,615	1,677	1,743
Encinal			110	110	109	108	106	107	107
Rural			244	282	321	384	441	478	500
	Subtotal		1,625	1,799	1,946	2,058	2,162	2,262	2,350
Total Municipal Demand			1,625	1,799	1,946	2,058	2,162	2,262	2,350
Municipal Existing Supply									
Nueces Basin									
Cotulla		Carrizo	2,487	2,487	2,487	2,487	2,487	2,487	2,487
Encinal		Carrizo	282	282	282	282	282	282	282
Rural		Carrizo	500	500	500	500	500	500	500
	Subtotal		3,269	3,269	3,269	3,269	3,269	3,269	3,269
Total Municipal Existing Supply			3,269	3,269	3,269	3,269	3,269	3,269	3,269
Municipal Surplus/Shortage									
Nueces Basin									
Cotulla			1,216	1,080	971	921	872	810	744
Encinal			172	172	173	174	176	175	175
Rural			256	218	179	116	59	22	0
	Subtotal		1,644	1,470	1,323	1,211	1,107	1,007	919
Total Municipal Surplus/Shortage			1,644	1,470	1,323	1,211	1,107	1,007	919
Municipal New Supply Need									
Nueces Basin									
Cotulla			0	0	0	0	0	0	0
Encinal			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0
Industrial Existing Supply									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			0	0	0	0	0	0	0
Industrial Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			0	0	0	0	0	0	0
Industrial New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0
Steam-Electric Demand									
Nueces Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			0	0	0	0	0	0	0

Table C-15 Projected Water Demands, Supplies, and Needs LaSalle County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000	2010	2020	2030	2040	2050	2060
		(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Steam-Electric Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Nueces Basin		4,003	4,791	4,643	4,500	4,361	4,227	4,097
Total Irrigation Demand		4,003	4,791	4,643	4,500	4,361	4,227	4,097
Irrigation Supply								
Nueces Basin	Run-of-River	3,287	3,287	3,287	3,287	3,287	3,287	3,287
	Carrizo	3,355	4,015	3,891	3,771	3,655	3,542	3,433
	Sparta	648	776	752	729	706	685	664
Total Irrigation Supply		7,290	8,078	7,930	7,787	7,648	7,514	7,384
Irrigation Surplus/Shortage								
Nueces Basin		3,287	3,287	3,287	3,287	3,287	3,287	3,287
Total Irrigation Surplus/Shortage		3,287	3,287	3,287	3,287	3,287	3,287	3,287
Irrigation New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0
Mining Demand								
Nueces Basin		0	0	0	0	0	0	0
Total Mining Demand		0	0	0	0	0	0	0
Mining Supply								
Nueces Basin		0	0	0	0	0	0	0
Total Mining Supply		0	0	0	0	0	0	0
Mining Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		0	0	0	0	0	0	0
Mining New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0
Livestock Demand								
Nueces Basin		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Total Livestock Demand		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Livestock Supply								
Nueces Basin	Carrizo	608	608	608	608	608	608	608
	Sparta	235	235	235	235	235	235	235
	Local	844	844	844	844	844	844	844
Total Livestock Supply		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Livestock Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0
Livestock New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Livestock New Supply Need		0	0	0	0	0	0	0

Table C-15 Projected Water Demands, Supplies, and Needs LaSalle County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total La Salle County Demand								
Municipal		1,625	1,799	1,946	2,058	2,162	2,262	2,350
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		4,003	4,791	4,643	4,500	4,361	4,227	4,097
Mining		0	0	0	0	0	0	0
Livestock		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Total County Demand		7,315	8,277	8,276	8,245	8,210	8,176	8,134
Total La Salle County Supply								
Municipal		3,269	3,269	3,269	3,269	3,269	3,269	3,269
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		7,290	8,078	7,930	7,787	7,648	7,514	7,384
Mining		0	0	0	0	0	0	0
Livestock		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Total County Supply		12,246	13,034	12,886	12,743	12,604	12,470	12,340
Total La Salle County Surplus/Shortage								
Municipal		1,644	1,470	1,323	1,211	1,107	1,007	919
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		3,287	3,287	3,287	3,287	3,287	3,287	3,287
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		4,931	4,757	4,610	4,498	4,394	4,294	4,206
Total Basin Demand								
Nueces								
Municipal		1,625	1,799	1,946	2,058	2,162	2,262	2,350
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		4,003	4,791	4,643	4,500	4,361	4,227	4,097
Mining		0	0	0	0	0	0	0
Livestock		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Total Nueces Basin Demand		7,315	8,277	8,276	8,245	8,210	8,176	8,134
Total Basin Supply								
Nueces								
Municipal		3,269	3,269	3,269	3,269	3,269	3,269	3,269
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		7,290	8,078	7,930	7,787	7,648	7,514	7,384
Mining		0	0	0	0	0	0	0
Livestock		1,687	1,687	1,687	1,687	1,687	1,687	1,687
Unallocated Groundwater Supply		28,515	27,727	27,875	28,018	28,157	28,291	28,421
Total Nueces Basin Supply		40,761	40,761	40,761	40,761	40,761	40,761	40,761
Total Basin Surplus/Shortage								
Nueces								
Municipal		1,644	1,470	1,323	1,211	1,107	1,007	919
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		3,287	3,287	3,287	3,287	3,287	3,287	3,287
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		28,515	27,727	27,875	28,018	28,157	28,291	28,421
Total Nueces Basin Surplus/Shortage		33,446	32,484	32,485	32,516	32,551	32,585	32,627

Table C-15 Projected Water Demands, Supplies, and Needs LaSalle County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Groundwater Supplies									
	Available								
	Nueces	Carrizo	34,810	34,810	34,810	34,810	34,810	34,810	34,810
	Nueces	Sparta	1,400	1,400	1,400	1,400	1,400	1,400	1,400
	Nueces	Queen City	420	420	420	420	420	420	420
	Total Available		36,630	36,630	36,630	36,630	36,630	36,630	36,630
	Allocated								
	Nueces	Carrizo	7,232	7,892	7,768	7,648	7,532	7,419	7,310
	Nueces	Sparta	883	1,011	987	964	941	920	899
	Nueces	Queen City	0	0	0	0	0	0	0
	Total Allocated		8,115	8,903	8,755	8,612	8,473	8,339	8,209
	Total Unallocated		28,515	27,727	27,875	28,018	28,157	28,291	28,421

Table C-16 Projected Water Demands, Supplies, and Needs Medina County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Demand									
Nueces Basin									
Benton City WSC			336	414	504	589	661	737	805
Devine			830	837	850	856	862	878	896
East Medina SUD			735	833	944	1,048	1,132	1,221	1,310
Hondo			1,601	1,784	2,001	2,205	2,375	2,548	2,717
Lytle			63	62	60	59	58	58	58
Natalia			291	330	374	415	450	485	519
Rural			1,194	1,489	1,816	2,108	2,367	2,635	2,876
	Subtotal		5,050	5,749	6,549	7,280	7,905	8,562	9,181
San Antonio Basin									
Bexar Met Water District			15	24	33	41	47	54	60
Castroville			621	680	743	802	854	908	961
East Medina SUD			42	48	54	60	65	70	75
La Coste			190	205	222	239	251	265	281
Yancey WSC			668	832	1,013	1,180	1,328	1,469	1,603
Rural			30	38	46	54	60	67	73
	Subtotal		1,566	1,827	2,111	2,376	2,605	2,833	3,053
Total Municipal Demand			6,616	7,576	8,660	9,656	10,510	11,395	12,234
Municipal Existing Supply									
Nueces Basin									
Benton City WSC		Carrizo	602	602	602	602	602	602	602
Devine		Edwards	404	404	404	404	404	404	404
		Carrizo	496	496	496	496	496	496	496
Devine Subtotal			900	900	900	900	900	900	900
East Medina SUD		Edwards	959	959	959	959	959	959	959
Hondo		Edwards	980	980	980	980	980	980	980
Lytle		Edwards	39	39	39	39	39	39	39
Natalia		Edwards	132	132	132	132	132	132	132
Rural		Edwards	170	170	170	170	170	170	170
		Carrizo	1,139	1,139	1,139	1,139	1,139	1,139	1,139
Rural Subtotal			1,309	1,309	1,309	1,309	1,309	1,309	1,309
	Subtotal		4,921	4,921	4,921	4,921	4,921	4,921	4,921
San Antonio Basin									
Bexar Met Water District		Edwards (BMWD)	9	9	9	9	9	9	9
Castroville		Edwards	406	406	406	406	406	406	406
East Medina SUD		Edwards	54	54	54	54	54	54	54
La Coste		Edwards	109	109	109	109	109	109	109
Yancey WSC		Edwards	255	255	255	255	255	255	255
Rural		Edwards	150	150	150	150	150	150	150
		Trinity	1	1	1	1	1	1	1
Rural Subtotal			151	151	151	151	151	151	151
	Subtotal		984	984	984	984	984	984	984
Total Municipal Existing Supply			5,905	5,905	5,905	5,905	5,905	5,905	5,905

Table C-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Surplus/Shortage									
Nueces Basin									
Benton City WSC			266	188	98	13	-59	-135	-203
Devine			70	63	50	44	38	22	4
East Medina SUD			224	126	15	-89	-173	-262	-351
Hondo			-621	-804	-1,021	-1,225	-1,395	-1,568	-1,737
Lytle			-24	-23	-21	-20	-19	-19	-19
Natalia			-159	-198	-242	-283	-318	-353	-387
Rural			115	-180	-507	-799	-1,058	-1,326	-1,567
	Subtotal		-129	-828	-1,628	-2,359	-2,984	-3,641	-4,260
San Antonio Basin									
Bexar Met Water District			-6	-15	-24	-32	-38	-45	-51
Castroville			-215	-274	-337	-396	-448	-502	-555
East Medina SUD			12	6	0	-6	-11	-16	-21
La Coste			-81	-96	-113	-130	-142	-156	-172
Yancey WSC			-413	-577	-758	-925	-1,073	-1,214	-1,348
Rural			121	113	105	97	91	84	78
	Subtotal		-582	-843	-1,127	-1,392	-1,621	-1,849	-2,069
Total Municipal Surplus/Shortage			-711	-1,671	-2,755	-3,751	-4,605	-5,490	-6,329
Municipal New Supply Need									
Nueces Basin									
Benton City WSC			0	0	0	0	59	135	203
Devine			0	0	0	0	0	0	0
East Medina SUD			0	0	0	89	173	262	351
Hondo			621	804	1,021	1,225	1,395	1,568	1,737
Lytle			24	23	21	20	19	19	19
Natalia			159	198	242	283	318	353	387
Rural			0	180	507	799	1,058	1,326	1,567
	Subtotal		804	1,205	1,791	2,416	3,022	3,663	4,264
San Antonio Basin									
Bexar Met Water District			6	15	24	32	38	45	51
Castroville			215	274	337	396	448	502	555
East Medina SUD			0	0	0	6	11	16	21
La Coste			81	96	113	130	142	156	172
Yancey WSC			413	577	758	925	1,073	1,214	1,348
Rural			0	0	0	0	0	0	0
	Subtotal		715	962	1,232	1,489	1,712	1,933	2,147
Total Municipal New Supply Need			1,519	2,167	3,023	3,905	4,734	5,596	6,411
Industrial Demand									
Nueces Basin			56	67	75	82	89	95	103
San Antonio Basin			0	0	0	0	0	0	0
Total Industrial Demand			56	67	75	82	89	95	103
Industrial Existing Supply									
Nueces Basin		Edwards	546	546	546	546	546	546	546
San Antonio Basin		Edwards	199	199	199	199	199	199	199
Total Industrial Existing Supply			745	745	745	745	745	745	745
Industrial Surplus/Shortage									
Nueces Basin			490	479	471	464	457	451	443
San Antonio Basin			199	199	199	199	199	199	199
Total Industrial Surplus/Shortage			689	678	670	663	656	650	642

Table C-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0
Steam-Electric Demand								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand[1]								
Nueces Basin		47,000	45,357	43,465	41,654	39,919	38,257	36,665
San Antonio Basin		9,422	9,093	8,714	8,351	8,003	7,670	7,350
Total Irrigation Demand		56,422	54,450	52,179	50,005	47,922	45,927	44,015
Irrigation Supply								
Nueces Basin	Edwards	37,622	37,622	37,622	37,622	37,622	37,622	37,622
	Carrizo	3,196	3,084	2,956	2,832	2,714	2,601	2,493
Nueces Basin Subtotal		40,818	40,706	40,578	40,454	40,336	40,223	40,115
San Antonio Basin	Edwards	13,694	13,694	13,694	13,694	13,694	13,694	13,694
	Run-of-River	1	1	1	1	1	1	1
	Carrizo	19	19	19	19	19	19	19
San Antonio Basin Subtotal		13,714	13,714	13,714	13,714	13,714	13,714	13,714
Total Irrigation Supply		54,532	54,420	54,292	54,168	54,050	53,937	53,829
Irrigation Surplus/Shortage								
Nueces Basin		-6,182	-4,651	-2,887	-1,200	417	1,966	3,450
San Antonio Basin		4,292	4,621	5,000	5,363	5,711	6,044	6,364
Total Irrigation Surplus/Shortage		-1,890	-30	2,113	4,163	6,128	8,010	9,814
Irrigation New Supply Need								
Nueces Basin		6,182	4,651	2,887	1,200	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		6,182	4,651	2,887	1,200	0	0	0
Mining Demand								
Nueces Basin		62	68	71	72	73	74	75
San Antonio Basin		56	62	64	65	66	67	68
Total Mining Demand		118	130	135	137	139	141	143

Table C-16
Projected Water Demands, Supplies, and Needs
Medina County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining Supply									
Nueces Basin		Carrizo	35	39	41	41	42	42	43
		Trinity	27	29	30	31	31	32	32
Subtotal			62	68	71	72	73	74	75
San Antonio Basin		Carrizo	1	1	1	1	1	1	1
		Trinity	55	61	63	64	65	66	67
Subtotal			56	62	64	65	66	67	68
Total Mining Supply			118	130	135	137	139	141	143
Mining Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
Nueces Basin			1,116	1,116	1,116	1,116	1,116	1,116	1,116
San Antonio Basin			182	182	182	182	182	182	182
Total Livestock Demand			1,298	1,298	1,298	1,298	1,298	1,298	1,298
Livestock Supply									
Nueces Basin		Carrizo	205	205	205	205	205	205	205
		Trinity	89	89	89	89	89	89	89
		Edwards[2]	264	264	264	264	264	264	264
		Local	558	558	558	558	558	558	558
	Subtotal		1,116	1,116	1,116	1,116	1,116	1,116	1,116
San Antonio Basin		Trinity	23	23	23	23	23	23	23
		Edwards[2]	68	68	68	68	68	68	68
		Local	91	91	91	91	91	91	91
	Subtotal		182	182	182	182	182	182	182
Total Livestock Supply			1,298	1,298	1,298	1,298	1,298	1,298	1,298
Livestock Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Medina County Demand									
Municipal			6,616	7,576	8,660	9,656	10,510	11,395	12,234
Industrial			56	67	75	82	89	95	103
Steam-Electric			0	0	0	0	0	0	0
Irrigation			56,422	54,450	52,179	50,005	47,922	45,927	44,015
Mining			118	130	135	137	139	141	143
Livestock			1,298	1,298	1,298	1,298	1,298	1,298	1,298
Total County Demand			64,510	63,521	62,347	61,178	59,958	58,856	57,793
Total Medina County Supply									

Table C-16 Projected Water Demands, Supplies, and Needs Medina County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal			5,905	5,905	5,905	5,905	5,905	5,905	5,905
Industrial			745	745	745	745	745	745	745
Steam-Electric			0	0	0	0	0	0	0
Irrigation			54,532	54,420	54,292	54,168	54,050	53,937	53,829
Mining			118	130	135	137	139	141	143
Livestock			1,298	1,298	1,298	1,298	1,298	1,298	1,298
Total County Supply			62,598	62,498	62,375	62,253	62,137	62,026	61,920

Table C-16 Projected Water Demands, Supplies, and Needs Medina County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Medina County Surplus/Shortage								
Municipal		-711	-1,671	-2,755	-3,751	-4,605	-5,490	-6,329
Industrial		689	678	670	663	656	650	642
Steam-Electric		0	0	0	0	0	0	0
Irrigation		-1,890	-30	2,113	4,163	6,128	8,010	9,814
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		-1,912	-1,023	28	1,075	2,179	3,170	4,127
Total Basin Demand								
Nueces								
Municipal		5,050	5,749	6,549	7,280	7,905	8,562	9,181
Industrial		56	67	75	82	89	95	103
Steam-Electric		0	0	0	0	0	0	0
Irrigation		47,000	45,357	43,465	41,654	39,919	38,257	36,665
Mining		62	68	71	72	73	74	75
Livestock		1,116	1,116	1,116	1,116	1,116	1,116	1,116
Total Nueces Basin Demand		53,284	52,357	51,276	50,204	49,102	48,104	47,140
San Antonio								
Municipal		1,566	1,827	2,111	2,376	2,605	2,833	3,053
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		9,422	9,093	8,714	8,351	8,003	7,670	7,350
Mining		56	62	64	65	66	67	68
Livestock		182	182	182	182	182	182	182
Total San Antonio Basin Demand		11,226	11,164	11,071	10,974	10,856	10,752	10,653
Total Basin Supply								
Nueces								
Municipal		4,921	4,921	4,921	4,921	4,921	4,921	4,921
Industrial		546	546	546	546	546	546	546
Steam-Electric		0	0	0	0	0	0	0
Irrigation		40,818	40,706	40,578	40,454	40,336	40,223	40,115
Mining		62	68	71	72	73	74	75
Livestock		1,116	1,116	1,116	1,116	1,116	1,116	1,116
Total Nueces Basin Supply		47,463	47,357	47,232	47,109	46,992	46,880	46,773
San Antonio								
Municipal		984	984	984	984	984	984	984
Industrial		199	199	199	199	199	199	199
Steam-Electric		0	0	0	0	0	0	0
Irrigation		13,714	13,714	13,714	13,714	13,714	13,714	13,714
Mining		56	62	64	65	66	67	68
Livestock		182	182	182	182	182	182	182
Total San Antonio Basin Supply		15,135	15,141	15,143	15,144	15,145	15,146	15,147
Total Basin Surplus/Shortage								
Nueces								
Municipal		-129	-828	-1,628	-2,359	-2,984	-3,641	-4,260
Industrial		490	479	471	464	457	451	443
Steam-Electric		0	0	0	0	0	0	0
Irrigation		-6,182	-4,651	-2,887	-1,200	417	1,966	3,450
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage		-5,821	-5,000	-4,044	-3,095	-2,110	-1,224	-367

Table C-16 Projected Water Demands, Supplies, and Needs Medina County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio									
Municipal			-582	-843	-1,127	-1,392	-1,621	-1,849	-2,069
Industrial			199	199	199	199	199	199	199
Steam-Electric			0	0	0	0	0	0	0
Irrigation			4,292	4,621	5,000	5,363	5,711	6,044	6,364
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total San Antonio Basin Surplus/Shortage			3,909	3,977	4,072	4,170	4,289	4,394	4,494
Groundwater Supplies									
	Available								
	Nueces	Edwards	41,150	41,150	41,150	41,150	41,150	41,150	41,150
	San Antonio	Edwards	14,813	14,813	14,813	14,813	14,813	14,813	14,813
	Nueces	Carrizo	6,946	6,946	6,946	6,946	6,946	6,946	6,946
	San Antonio	Carrizo	20	20	20	20	20	20	20
	Nueces	Trinity	714	714	714	714	714	714	714
	San Antonio	Trinity	146	146	146	146	146	146	146
	Total Available		63,789	63,789	63,789	63,789	63,789	63,789	63,789
	Allocated								
	Nueces	Edwards	41,150	41,150	41,150	41,150	41,150	41,150	41,150
	San Antonio	Edwards	14,813	14,813	14,813	14,813	14,813	14,813	14,813
	Nueces	Carrizo	6,582	6,474	6,347	6,225	6,107	5,995	5,887
	San Antonio	Carrizo	20	20	20	20	20	20	20
	Nueces	Trinity	116	118	119	120	120	121	121
	San Antonio	Trinity	79	85	87	88	89	90	91
	Total Allocated		62,760	62,661	62,537	62,416	62,300	62,189	62,082
	Total Unallocated		1,029	1,128	1,252	1,373	1,489	1,600	1,707

Note:

[1] The projected irrigation demand for Medina County does not include conveyance losses of surface water from the BMA canal system between the diversion points and the irrigated farms. Pursuant to TWDB guidelines for regional water planning, supplies from the Medina Lake System are not included because they are not reliable during severe drought.

[2] There is limited supply from the Edwards Aquifer permitted for D&L; however, these values are not part of the 340,000 acft/yr allocated to other uses.

Table C-17									
Projected Water Demands, Supplies, and Needs									
Refugio County									
South Central Texas Region									
			Total in	**Projections**					
Basin		**Source**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
			(acft)	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**	**(acft)**
Municipal Demand									
San Antonio Basin									
Rural			8	7	6	6	5	5	5
	Subtotal		8	7	6	6	5	5	5
San Antonio-Nueces Coastal Basin									
Refugio			557	645	709	723	763	787	777
Woodsboro			272	283	291	289	292	295	293
Rural			354	314	281	264	239	225	227
	Subtotal		1,183	1,242	1,281	1,276	1,294	1,307	1,297
Total Municipal Demand			1,191	1,249	1,287	1,282	1,299	1,312	1,302
Municipal Existing Supply									
San Antonio Basin									
Rural		Gulf Coast	10	10	10	10	10	10	10
	Subtotal		10	10	10	10	10	10	10
San Antonio-Nueces Coastal Basin									
Refugio		Gulf Coast	1,512	1,512	1,512	1,512	1,512	1,512	1,512
Woodsboro		Gulf Coast	710	710	710	710	710	710	710
Rural		Gulf Coast	443	443	443	443	443	443	443
	Subtotal		2,665	2,665	2,665	2,665	2,665	2,665	2,665
Total Municipal Existing Supply			2,675	2,675	2,675	2,675	2,675	2,675	2,675
Municipal Surplus/Shortage									
San Antonio Basin									
Rural			2	3	4	4	5	5	5
	Subtotal		2	3	4	4	5	5	5
San Antonio-Nueces Coastal Basin									
Refugio			955	867	803	789	749	725	735
Woodsboro			438	427	419	421	418	415	417
Rural			89	129	162	179	204	218	216
	Subtotal		1,482	1,423	1,384	1,389	1,371	1,358	1,368
Total Municipal Surplus/Shortage			1,484	1,426	1,388	1,393	1,376	1,363	1,373
Municipal New Supply Need									
San Antonio Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
San Antonio-Nueces Coastal Basin									
Refugio			0	0	0	0	0	0	0
Woodsboro			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Industrial Demand			0	0	0	0	0	0	0

Table C-17 Projected Water Demands, Supplies, and Needs Refugio County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial Existing Supply								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Industrial Existing Supply		0	0	0	0	0	0	0
Industrial Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Industrial Surplus/Shortage		0	0	0	0	0	0	0
Industrial New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0
Steam-Electric Demand								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		850	69	69	69	69	69	69
Total Irrigation Demand		850	69	69	69	69	69	69
Irrigation Supply								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin	Gulf Coast	850	69	69	69	69	69	69
Total Irrigation Supply		850	69	69	69	69	69	69
Irrigation Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage		0	0	0	0	0	0	0
Irrigation New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
San Antonio-Nueces Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0

Table C-17
Projected Water Demands, Supplies, and Needs
Refugio County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Mining Demand									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			6	7	8	8	8	8	8
Total Mining Demand			6	7	8	8	8	8	8
Mining Supply									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin		Gulf Coast	6	7	8	8	8	8	8
Total Mining Supply			6	7	8	8	8	8	8
Mining Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
San Antonio Basin			25	25	25	25	25	25	25
San Antonio-Nueces Basin			598	598	598	598	598	598	598
Total Livestock Demand			623	623	623	623	623	623	623
Livestock Supply									
San Antonio Basin		Gulf Coast	12	12	12	12	12	12	12
		Local	13	13	13	13	13	13	13
	Subtotal		25	25	25	25	25	25	25
San Antonio-Nueces Basin		Gulf Coast	299	299	299	299	299	299	299
		Local	299	299	299	299	299	299	299
	Subtotal		598	598	598	598	598	598	598
Total Livestock Supply			623	623	623	623	623	623	623
Livestock Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
San Antonio-Nueces Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Refugio County Demand									
Municipal			1,191	1,249	1,287	1,282	1,299	1,312	1,302
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			850	69	69	69	69	69	69
Mining			6	7	8	8	8	8	8
Livestock			623	623	623	623	623	623	623
Total County Demand			2,670	1,948	1,987	1,982	1,999	2,012	2,002

Table C-17 Projected Water Demands, Supplies, and Needs Refugio County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Refugio County Supply								
Municipal		2,675	2,675	2,675	2,675	2,675	2,675	2,675
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		850	69	69	69	69	69	69
Mining		6	7	8	8	8	8	8
Livestock		623	623	623	623	623	623	623
Total County Supply		4,154	3,374	3,375	3,375	3,375	3,375	3,375
Total Refugio County Surplus/Shortage								
Municipal		1,484	1,426	1,388	1,393	1,376	1,363	1,373
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		1,484	1,426	1,388	1,393	1,376	1,363	1,373
Total Basin Demand								
San Antonio								
Municipal		8	7	6	6	5	5	5
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		25	25	25	25	25	25	25
Total San Antonio Basin Demand		33	32	31	31	30	30	30
San Antonio-Nueces								
Municipal		1,183	1,242	1,281	1,276	1,294	1,307	1,297
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		850	69	69	69	69	69	69
Mining		6	7	8	8	8	8	8
Livestock		598	598	598	598	598	598	598
Total San Antonio-Nueces Basin Demand		2,637	1,916	1,956	1,951	1,969	1,982	1,972
Total Basin Supply								
San Antonio								
Municipal		10	10	10	10	10	10	10
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Mining		0	0	0	0	0	0	0
Livestock		25	25	25	25	25	25	25
Unallocated Groundwater Supply		1,939	1,939	1,939	1,939	1,939	1,939	1,939
Total San Antonio Basin Supply		1,974	1,974	1,974	1,974	1,974	1,974	1,974

Table C-17 Projected Water Demands, Supplies, and Needs Refugio County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio-Nueces									
Municipal			2,665	2,665	2,665	2,665	2,665	2,665	2,665
Industrial			850	69	69	69	69	69	69
Steam-Electric			0	0	0	0	0	0	0
Irrigation			850	69	69	69	69	69	69
Mining			6	7	8	8	8	8	8
Livestock			598	598	598	598	598	598	598
Unallocated Groundwater Supply			36,540	37,320	37,319	37,319	37,319	37,319	37,319
Total San Antonio-Nueces Basin Supply			41,509	40,728	40,728	40,728	40,728	40,728	40,728
Total Basin Surplus/Shortage									
San Antonio									
Municipal			2	3	4	4	5	5	5
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			1,939	1,939	1,939	1,939	1,939	1,939	1,939
Total San Antonio Basin Surplus/Shortage			1,941	1,942	1,943	1,943	1,944	1,944	1,944
San Antonio-Nueces									
Municipal			1,482	1,423	1,384	1,389	1,371	1,358	1,368
Industrial			850	69	69	69	69	69	69
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			36,540	37,320	37,319	37,319	37,319	37,319	37,319
Total San Antonio Basin-Nueces Surplus/Shortage			38,872	38,812	38,772	38,777	38,759	38,746	38,756
Groundwater Supplies									
	Available								
	San Antonio	Gulf Coast	1,961	1,961	1,961	1,961	1,961	1,961	1,961
	San Antonio-Nueces	Gulf Coast	40,359	40,359	40,359	40,359	40,359	40,359	40,359
	Total Available		42,320	42,320	42,320	42,320	42,320	42,320	42,320
	Allocated								
	San Antonio	Gulf Coast	22	22	22	22	22	22	22
	San Antonio-Nueces	Gulf Coast	3,820	3,040	3,041	3,041	3,041	3,041	3,041
	Total Allocated		3,842	3,062	3,063	3,063	3,063	3,063	3,063
	Total Unallocated		38,479	39,259	39,258	39,258	39,258	39,258	39,258

Table C-18
Projected Water Demands, Supplies, and Needs
Uvalde County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Nueces Basin									
Sabinal			412	407	403	398	393	389	389
Uvalde			6,070	6,087	6,124	6,144	6,148	6,150	6,178
Rural			1,286	1,572	1,867	2,110	2,305	2,425	2,532
	Subtotal		7,768	8,066	8,394	8,652	8,846	8,964	9,099
Total Municipal Demand			7,768	8,066	8,394	8,652	8,846	8,964	9,099
Municipal Existing Supply									
Nueces Basin									
Sabinal		Edwards	268	268	268	268	268	268	268
Uvalde		Edwards	2,294	2,294	2,294	2,294	2,294	2,294	2,294
Rural		Edwards	131	131	131	131	131	131	131
		Carrizo	2,401	2,401	2,401	2,401	2,401	2,401	2,401
Rural Subtotal			2,532	2,532	2,532	2,532	2,532	2,532	2,532
	Subtotal		5,094	5,094	5,094	5,094	5,094	5,094	5,094
Total Municipal Existing Supply			5,094	5,094	5,094	5,094	5,094	5,094	5,094
Municipal Surplus/Shortage									
Nueces Basin									
Sabinal			-144	-139	-135	-130	-125	-121	-121
Uvalde			-3,776	-3,793	-3,830	-3,850	-3,854	-3,856	-3,884
Rural			1,246	960	665	422	227	107	0
	Subtotal		-2,674	-2,972	-3,300	-3,558	-3,752	-3,870	-4,005
Total Municipal Surplus/Shortage			-2,674	-2,972	-3,300	-3,558	-3,752	-3,870	-4,005
Municipal New Supply Need									
Nueces Basin									
Sabinal			144	139	135	130	125	121	121
Uvalde			3,776	3,793	3,830	3,850	3,854	3,856	3,884
Rural			0	0	0	0	0	0	0
	Subtotal		3,920	3,932	3,965	3,980	3,979	3,977	4,005
Total Municipal New Supply Need			3,920	3,932	3,965	3,980	3,979	3,977	4,005
Industrial Demand									
Nueces Basin			378	432	455	473	490	505	538
Total Industrial Demand			378	432	455	473	490	505	538
Industrial Existing Supply									
Nueces Basin		Edwards	1,160	1,160	1,160	1,160	1,160	1,160	1,160
Total Industrial Existing Supply			1,160	1,160	1,160	1,160	1,160	1,160	1,160
Industrial Surplus/Shortage									
Nueces Basin			782	728	705	687	670	655	622
Total Industrial Surplus/Shortage			782	728	705	687	670	655	622
Industrial New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0

Table C-18 Projected Water Demands, Supplies, and Needs Uvalde County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Steam-Electric Demand								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Nueces Basin		58,061	55,791	53,609	51,513	49,498	47,563	45,703
Total Irrigation Demand		58,061	55,791	53,609	51,513	49,498	47,563	45,703
Irrigation Supply								
Nueces Basin	Edwards	78,816	78,816	78,816	78,816	78,816	78,816	78,816
	Run-of-River	1,231	1,231	1,231	1,231	1,231	1,231	1,231
Total Irrigation Supply		80,047	80,047	80,047	80,047	80,047	80,047	80,047
Irrigation Surplus/Shortage								
Nueces Basin		21,986	24,256	26,438	28,534	30,549	32,484	34,344
Total Irrigation Surplus/Shortage		21,986	24,256	26,438	28,534	30,549	32,484	34,344
Irrigation New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0
Mining Demand								
Nueces Basin		250	313	345	364	383	401	418
Total Mining Demand		250	313	345	364	383	401	418
Mining Supply								
Nueces Basin	Carrizo	250	313	345	364	383	401	418
Total Mining Supply		250	313	345	364	383	401	418
Mining Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		0	0	0	0	0	0	0
Mining New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0
Livestock Demand								
Nueces Basin		1,284	1,284	1,284	1,284	1,284	1,284	1,284
Total Livestock Demand		1,284	1,284	1,284	1,284	1,284	1,284	1,284

Table C-18 Projected Water Demands, Supplies, and Needs Uvalde County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock Supply									
Nueces Basin		Carrizo	27	27	27	27	27	27	27
		Edwards-Trinity	430	430	430	430	430	430	430
		Trinity	12	12	12	12	12	12	12
		Edwards[1]	173	173	173	173	173	173	173
		Local	642	642	642	642	642	642	642
Total Livestock Supply			1,284	1,284	1,284	1,284	1,284	1,284	1,284
Livestock Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Uvalde County Demand									
Municipal			7,768	8,066	8,394	8,652	8,846	8,964	9,099
Industrial			378	432	455	473	490	505	538
Steam-Electric			0	0	0	0	0	0	0
Irrigation			58,061	55,791	53,609	51,513	49,498	47,563	45,703
Mining			250	313	345	364	383	401	418
Livestock			1,284	1,284	1,284	1,284	1,284	1,284	1,284
Total County Demand			67,741	65,886	64,087	62,286	60,501	58,717	57,042
Total Uvalde County Supply									
Municipal			5,094	5,094	5,094	5,094	5,094	5,094	5,094
Industrial			1,160	1,160	1,160	1,160	1,160	1,160	1,160
Steam-Electric			0	0	0	0	0	0	0
Irrigation			80,047	80,047	80,047	80,047	80,047	80,047	80,047
Mining			250	313	345	364	383	401	418
Livestock			1,284	1,284	1,284	1,284	1,284	1,284	1,284
Total County Supply			87,835	87,898	87,930	87,949	87,968	87,986	88,003
Total Uvalde County Surplus/Shortage									
Municipal			-2,674	-2,972	-3,300	-3,558	-3,752	-3,870	-4,005
Industrial			782	728	705	687	670	655	622
Steam-Electric			0	0	0	0	0	0	0
Irrigation			21,986	24,256	26,438	28,534	30,549	32,484	34,344
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			20,094	22,012	23,843	25,663	27,467	29,269	30,961
Total Basin Demand									
Nueces									
Municipal			7,768	8,066	8,394	8,652	8,846	8,964	9,099
Industrial			378	432	455	473	490	505	538
Steam-Electric			0	0	0	0	0	0	0
Irrigation			58,061	55,791	53,609	51,513	49,498	47,563	45,703
Mining			250	313	345	364	383	401	418
Livestock			1,284	1,284	1,284	1,284	1,284	1,284	1,284
Total Nueces Basin Demand			67,741	65,886	64,087	62,286	60,501	58,717	57,042

Table C-18 Projected Water Demands, Supplies, and Needs Uvalde County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Total Basin Supply									
Nueces									
Municipal			5,094	5,094	5,094	5,094	5,094	5,094	5,094
Industrial			1,160	1,160	1,160	1,160	1,160	1,160	1,160
Steam-Electric			0	0	0	0	0	0	0
Irrigation			80,047	80,047	80,047	80,047	80,047	80,047	80,047
Mining			250	313	345	364	383	401	418
Livestock			1,284	1,284	1,284	1,284	1,284	1,284	1,284
Total Nueces Basin Supply			87,835	87,898	87,930	87,949	87,968	87,986	88,003
Total Basin Surplus/Shortage									
Nueces									
Municipal			-2,674	-2,972	-3,300	-3,558	-3,752	-3,870	-4,005
Industrial			782	728	705	687	670	655	622
Steam-Electric			0	0	0	0	0	0	0
Irrigation			21,986	24,256	26,438	28,534	30,549	32,484	34,344
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage			20,094	22,012	23,843	25,663	27,467	29,269	30,961
Groundwater Supplies									
	Available								
	Nueces	Edwards	82,669	82,669	82,669	82,669	82,669	82,669	82,669
	Nueces	Carrizo	27,093	27,093	27,093	27,093	27,093	27,093	27,093
	Nueces	Edwards-Trinity	3,185	3,185	3,185	3,185	3,185	3,185	3,185
	Nueces	Trinity	580	580	580	580	580	476	476
	Total Available		113,527	113,527	113,527	113,527	113,527	113,423	113,423
	Allocated								
	Nueces	Edwards	82,669	82,669	82,669	82,669	82,669	82,669	82,669
	Nueces	Carrizo	2,678	2,678	2,678	2,678	2,678	2,678	2,678
	Nueces	Edwards-Trinity	430	430	430	430	430	430	430
	Nueces	Trinity	12	12	12	12	12	12	12
	Total Allocated		85,789	85,789	85,789	85,789	85,789	85,789	85,789
	Total Unallocated		27,738	27,738	27,738	27,738	27,738	27,634	27,634

Notes:

[1] There is limited supply from the Edwards Aquifer permitted for D&L; however, these values are not part of the 340,000 acft/yr allocated to other uses

Table C-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
San Antonio Basin									
Rural			5	5	6	7	7	7	7
	Subtotal		5	5	6	7	7	7	7
Guadalupe Basin									
Victoria			7,573	8,013	8,505	8,860	9,092	9,361	9,650
Rural			1,365	1,520	1,686	1,821	1,912	1,998	2,095
	Subtotal		8,938	9,533	10,191	10,681	11,004	11,359	11,745
Lavaca Basin									
Rural			5	5	6	6	7	7	7
	Subtotal		5	5	6	6	7	7	7
Lavaca-Guadalupe Coastal Basin									
Victoria			3,696	3,911	4,151	4,324	4,438	4,569	4,710
Rural			1,020	1,136	1,260	1,360	1,428	1,493	1,565
	Subtotal		4,716	5,047	5,411	5,684	5,866	6,062	6,275
Total Municipal Demand			13,664	14,590	15,614	16,378	16,884	17,435	18,034
Municipal Existing Supply									
San Antonio Basin									
Rural		Gulf Coast	7	7	7	7	7	7	7
	Subtotal		7	7	7	7	7	7	7
Guadalupe Basin									
Victoria		Gulf Coast	8,031	8,031	8,031	8,031	8,031	8,031	8,031
		Run-of-River (GBRA)	831	831	831	831	831	831	831
		Run-of-River	1,002	1,002	1,002	1,002	1,002	1,002	1,002
Victoria Subtotal			9,864	9,864	9,864	9,864	9,864	9,864	9,864
Rural		Gulf Coast	2,095	2,095	2,095	2,095	2,095	2,095	2,095
	Subtotal		11,959	11,959	11,959	11,959	11,959	11,959	11,959
Lavaca Basin									
Rural		Gulf Coast	7	7	7	7	7	7	7
	Subtotal		7	7	7	7	7	7	7
Lavaca-Guadalupe Coastal Basin									
Victoria		Gulf Coast	6,827	6,827	6,827	6,827	6,827	6,827	6,827
		Run-of-River (GBRA)	409	409	409	409	409	409	409
		Run-of-River	494	494	494	494	494	494	494
Victoria Subtotal			7,730	7,730	7,730	7,730	7,730	7,730	7,730
Rural		Gulf Coast	1,565	1,565	1,565	1,565	1,565	1,565	1,565
	Subtotal		9,295	9,295	9,295	9,295	9,295	9,295	9,295
Total Municipal Existing Supply			21,268	21,268	21,268	21,268	21,268	21,268	21,268
Municipal Surplus/Shortage									
San Antonio Basin									
Rural			2	2	1	0	0	0	0
	Subtotal		2	2	1	0	0	0	0
Guadalupe Basin									
Victoria			2,291	1,851	1,359	1,004	772	503	214
Rural			730	575	409	274	183	97	0
	Subtotal		3,021	2,426	1,768	1,278	955	600	214
Lavaca Basin									
Rural			2	2	1	1	0	0	0
	Subtotal		2	2	1	1	0	0	0

Table C-19 Projected Water Demands, Supplies, and Needs Victoria County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Lavaca-Guadalupe Coastal Basin									
Victoria			4,034	3,819	3,579	3,406	3,292	3,161	3,020
Rural			545	429	305	205	137	72	0
	Subtotal		4,579	4,248	3,884	3,611	3,429	3,233	3,020
Total Municipal Surplus/Shortage			7,604	6,678	5,654	4,890	4,384	3,833	3,234
Municipal New Supply Need									
San Antonio Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Guadalupe Basin									
Victoria			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Lavaca Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin									
Victoria			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			24,323	28,726	32,095	35,035	37,962	40,578	43,520
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial Demand			24,323	28,726	32,095	35,035	37,962	40,578	43,520
Industrial Existing Supply									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin		Run-of-River	35,942	35,942	35,942	35,942	35,942	35,942	35,942
		Gulf Coast	1,012	1,012	1,012	1,012	1,012	1,012	1,012
Guadalupe Basin Subtotal			36,954	36,954	36,954	36,954	36,954	36,954	36,954
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			36,954	36,954	36,954	36,954	36,954	36,954	36,954
Industrial Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			12,631	8,228	4,859	1,919	-1,008	-3,624	-6,566
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial Surplus/Shortage			12,631	8,228	4,859	1,919	-1,008	-3,624	-6,566
Industrial New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	1,008	3,624	6,566
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	1,008	3,624	6,566
Steam-Electric Demand									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			2,197	2,026	1,741	2,035	2,394	2,832	3,365
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Steam-Electric Demand			2,197	2,026	1,741	2,035	2,394	2,832	3,365

Table C-19 Projected Water Demands, Supplies, and Needs Victoria County South Central Texas Region								
		Total in	Projections					
Basin	Source	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Steam-Electric Existing Supply								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin	Run-of-River	1,159	1,159	1,159	1,159	1,159	1,159	1,159
	Gulf Coast	2,467	2,467	2,467	2,467	2,467	2,467	2,467
Guadalupe Basin Subtotal		3,626	3,626	3,626	3,626	3,626	3,626	3,626
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		3,626	3,626	3,626	3,626	3,626	3,626	3,626
Steam-Electric Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		1,429	1,600	1,885	1,591	1,232	794	261
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		1,429	1,600	1,885	1,591	1,232	794	261
Steam-Electric New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		979	1,450	1,253	1,081	932	805	695
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		5,729	8,486	7,323	6,321	5,456	4,709	4,064
Total Irrigation Demand		6,708	9,936	8,576	7,402	6,388	5,514	4,759
Irrigation Supply								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin	Run-of-River	1,407	1,407	1,407	1,407	1,407	1,407	1,407
	Gulf Coast	343	508	439	378	326	282	243
Guadalupe Basin Subtotal		1,750	1,915	1,846	1,785	1,733	1,689	1,650
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin	Gulf Coast	5,729	8,486	7,323	6,321	5,456	4,709	4,064
Total Irrigation Supply		7,479	10,401	9,169	8,106	7,189	6,398	5,714
Irrigation Surplus/Shortage								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		771	465	593	704	801	884	955
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage		771	465	593	704	801	884	955
Irrigation New Supply Need								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		0	0	0	0	0	0	0
Total Irrigation New Supply Need		0	0	0	0	0	0	0
Mining Demand								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		2,267	2,965	3,391	3,688	3,990	4,301	4,541
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin		748	979	1,120	1,218	1,318	1,420	1,500
Total Mining Demand		3,015	3,944	4,511	4,906	5,308	5,721	6,041
Mining Supply								
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin	Gulf Coast	2,267	2,965	3,391	3,688	3,990	4,301	4,541
Lavaca Basin		0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin	Gulf Coast	748	979	1,120	1,218	1,318	1,420	1,500
Total Mining Supply		3,015	3,944	4,511	4,906	5,308	5,721	6,041

Table C-19 Projected Water Demands, Supplies, and Needs Victoria County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Mining Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
San Antonio Basin			61	61	61	61	61	61	61
Guadalupe Basin			507	507	507	507	507	507	507
Lavaca Basin			5	5	5	5	5	5	5
Lavaca-Guadalupe Coastal Basin			512	512	512	512	512	512	512
Total Livestock Demand			1,085	1,085	1,085	1,085	1,085	1,085	1,085
Livestock Supply									
San Antonio Basin		Gulf Coast	30	30	30	30	30	30	30
		Local	31	31	31	31	31	31	31
	Subtotal		61	61	61	61	61	61	61
Guadalupe Basin		Gulf Coast	253	253	253	253	253	253	253
		Local	254	254	254	254	254	254	254
	Subtotal		507	507	507	507	507	507	507
Lavaca Basin		Gulf Coast	2	2	2	2	2	2	2
		Local	3	3	3	3	3	3	3
	Subtotal		5	5	5	5	5	5	5
Lavaca-Guadalupe Coastal Basin		Gulf Coast	256	256	256	256	256	256	256
		Local	256	256	256	256	256	256	256
	Subtotal		512	512	512	512	512	512	512
Total Livestock Supply			1,085	1,085	1,085	1,085	1,085	1,085	1,085
Livestock Surplus/Shortage									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0
Livestock New Supply Need									
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Lavaca Basin			0	0	0	0	0	0	0
Lavaca-Guadalupe Coastal Basin			0	0	0	0	0	0	0
Total Livestock New Supply Need			0	0	0	0	0	0	0
Total Victoria County Demand									
Municipal			13,664	14,590	15,614	16,378	16,884	17,435	18,034
Industrial			24,323	28,726	32,095	35,035	37,962	40,578	43,520
Steam-Electric			2,197	2,026	1,741	2,035	2,394	2,832	3,365
Irrigation			6,708	9,936	8,576	7,402	6,388	5,514	4,759
Mining			3,015	3,944	4,511	4,906	5,308	5,721	6,041
Livestock			1,085	1,085	1,085	1,085	1,085	1,085	1,085
Total County Demand			50,992	60,307	63,622	66,841	70,021	73,165	76,804
Total Victoria County Supply									
Municipal			21,268	21,268	21,268	21,268	21,268	21,268	21,268
Industrial			36,954	36,954	36,954	36,954	36,954	36,954	36,954
Steam-Electric			3,626	3,626	3,626	3,626	3,626	3,626	3,626
Irrigation			7,479	10,401	9,169	8,106	7,189	6,398	5,714
Mining			3,015	3,944	4,511	4,906	5,308	5,721	6,041
Livestock			1,085	1,085	1,085	1,085	1,085	1,085	1,085
Total County Supply			73,427	77,278	76,613	75,945	75,430	75,052	74,688
Total Victoria County Surplus/Shortage									

Table C-19 Projected Water Demands, Supplies, and Needs Victoria County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal			7,604	6,678	5,654	4,890	4,384	3,833	3,234
Industrial			12,631	8,228	4,859	1,919	-1,008	-3,624	-6,566
Steam-Electric			1,429	1,600	1,885	1,591	1,232	794	261
Irrigation			771	465	593	704	801	884	955
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total County Surplus/Shortage			22,435	16,971	12,991	9,104	5,409	1,887	-2,116

Table C-19 Projected Water Demands, Supplies, and Needs Victoria County South Central Texas Region									
Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Demand									
San Antonio									
Municipal			5	5	6	7	7	7	7
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			61	61	61	61	61	61	61
Total San Antonio Basin Demand			66	66	67	68	68	68	68
Guadalupe									
Municipal			8,938	9,533	10,191	10,681	11,004	11,359	11,745
Industrial			24,323	28,726	32,095	35,035	37,962	40,578	43,520
Steam-Electric			2,197	2,026	1,741	2,035	2,394	2,832	3,365
Irrigation			979	1,450	1,253	1,081	932	805	695
Mining			2,267	2,965	3,391	3,688	3,990	4,301	4,541
Livestock			507	507	507	507	507	507	507
Total Guadalupe Basin Demand			39,211	45,207	49,178	53,027	56,789	60,382	64,373
Lavaca									
Municipal			5	5	6	6	7	7	7
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			5	5	5	5	5	5	5
Total Lavaca Basin Demand			10	10	11	11	12	12	12
Lavaca-Guadalupe									
Municipal			4,716	5,047	5,411	5,684	5,866	6,062	6,275
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			5,729	8,486	7,323	6,321	5,456	4,709	4,064
Mining			748	979	1,120	1,218	1,318	1,420	1,500
Livestock			512	512	512	512	512	512	512
Total Lavaca-Guadalupe Basin Demand			11,705	15,024	14,366	13,735	13,152	12,703	12,351
Total Basin Supply									
San Antonio									
Municipal			7	7	7	7	7	7	7
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			61	61	61	61	61	61	61
Unallocated Groundwater Supply			1,763	1,763	1,763	1,763	1,763	1,763	1,763
Total San Antonio Basin Supply			1,831	1,831	1,831	1,831	1,831	1,831	1,831
Guadalupe									
Municipal			11,959	11,959	11,959	11,959	11,959	11,959	11,959
Industrial			36,954	36,954	36,954	36,954	36,954	36,954	36,954
Steam-Electric			3,626	3,626	3,626	3,626	3,626	3,626	3,626
Irrigation			1,750	1,915	1,846	1,785	1,733	1,689	1,650
Mining			2,267	2,965	3,391	3,688	3,990	4,301	4,541
Livestock			507	507	507	507	507	507	507
Unallocated Groundwater Supply			2,202	1,339	982	745	495	228	27
Total Guadalupe Basin Supply			59,265	59,265	59,265	59,264	59,264	59,265	59,264
Lavaca									
Municipal			7	7	7	7	7	7	7
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			5	5	5	5	5	5	5
Unallocated Groundwater Supply			262	262	262	262	262	262	262
Total Lavaca Basin Supply			274	274	274	274	274	274	274

Table C-19
Projected Water Demands, Supplies, and Needs
Victoria County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lavaca-Guadalupe									
Municipal			9,295	9,295	9,295	9,295	9,295	9,295	9,295
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			5,729	8,486	7,323	6,321	5,456	4,709	4,064
Mining			748	979	1,120	1,218	1,318	1,420	1,500
Livestock			512	512	512	512	512	512	512
Unallocated Groundwater Supply			5,264	2,276	3,298	4,202	4,967	5,612	6,177
Total Lavaca-Guadalupe Basin Supply			21,548	21,548	21,548	21,548	21,548	21,548	21,548
Total Basin Surplus/Shortage									
San Antonio									
Municipal			2	2	1	0	0	0	0
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			1,763	1,763	1,763	1,763	1,763	1,763	1,763
Total San Antonio Basin Surplus/Shortage			1,765	1,765	1,764	1,763	1,763	1,763	1,763
Guadalupe									
Municipal			3,021	2,426	1,768	1,278	955	600	214
Industrial			12,631	8,228	4,859	1,919	-1,008	-3,624	-6,566
Steam-Electric			1,429	1,600	1,885	1,591	1,232	794	261
Irrigation			771	465	593	704	801	884	955
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			2,202	1,339	982	745	495	228	27
Total Guadalupe Basin Surplus/Shortage			20,054	14,058	10,087	6,237	2,475	-1,117	-5,109
Lavaca									
Municipal			2	2	1	1	0	0	0
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			262	262	262	262	262	262	262
Total Lavaca Basin Surplus/Shortage			264	264	263	263	262	262	262
Lavaca-Guadalupe									
Municipal			4,579	4,248	3,884	3,611	3,429	3,233	3,020
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			5,264	2,276	3,298	4,202	4,967	5,612	6,177
Total Lavaca-Guadalupe Basin Surplus/Shortage			9,843	6,524	7,182	7,813	8,396	8,845	9,197
Groundwater Supplies									
	Available								
	Guadalupe	Gulf Coast	18,669	18,669	18,669	18,669	18,669	18,669	18,669
	Lavaca	Gulf Coast	271	271	271	271	271	271	271
	Lavaca-Guadalupe	Gulf Coast	20,389	20,389	20,389	20,389	20,389	20,389	20,389
	San Antonio	Gulf Coast	1,800	1,800	1,800	1,800	1,800	1,800	1,800
	Total Available		41,129	41,129	41,129	41,129	41,129	41,129	41,129
	Allocated								
	Guadalupe	Gulf Coast	16,467	17,330	17,687	17,924	18,174	18,441	18,642
	Lavaca	Gulf Coast	9	9	9	9	9	9	9
	Lavaca-Guadalupe	Gulf Coast	15,125	18,113	17,091	16,187	15,422	14,777	14,212
	San Antonio	Gulf Coast	37	37	37	37	37	37	37
	Total Allocated		31,638	35,489	34,824	34,157	33,642	33,264	32,900
	Total Unallocated		9,491	5,640	6,305	6,972	7,487	7,865	8,229

Table C-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Municipal Demand									
Nueces Basin									
McCoy WSC			25	41	61	82	102	124	147
Rural			31	42	56	72	86	103	120
	Subtotal		56	83	117	154	188	227	267
San Antonio Basin									
East Central SUD			89	104	124	146	169	194	222
El Oso WSC			45	52	62	71	81	91	102
Floresville			1,203	1,805	2,011	2,245	2,475	2,726	3,000
La Vernia			206	278	367	464	557	658	764
Oak Hills WSC			479	693	960	1,251	1,536	1,843	2,160
Poth			315	348	389	434	480	530	585
SS WSC			1,072	1,563	2,204	2,886	3,554	4,279	5,030
Stockdale			321	350	386	426	466	510	558
Sunko WSC			465	564	691	826	965	1,107	1,262
Rural			542	539	770	1,027	1,269	1,533	1,807
	Subtotal		4,737	6,296	7,964	9,776	11,552	13,471	15,490
Guadalupe Basin									
Rural			20	28	37	47	57	68	79
	Subtotal		20	28	37	47	57	68	79
Total Municipal Demand			4,813	6,407	8,118	9,977	11,797	13,766	15,836
Municipal Existing Supply									
Nueces Basin									
McCoy WSC		Carrizo	21	19	19	20	20	21	21
Rural		Carrizo	119	120	120	120	120	120	120
	Subtotal		140	139	139	140	140	141	141
San Antonio Basin									
East Central SUD		Canyon (CRWA)	106	106	23	23	23	23	23
		Carrizo (Springs Hill/CRWA)	29	29	29	29	29	29	29
		Edwards (SAWS)	85	0	0	0	0	0	0
		Edwards (BMWD)	91	91	91	91	91	91	91
East Central WSC Subtotal			312	227	143	143	143	143	143
El Oso WSC		Carrizo (Karnes)	102	102	102	102	102	102	102
Floresville		Carrizo	2,589	2,589	2,589	2,589	2,589	2,589	2,589
La Vernia		Carrizo	250	250	250	250	250	250	250
		Carrizo (Guadalupe) - SH/CRWA	400	400	400	400	400	400	400
La Vernia Subtotal			650	650	650	650	650	650	650
Oak Hills WSC		Carrizo	1,170	1,170	1,170	1,170	1,170	1,170	1,170
Poth		Carrizo	1,613	1,613	1,613	1,613	1,613	1,613	1,613
SS WSC		Carrizo	1,340	1,340	1,340	1,340	1,340	1,340	1,340
Stockdale		Carrizo	1,533	1,533	1,533	1,533	1,533	1,533	1,533
Sunko WSC		Carrizo	870	870	870	870	870	870	870
Rural		Carrizo	1,774	1,774	1,774	1,774	1,774	1,774	1,774
		ROR (San Antonio)	33	33	33	33	33	33	33
Rural Subtotal			1,807	1,807	1,807	1,807	1,807	1,807	1,807
	Subtotal		11,986	11,901	11,817	11,817	11,817	11,817	11,817
Guadalupe Basin									
Rural		Carrizo	79	79	79	79	79	79	79
	Subtotal		79	79	79	79	79	79	79
Total Municipal Existing Supply			12,205	12,119	12,035	12,036	12,036	12,037	12,037
Municipal Surplus/Shortage									
Nueces Basin									
McCoy WSC			-4	-22	-42	-62	-82	-103	-126
Rural			88	78	64	48	34	17	0
	Subtotal		84	56	22	-14	-48	-86	-126

Table C-20 Projected Water Demands, Supplies, and Needs Wilson County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
San Antonio Basin									
East Central SUD			223	123	19	-3	-26	-51	-79
El Oso WSC			57	50	40	31	21	11	0
Floresville			1,386	784	578	344	114	-137	-411
La Vernia			444	372	283	186	93	-8	-114
Oak Hills WSC			691	477	210	-81	-366	-673	-990
Poth			1,298	1,265	1,224	1,179	1,133	1,083	1,028
SS WSC			268	-223	-864	-1,546	-2,214	-2,939	-3,690
Stockdale			1,212	1,183	1,147	1,107	1,067	1,023	975
Sunko WSC			405	306	179	44	-95	-237	-392
Rural			1,265	1,268	1,037	780	538	274	0
	Subtotal		7,249	5,605	3,853	2,041	265	-1,654	-3,673
Guadalupe Basin									
Rural			59	51	42	32	22	11	0
	Subtotal		59	51	42	32	22	11	0
Total Municipal Surplus/Shortage			7,392	5,712	3,917	2,059	239	-1,729	-3,799
Municipal New Supply Need									
Nueces Basin									
McCoy WSC			4	22	42	62	82	103	126
Rural			0	0	0	0	0	0	0
	Subtotal		4	22	42	62	82	103	126
San Antonio Basin									
East Central SUD			0	0	0	3	26	51	79
El Oso WSC			0	0	0	0	0	0	0
Floresville			0	0	0	0	0	137	411
La Vernia			0	0	0	0	0	8	114
Oak Hills WSC			0	0	0	81	366	673	990
Poth			0	0	0	0	0	0	0
SS WSC			0	223	864	1,546	2,214	2,939	3,690
Stockdale			0	0	0	0	0	0	0
Sunko WSC			0	0	0	0	95	237	392
Rural			0	0	0	0	0	0	0
	Subtotal		0	223	864	1,630	2,701	4,045	5,676
Guadalupe Basin									
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			4	245	906	1,692	2,783	4,148	5,802
Industrial Demand									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin	,		1	1	1	1	1	1	1
Guadalupe Basin			0	0	0	0	0	0	0
Total Industrial Demand			1	1	1	1	1	1	1
Industrial Existing Supply									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin		Carrizo	1	1	1	1	1	1	1
Guadalupe Basin			0	0	0	0	0	0	0
Total Industrial Existing Supply			1	1	1	1	1	1	1

Table C-20 Projected Water Demands, Supplies, and Needs Wilson County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Industrial Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Industrial Surplus/Shortage		0	0	0	0	0	0	0
Industrial New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Industrial New Supply Need		0	0	0	0	0	0	0
Steam-Electric Demand								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Nueces Basin		5,263	2,847	2,529	2,248	2,001	1,783	1,595
San Antonio Basin		15,474	8,370	7,435	6,610	5,883	5,245	4,691
Guadalupe Basin		146	79	70	63	56	49	44
Total Irrigation Demand		20,883	11,296	10,034	8,921	7,940	7,077	6,330
Irrigation Supply								
Nueces Basin	Carrizo	3,624	1,979	1,758	1,562	1,391	1,239	1,109
	Queen City	1,426	772	685	609	542	483	432
	Sparta	181	100	89	79	70	62	56
Nueces Basin Subtotal		5,231	2,851	2,532	2,250	2,003	1,784	1,597
San Antonio Basin	Carrizo	10,368	5,608	4,981	4,429	3,942	3,514	3,143
	Queen City	1,362	737	654	582	518	462	413
	Sparta	279	151	134	119	106	94	84
	Run-of-River	2,631	2,631	2,631	2,631	2,631	2,631	2,631
San Antonio Basin Subtotal		14,640	9,127	8,400	7,761	7,197	6,701	6,271
Guadalupe Basin	Carrizo	146	79	70	63	56	49	44
Total Irrigation Supply		20,017	12,057	11,002	10,074	9,256	8,534	7,912

Table C-20 Projected Water Demands, Supplies, and Needs Wilson County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Irrigation Surplus/Shortage									
Nueces Basin			-32	4	3	2	2	1	2
San Antonio Basin			-834	757	965	1,151	1,314	1,456	1,580
Guadalupe Basin			0	0	0	0	0	0	0
Total Irrigation Surplus/Shortage			-866	761	968	1,153	1,316	1,457	1,582
Irrigation New Supply Need									
Nueces Basin			32	0	0	0	0	0	0
San Antonio Basin			834	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Irrigation New Supply Need			866	0	0	0	0	0	0
Mining Demand									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			261	228	221	216	212	208	206
Guadalupe Basin			16	14	13	13	13	13	12
Total Mining Demand			277	242	234	229	225	221	218
Mining Supply									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin		Carrizo	261	228	221	216	212	208	206
Guadalupe Basin		Carrizo	16	14	13	13	13	13	12
Total Mining Supply			277	242	234	229	225	221	218
Mining Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Mining Surplus/Shortage			0	0	0	0	0	0	0
Mining New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Mining New Supply Need			0	0	0	0	0	0	0
Livestock Demand									
Nueces Basin			145	145	145	145	145	145	145
San Antonio Basin			1,609	1,609	1,609	1,609	1,609	1,609	1,609
Guadalupe Basin			54	54	54	54	54	54	54
Total Livestock Demand			1,808	1,808	1,808	1,808	1,808	1,808	1,808
Livestock Supply									
Nueces Basin		Carrizo	50	50	50	50	50	50	50
		Queen City	18	18	18	18	18	18	18
		Sparta	4	4	4	4	4	4	4
		Local	73	73	73	73	73	73	73
	Subtotal		145	145	145	145	145	145	145
San Antonio Basin		Carrizo	563	563	563	563	563	563	563
		Queen City	201	201	201	201	201	201	201
		Sparta	40	40	40	40	40	40	40
		Local	805	805	805	805	805	805	805
	Subtotal		1,609	1,609	1,609	1,609	1,609	1,609	1,609
Guadalupe Basin		Carrizo	19	19	19	19	19	19	19
		Queen City	7	7	7	7	7	7	7
		Sparta	1	1	1	1	1	1	1
		Local	27	27	27	27	27	27	27
	Subtotal		54	54	54	54	54	54	54
Total Livestock Supply			1,808	1,808	1,808	1,808	1,808	1,808	1,808
Livestock Surplus/Shortage									
Nueces Basin			0	0	0	0	0	0	0
San Antonio Basin			0	0	0	0	0	0	0
Guadalupe Basin			0	0	0	0	0	0	0
Total Livestock Surplus/Shortage			0	0	0	0	0	0	0

Table C-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
San Antonio Basin		0	0	0	0	0	0	0
Guadalupe Basin		0	0	0	0	0	0	0
Total Livestock New Supply Need		0	0	0	0	0	0	0
Total Wilson County Demand								
Municipal		4,813	6,407	8,118	9,977	11,797	13,766	15,836
Industrial		1	1	1	1	1	1	1
Steam-Electric		0	0	0	0	0	0	0
Irrigation		20,883	11,296	10,034	8,921	7,940	7,077	6,330
Mining		277	242	234	229	225	221	218
Livestock		1,808	1,808	1,808	1,808	1,808	1,808	1,808
Total County Demand		27,782	19,754	20,195	20,936	21,771	22,873	24,193
Total Wilson County Supply								
Municipal		12,205	12,119	12,035	12,036	12,036	12,037	12,037
Industrial		1	1	1	1	1	1	1
Steam-Electric		0	0	0	0	0	0	0
Irrigation		20,017	12,057	11,002	10,074	9,256	8,534	7,912
Mining		277	242	234	229	225	221	218
Livestock		1,808	1,808	1,808	1,808	1,808	1,808	1,808
Total County Supply		34,308	26,227	25,080	24,148	23,326	22,601	21,976
Total Wilson County Surplus/Shortage								
Municipal		7,392	5,712	3,917	2,059	239	-1,729	-3,799
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		-866	761	968	1,153	1,316	1,457	1,582
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		6,526	6,473	4,885	3,212	1,555	-272	-2,217
Total Basin Demand								
Nueces								
Municipal		56	83	117	154	188	227	267
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		5,263	2,847	2,529	2,248	2,001	1,783	1,595
Mining		0	0	0	0	0	0	0
Livestock		145	145	145	145	145	145	145
Total Nueces Basin Demand		5,464	3,075	2,791	2,547	2,334	2,155	2,007
San Antonio								
Municipal		4,737	6,296	7,964	9,776	11,552	13,471	15,490
Industrial		1	1	1	1	1	1	1
Steam-Electric		0	0	0	0	0	0	0
Irrigation		15,474	8,370	7,435	6,610	5,883	5,245	4,691
Mining		261	228	221	216	212	208	206
Livestock		1,609	1,609	1,609	1,609	1,609	1,609	1,609
Total San Antonio Basin Demand		22,082	16,504	17,230	18,212	19,257	20,534	21,997

Table C-20 Projected Water Demands, Supplies, and Needs Wilson County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe								
Municipal		20	28	37	47	57	68	79
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		146	79	70	63	56	49	44
Mining		16	14	13	13	13	13	12
Livestock		54	54	54	54	54	54	54
Total Guadalupe Basin Demand		236	175	174	177	180	184	189
Total Basin Supply								
Nueces								
Municipal		140	139	139	140	140	141	141
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		5,231	2,851	2,532	2,250	2,003	1,784	1,597
Mining		0	0	0	0	0	0	0
Livestock		145	145	145	145	145	145	145
Unallocated Groundwater Supply		32	2,411	2,729	3,011	3,258	3,476	3,664
Total Nueces Basin Supply		5,548	5,546	5,545	5,546	5,546	5,546	5,547
San Antonio								
Municipal		11,986	11,901	11,817	11,817	11,817	11,817	11,817
Industrial		1	1	1	1	1	1	1
Steam-Electric		0	0	0	0	0	0	0
Irrigation		14,640	9,127	8,400	7,761	7,197	6,701	6,271
Mining		261	228	221	216	212	208	206
Livestock		1,609	1,609	1,609	1,609	1,609	1,609	1,609
Unallocated Groundwater Supply		6,830	12,376	13,108	13,753	14,321	14,821	15,252
Total San Antonio Basin Supply		35,327	35,241	35,156	35,158	35,158	35,157	35,157
Guadalupe								
Municipal		79	79	79	79	79	79	79
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		146	79	70	63	56	49	44
Mining		16	14	13	13	13	13	12
Livestock		54	54	54	54	54	54	54
Unallocated Groundwater Supply		2,606	2,675	2,685	2,692	2,699	2,706	2,712
Total Guadalupe Basin Supply		2,901	2,901	2,901	2,901	2,901	2,901	2,901
Total Basin Surplus/Shortage								
Nueces								
Municipal		84	56	22	-14	-48	-86	-126
Industrial		0	0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0	0
Irrigation		-32	4	3	2	2	1	2
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Unallocated Groundwater Supply		32	2,411	2,729	3,011	3,258	3,476	3,664
Total Nueces Basin Surplus/Shortage		84	2,471	2,754	2,999	3,212	3,391	3,540

Table C-20
Projected Water Demands, Supplies, and Needs
Wilson County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
San Antonio									
Municipal			7,249	5,605	3,853	2,041	265	-1,654	-3,673
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			-834	757	965	1,151	1,314	1,456	1,580
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			6,830	12,376	13,108	13,753	14,321	14,821	15,252
Total San Antonio Basin Surplus/Shortage			13,245	18,737	17,926	16,946	15,901	14,623	13,160
Guadalupe									
Municipal			59	51	42	32	22	11	0
Industrial			0	0	0	0	0	0	0
Steam-Electric			0	0	0	0	0	0	0
Irrigation			0	0	0	0	0	0	0
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Unallocated Groundwater Supply			2,606	2,675	2,685	2,692	2,699	2,706	2,712
Total Guadalupe Basin Surplus/Shortage			2,665	2,726	2,727	2,724	2,721	2,717	2,712
Groundwater Supplies									
	Available								
	Guadalupe	Carrizo	2,093	2,093	2,093	2,093	2,093	2,093	2,093
	Nueces	Carrizo	3,792	3,792	3,792	3,792	3,792	3,792	3,792
	San Antonio	Carrizo	26,919	26,919	26,919	26,919	26,919	26,919	26,919
	Guadalupe	Sparta	95	95	95	95	95	95	95
	Nueces	Sparta	185	185	185	185	185	185	185
	San Antonio	Sparta	700	700	700	700	700	700	700
	Guadalupe	Queen City	686	686	686	686	686	686	686
	Nueces	Queen City	1,476	1,476	1,476	1,476	1,476	1,476	1,476
	San Antonio	Queen City	3,488	3,488	3,488	3,488	3,488	3,488	3,488
	Total Available		39,434	39,434	39,434	39,434	39,434	39,434	39,434
	Allocated								
	Guadalupe	Carrizo	260	191	181	174	167	160	154
	Nueces	Carrizo	3,792	2,149	1,928	1,732	1,561	1,409	1,279
	San Antonio	Carrizo	22,396	17,603	16,970	16,412	15,921	15,489	15,116
	Guadalupe	Sparta	1	1	1	1	1	1	1
	Nueces	Sparta	185	104	93	83	74	66	60
	San Antonio	Sparta	319	191	174	159	146	134	124
	Guadalupe	Queen City	7	7	7	7	7	7	7
	Nueces	Queen City	1,444	790	703	627	560	501	450
	San Antonio	Queen City	1,563	938	855	783	719	663	614
	Total Allocated		29,966	21,972	20,911	19,978	19,156	18,431	17,805
	Total Unallocated		9,468	17,462	18,523	19,456	20,278	21,003	21,629

Table C-21 Projected Water Demands, Supplies, and Needs Zavala County South Central Texas Region									
			Total in	Projections					
Basin		Source	2000	2010	2020	2030	2040	2050	2060
			(acft)	(acft)	(acft)	(acft)	(acft)	(acft)	(acft)
Municipal Demand									
Nueces Basin									
Crystal City			2,175	2,247	2,272	2,343	2,337	2,349	2,370
Rural			741	864	1,028	1,134	1,241	1,327	1,371
	Subtotal		2,916	3,111	3,300	3,477	3,578	3,676	3,741
Total Municipal Demand			2,916	3,111	3,300	3,477	3,578	3,676	3,741
Municipal Existing Supply									
Nueces Basin									
Crystal City		Carrizo	3,664	3,657	3,664	3,664	3,664	3,664	3,664
Rural		Carrizo	1,371	1,368	1,371	1,371	1,371	1,371	1,371
	Subtotal		5,035	5,025	5,035	5,035	5,035	5,035	5,035
Total Municipal Existing Supply			5,035	5,025	5,035	5,035	5,035	5,035	5,035
Municipal Surplus/Shortage									
Nueces Basin									
Crystal City			1,489	1,410	1,392	1,321	1,327	1,315	1,294
Rural			630	504	343	237	130	44	0
	Subtotal		2,119	1,914	1,735	1,558	1,457	1,359	1,294
Total Municipal Surplus/Shortage			2,119	1,914	1,735	1,558	1,457	1,359	1,294
Municipal New Supply Need									
Nueces Basin									
Crystal City			0	0	0	0	0	0	0
Rural			0	0	0	0	0	0	0
	Subtotal		0	0	0	0	0	0	0
Total Municipal New Supply Need			0	0	0	0	0	0	0
Industrial Demand									
Nueces Basin			922	1,043	1,106	1,154	1,200	1,238	1,315
Total Industrial Demand			922	1,043	1,106	1,154	1,200	1,238	1,315
Industrial Existing Supply									
Nueces Basin		Carrizo	1,318	1,316	1,318	1,318	1,318	1,318	1,318
Total Industrial Existing Supply			1,318	1,316	1,318	1,318	1,318	1,318	1,318
Industrial Surplus/Shortage									
Nueces Basin			396	273	212	164	118	80	3
Total Industrial Surplus/Shortage			396	273	212	164	118	80	3
Industrial New Supply Need									
Nueces Basin			0	0	0	0	0	0	0
Total Industrial New Supply Need			0	0	0	0	0	0	0

Table C-21 Projected Water Demands, Supplies, and Needs Zavala County South Central Texas Region								
Basin	**Source**	**Total in 2000 (acft)**	**Projections 2010 (acft)**	**2020 (acft)**	**2030 (acft)**	**2040 (acft)**	**2050 (acft)**	**2060 (acft)**
Steam-Electric Demand								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Demand		0	0	0	0	0	0	0
Steam-Electric Existing Supply								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Existing Supply		0	0	0	0	0	0	0
Steam-Electric Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric Surplus/Shortage		0	0	0	0	0	0	0
Steam-Electric New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Steam-Electric New Supply Need		0	0	0	0	0	0	0
Irrigation Demand								
Nueces Basin		46,275	71,800	68,963	66,238	63,621	61,107	58,692
Total Irrigation Demand		46,275	71,800	68,963	66,238	63,621	61,107	58,692
Irrigation Supply								
Nueces Basin	Carrizo	23,630	23,635	23,619	23,617	23,616	23,615	23,614
Total Irrigation Supply		23,630	23,635	23,619	23,617	23,616	23,615	23,614
Irrigation Surplus/Shortage								
Nueces Basin		-22,645	-48,165	-45,344	-42,621	-40,005	-37,492	-35,078
Total Irrigation Surplus/Shortage		-22,645	-48,165	-45,344	-42,621	-40,005	-37,492	-35,078
Irrigation New Supply Need								
Nueces Basin		22,645	48,165	45,344	42,621	40,005	37,492	35,078
Total Irrigation New Supply Need		22,645	48,165	45,344	42,621	40,005	37,492	35,078
Mining Demand								
Nueces Basin		114	122	125	127	128	129	130
Total Mining Demand		114	122	125	127	128	129	130
Mining Supply								
Nueces Basin	Carrizo	114	122	125	127	128	129	130
Total Mining Supply		114	122	125	127	128	129	130
Mining Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Mining Surplus/Shortage		0	0	0	0	0	0	0
Mining New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Mining New Supply Need		0	0	0	0	0	0	0

Table C-21 Projected Water Demands, Supplies, and Needs Zavala County South Central Texas Region								
Basin	Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Livestock Demand								
Nueces Basin		756	756	756	756	756	756	756
Total Livestock Demand		756	756	756	756	756	756	756
Livestock Supply								
Nueces Basin	Carrizo	377	376	377	377	377	377	377
	Local	379	380	379	379	379	379	379
Total Livestock Supply		756	756	756	756	756	756	756
Livestock Surplus/Shortage								
Nueces Basin		0	0	0	0	0	0	0
Total Livestock Surplus/Shortage		0	0	0	0	0	0	0
Livestock New Supply Need								
Nueces Basin		0	0	0	0	0	0	0
Total Livestock New Supply Need		0	0	0	0	0	0	0
Total Zavala County Demand								
Municipal		2,916	3,111	3,300	3,477	3,578	3,676	3,741
Industrial		922	1,043	1,106	1,154	1,200	1,238	1,315
Steam-Electric		0	0	0	0	0	0	0
Irrigation		46,275	71,800	68,963	66,238	63,621	61,107	58,692
Mining		114	122	125	127	128	129	130
Livestock		756	756	756	756	756	756	756
Total County Demand		50,983	76,832	74,250	71,752	69,283	66,906	64,634
Total Zavala County Supply								
Municipal		5,035	5,025	5,035	5,035	5,035	5,035	5,035
Industrial		1,318	1,316	1,318	1,318	1,318	1,318	1,318
Steam-Electric		0	0	0	0	0	0	0
Irrigation		23,630	23,635	23,619	23,617	23,616	23,615	23,614
Mining		114	122	125	127	128	129	130
Livestock		756	756	756	756	756	756	756
Total County Supply		30,853	30,854	30,853	30,853	30,853	30,853	30,853
Total Zavala County Surplus/Shortage								
Municipal		2,119	1,914	1,735	1,558	1,457	1,359	1,294
Industrial		396	273	212	164	118	80	3
Steam-Electric		0	0	0	0	0	0	0
Irrigation		-22,645	-48,165	-45,344	-42,621	-40,005	-37,492	-35,078
Mining		0	0	0	0	0	0	0
Livestock		0	0	0	0	0	0	0
Total County Surplus/Shortage		-20,130	-45,978	-43,397	-40,899	-38,430	-36,053	-33,781

Table C-21
Projected Water Demands, Supplies, and Needs
Zavala County
South Central Texas Region

Basin		Source	Total in 2000 (acft)	Projections 2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Total Basin Demand									
Nueces									
Municipal			2,916	3,111	3,300	3,477	3,578	3,676	3,741
Industrial			922	1,043	1,106	1,154	1,200	1,238	1,315
Steam-Electric			0	0	0	0	0	0	0
Irrigation			46,275	71,800	68,963	66,238	63,621	61,107	58,692
Mining			114	122	125	127	128	129	130
Livestock			756	756	756	756	756	756	756
Total Nueces Basin Demand			50,983	76,832	74,250	71,752	69,283	66,906	64,634
Total Basin Supply									
Nueces									
Municipal			5,035	5,025	5,035	5,035	5,035	5,035	5,035
Industrial			1,318	1,316	1,318	1,318	1,318	1,318	1,318
Steam-Electric			0	0	0	0	0	0	0
Irrigation			23,630	23,635	23,619	23,617	23,616	23,615	23,614
Mining			114	122	125	127	128	129	130
Livestock			756	756	756	756	756	756	756
Total Nueces Basin Supply			30,853	30,854	30,853	30,853	30,853	30,853	30,853
Total Basin Surplus/Shortage									
Nueces									
Municipal			2,119	1,914	1,735	1,558	1,457	1,359	1,294
Industrial			396	273	212	164	118	80	3
Steam-Electric			0	0	0	0	0	0	0
Irrigation			-22,645	-48,165	-45,344	-42,621	-40,005	-37,492	-35,078
Mining			0	0	0	0	0	0	0
Livestock			0	0	0	0	0	0	0
Total Nueces Basin Surplus/Shortage			-20,130	-45,978	-43,397	-40,899	-38,430	-36,053	-33,781
Groundwater Supplies									
	Available								
	Nueces	Carrizo	30,475	30,475	30,475	30,475	30,475	30,475	30,475
	Total Available		30,475	30,475	30,475	30,475	30,475	30,475	30,475
	Allocated								
	Nueces	Carrizo	30,475	30,475	30,475	30,475	30,475	30,475	30,475
	Total Allocated		30,475	30,475	30,475	30,475	30,475	30,475	30,475
	Total Unallocated		0	0	0	0	0	0	0

Table C-22 Projected Water Demands, Supplies, and Needs River Basin and South Central Texas Region Summaries South Central Texas Region							
Basin	Total in 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Nueces Basin Demand							
Municipal	29,599	32,130	34,782	37,029	38,703	40,264	41,555
Industrial	1,362	1,548	1,642	1,715	1,785	1,844	1,962
Steam-Electric	5,943	5,991	6,039	7,062	8,306	9,824	11,675
Irrigation	319,890	314,279	302,311	291,011	279,881	269,196	258,935
Mining	2,715	3,044	3,193	3,273	3,350	3,424	3,498
Livestock	8,450	8,450	8,450	8,450	8,450	8,450	8,450
Total Nueces Basin Demand	367,959	365,442	356,417	348,540	340,475	333,002	326,075
Nueces Basin Supply							
Municipal		37,961	38,139	38,201	38,373	38,545	38,641
Industrial		3,029	3,031	3,031	3,032	3,032	3,032
Steam-Electric		7,013	7,167	7,324	7,483	7,641	7,726
Irrigation		287,144	282,986	278,731	274,868	271,088	267,125
Mining		3,029	3,210	3,273	3,385	3,483	3,571
Livestock		8,450	8,450	8,450	8,450	8,450	8,450
Unallocated Groundwater Supply		46,105	46,716	47,191	47,821	48,424	48,984
Total Nueces Basin Supply		392,731	389,699	386,201	383,412	380,663	377,529
Nueces Basin Surplus/Shortage [1]							
Municipal		5,831	3,357	1,172	-330	-1,719	-2,914
Industrial		1,481	1,389	1,316	1,247	1,188	1,070
Steam-Electric		1,022	1,128	262	-823	-2,183	-3,949
Irrigation		-27,135	-19,325	-12,280	-5,013	1,892	8,190
Mining		-15	17	0	35	59	73
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		46,105	46,716	47,191	47,821	48,424	48,984
San Antonio Basin Demand							
Municipal	247,069	285,001	319,511	352,860	379,040	405,175	431,723
Industrial	21,364	26,079	29,633	32,919	36,220	39,123	42,282
Steam-Electric	17,399	17,309	17,275	20,196	23,757	28,098	33,390
Irrigation	42,823	34,568	32,437	30,474	28,668	27,010	25,493
Mining	3,232	3,980	4,273	4,450	4,630	4,811	4,982
Livestock	5,058	5,058	5,058	5,058	5,058	5,058	5,058
Total San Antonio Basin Demand	336,945	371,995	408,187	445,957	477,373	509,275	542,928
San Antonio Basin Supply							
Municipal		225,892	222,598	220,683	216,881	216,842	216,387
Industrial		23,431	23,431	23,431	23,431	23,431	23,431
Steam-Electric		48,900	48,900	48,900	48,900	48,900	48,900
Irrigation		50,430	49,569	48,652	47,972	47,367	46,855
Mining		3,985	4,278	3,576	3,664	3,751	3,836
Livestock		5,015	5,015	4,935	4,931	4,923	4,920
Unallocated Groundwater Supply		28,204	29,064	29,814	30,474	31,059	31,558
Total San Antonio Basin Supply		385,857	382,855	379,991	376,253	376,273	375,887
San Antonio Basin Surplus/Shortage [1]							
Municipal		-59,109	-96,913	-132,177	-162,159	-188,333	-215,336
Industrial		-2,648	-6,202	-9,488	-12,789	-15,692	-18,851
Steam-Electric		31,591	31,625	28,704	25,143	20,802	15,510
Irrigation		15,862	17,132	18,178	19,304	20,357	21,362
Mining		5	5	-874	-966	-1,060	-1,146
Livestock		-43	-43	-123	-127	-135	-138
Unallocated Groundwater Supply		28,204	29,064	29,814	30,474	31,059	31,558

Table C-22 Projected Water Demands, Supplies, and Needs River Basin and South Central Texas Region Summaries South Central Texas Region							
Basin	Total in 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Guadalupe Basin Demand							
Municipal	53,805	68,514	85,622	101,545	116,799	133,839	150,387
Industrial	35,201	42,051	46,871	51,112	55,306	59,014	63,453
Steam-Electric	11,353	26,558	33,024	38,609	45,417	53,718	63,834
Irrigation	5,937	6,032	5,371	4,787	4,263	3,859	3,525
Mining	4,966	6,288	6,918	7,336	7,758	8,185	8,537
Livestock	9,667	9,914	9,914	9,914	9,914	9,914	9,914
Total Guadalupe Basin Demand	120,929	159,357	187,720	213,303	239,457	268,529	299,650
Guadalupe Basin Supply							
Municipal		159,425	162,798	163,076	163,141	162,577	162,962
Industrial		57,849	57,849	57,849	57,849	57,849	57,849
Steam-Electric		29,894	28,774	28,774	28,774	28,774	28,774
Irrigation		9,870	9,640	9,436	9,256	9,104	8,974
Mining		4,301	4,737	5,036	5,341	5,489	5,736
Livestock		9,741	9,739	9,739	9,738	9,731	9,731
Unallocated Groundwater Supply		35,319	35,099	34,982	34,839	34,122	34,003
Total Guadalupe Basin Supply		306,399	308,636	308,892	308,937	307,645	308,029
Guadalupe Basin Surplus/Shortage [1]							
Municipal		90,911	77,176	61,531	46,342	28,738	12,575
Industrial		15,798	10,978	6,737	2,543	-1,165	-5,604
Steam-Electric		3,336	-4,250	-9,835	-16,643	-24,944	-35,060
Irrigation		3,838	4,269	4,649	4,993	5,245	5,449
Mining		-1,987	-2,181	-2,300	-2,417	-2,696	-2,801
Livestock		-173	-175	-175	-176	-183	-183
Unallocated Groundwater Supply		35,319	35,099	34,982	34,839	34,122	34,003
Lower Colorado Basin Demand							
Municipal	365	518	676	817	959	1,097	1,239
Industrial	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0
Irrigation	15	15	14	12	11	10	8
Mining	13	15	15	16	17	17	17
Livestock	169	169	169	169	169	169	169
Total Lower Colorado Basin Demand	562	717	874	1,014	1,156	1,293	1,433
Lower Colorado Basin Supply							
Municipal		877	877	877	877	877	877
Industrial		0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0
Irrigation		15	14	12	11	10	9
Mining		15	15	16	17	17	17
Livestock		169	169	169	169	169	169
Unallocated Groundwater Supply		853	854	855	855	846	848
Total Lower Colorado Basin Supply		1,929	1,929	1,929	1,929	1,919	1,920
Lower Colorado Basin Surplus/Shortage [1]							
Municipal		359	201	60	-82	-220	-362
Industrial		0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0
Irrigation		0	0	0	0	0	1
Mining		0	0	0	0	0	0
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		853	854	855	855	846	848

Table C-22 Projected Water Demands, Supplies, and Needs River Basin and South Central Texas Region Summaries South Central Texas Region							
Basin	Total in 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Colorado-Lavaca Basin Demand							
Municipal	251	289	362	523	691	675	672
Industrial	19,175	22,516	24,810	26,790	28,753	30,486	32,671
Steam-Electric	684	569	454	530	624	738	877
Irrigation	0	0	0	0	0	0	0
Mining	1	1	1	1	1	1	1
Livestock	17	17	17	17	17	17	17
Total Colorado-Lavaca Basin Demand	20,128	23,392	25,644	27,861	30,086	31,917	34,238
Colorado-Lavaca Basin Supply							
Municipal		317	317	317	317	317	317
Industrial		32,675	32,675	32,675	32,675	32,675	32,675
Steam-Electric		889	889	889	889	889	889
Irrigation		0	0	0	0	0	0
Mining		1	1	1	1	1	1
Livestock		17	17	17	17	17	17
Unallocated Groundwater Supply		181	181	181	181	181	181
Total Colorado-Lavaca Basin Supply		34,080	34,080	34,080	34,080	34,080	34,080
Colorado-Lavaca Basin Surplus/Shortage [1]							
Municipal		28	-45	-206	-374	-358	-355
Industrial		10,159	7,865	5,885	3,922	2,189	4
Steam-Electric		320	435	359	265	151	12
Irrigation		0	0	0	0	0	0
Mining		0	0	0	0	0	0
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		181	181	181	181	181	181
Lavaca Basin Demand							
Municipal	513	511	512	505	495	479	471
Industrial	7	8	9	10	10	11	12
Steam-Electric	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	37	40	42	43	42	43	43
Livestock	310	357	357	357	357	357	357
Total Lavaca Basin Demand	867	916	920	915	904	890	883
Lavaca Basin Supply							
Municipal		1,229	1,229	1,229	1,229	1,229	1,229
Industrial		15	15	15	15	15	15
Steam-Electric		0	0	0	0	0	0
Irrigation		0	0	0	0	0	0
Mining		40	42	43	42	43	43
Livestock		357	357	357	357	357	357
Unallocated Groundwater Supply		1,526	1,524	1,523	1,524	1,523	1,523
Total Lavaca Basin Supply		3,167	3,167	3,167	3,167	3,167	3,167
Lavaca Basin Surplus/Shortage [1]							
Municipal		718	717	724	734	750	758
Industrial		7	6	5	5	4	3
Steam-Electric		0	0	0	0	0	0
Irrigation		0	0	0	0	0	0
Mining		0	0	0	0	0	0
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		1,526	1,524	1,523	1,524	1,523	1,523

Table C-22 Projected Water Demands, Supplies, and Needs River Basin and South Central Texas Region Summaries South Central Texas Region							
Basin	Total in 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Lavaca-Guadalupe Basin Demand							
Municipal	7,163	7,702	8,269	8,716	9,044	9,394	9,774
Industrial	23,086	27,108	29,871	32,255	34,618	36,704	39,335
Steam-Electric	0	0	0	0	0	0	0
Irrigation	13,806	24,054	20,977	18,417	16,497	14,994	13,645
Mining	769	1,003	1,146	1,244	1,344	1,447	1,527
Livestock	868	868	868	868	868	868	868
Total Lavaca-Guadalupe Basin Demand	45,692	60,735	61,131	61,500	62,371	63,407	65,149
Lavaca-Guadalupe Basin Supply							
Municipal		13,108	13,108	13,108	13,108	13,108	13,108
Industrial		56,479	56,479	56,479	56,479	56,479	56,479
Steam-Electric		0	0	0	0	0	0
Irrigation		31,544	30,381	29,379	28,514	27,767	27,122
Mining		1,003	1,146	1,244	1,344	1,447	1,527
Livestock		868	868	868	868	868	868
Unallocated Groundwater Supply		2,836	3,856	4,760	5,525	6,169	6,734
Total Lavaca-Guadalupe Basin Supply		105,838	105,838	105,838	105,838	105,838	105,838
Lavaca-Guadalupe Basin Surplus/Shortage [1]							
Municipal		5,406	4,839	4,392	4,064	3,714	3,334
Industrial		29,371	26,608	24,224	21,861	19,775	17,144
Steam-Electric		0	0	0	0	0	0
Irrigation		7,490	9,404	10,962	12,017	12,773	13,477
Mining		0	0	0	0	0	0
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		2,836	3,856	4,760	5,525	6,169	6,734
San Antonio-Nueces Basin Demand							
Municipal	1,261	1,327	1,376	1,379	1,403	1,419	1,412
Industrial	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0
Irrigation	861	78	77	76	75	74	73
Mining	24	153	116	91	70	49	39
Livestock	1,016	1,016	1,016	1,016	1,016	1,016	1,016
Total San Antonio-Nueces Basin Demand	3,162	2,574	2,585	2,562	2,564	2,558	2,540
San Antonio-Nueces Basin Supply							
Municipal		2,797	2,797	2,797	2,797	2,797	2,797
Industrial		69	69	69	69	69	69
Steam-Electric		0	0	0	0	0	0
Irrigation		78	77	76	75	74	73
Mining		153	116	91	70	49	39
Livestock		1,016	1,016	1,016	1,016	1,016	1,016
Unallocated Groundwater Supply		42,536	42,574	42,600	42,622	42,644	42,655
Total San Antonio-Nueces Basin Supply		46,649	46,649	46,649	46,649	46,649	46,649
San Antonio-Nueces Basin Surplus/Shortage [1]							
Municipal		1,470	1,421	1,418	1,394	1,378	1,385
Industrial		69	69	69	69	69	69
Steam-Electric		0	0	0	0	0	0
Irrigation		0	0	0	0	0	0
Mining		0	0	0	0	0	0
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		42,536	42,574	42,600	42,622	42,644	42,655

Table C-22 Projected Water Demands, Supplies, and Needs River Basin and South Central Texas Region Summaries South Central Texas Region							
Basin	Total in 2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Rio Grande Basin Demand							
Municipal	2	2	2	2	2	2	2
Industrial	0	0	0	0	0	0	0
Steam-Electric	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Mining	0	0	0	0	0	0	0
Livestock	105	105	105	105	105	105	105
Total Rio Grande Basin Demand	107	107	107	107	107	107	107
Rio Grande Basin Supply							
Municipal		3	3	3	3	3	3
Industrial		0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0
Irrigation		0	0	0	0	0	0
Mining		0	0	0	0	0	0
Livestock		105	105	105	105	105	105
Unallocated Groundwater Supply		3,801	3,801	3,801	3,801	3,801	3,801
Total Rio Grande Basin Supply		3,909	3,909	3,909	3,909	3,909	3,909
Rio Grande Basin Surplus/Shortage [1]							
Municipal		1	1	1	1	1	1
Industrial		0	0	0	0	0	0
Steam-Electric		0	0	0	0	0	0
Irrigation		0	0	0	0	0	0
Mining		0	0	0	0	0	0
Livestock		0	0	0	0	0	0
Unallocated Groundwater Supply		3,801	3,801	3,801	3,801	3,801	3,801
South Central Texas Region Demand							
Municipal	340,028	395,994	451,112	503,376	547,136	592,344	637,235
Industrial	100,195	119,310	132,836	144,801	156,692	167,182	179,715
Steam-Electric	35,379	50,427	56,792	66,397	78,104	92,378	109,776
Irrigation	383,332	379,026	361,187	344,777	329,395	315,143	301,679
Mining	11,757	14,524	15,704	16,454	17,212	17,977	18,644
Livestock	25,660	25,954	25,954	25,954	25,954	25,954	25,954
Total South Central Texas Region Demand	896,351	985,235	1,043,585	1,101,759	1,154,493	1,210,978	1,273,003
South Central Texas Region Supply							
Municipal		441,609	441,866	440,291	436,725	436,294	436,320
Industrial		173,547	173,549	173,549	173,550	173,550	173,550
Steam-Electric		86,696	85,730	85,887	86,046	86,204	86,289
Irrigation		379,081	372,667	366,286	360,696	355,410	350,158
Mining		12,527	13,545	13,280	13,864	14,280	14,770
Livestock		25,738	25,736	25,656	25,651	25,636	25,633
Unallocated Groundwater Supply		161,361	163,667	165,706	167,641	168,768	170,286
Total South Central Texas Region Supply		1,280,559	1,276,760	1,270,655	1,264,173	1,260,142	1,257,006
South Central Texas Region Surplus/Shortage [1]							
Municipal		45,615	-9,246	-63,085	-110,411	-156,050	-200,915
Industrial		54,237	40,713	28,748	16,858	6,368	-6,165
Steam-Electric		36,269	28,938	19,490	7,942	-6,174	-23,487
Irrigation		55	11,480	21,509	31,301	40,267	48,479
Mining		-1,997	-2,159	-3,174	-3,348	-3,697	-3,874
Livestock		-216	-218	-298	-303	-318	-321
Unallocated Groundwater Supply		161,361	163,667	165,706	167,641	168,768	170,286

Notes:
[1] The values listed in this section of the table are not necessarily additive due to the fact that demands and supplies are not necessarily located in close proximity to each other.

Appendix D
Wholesale Water Provider & County Summaries of Projected Water Needs and Water Management Strategies

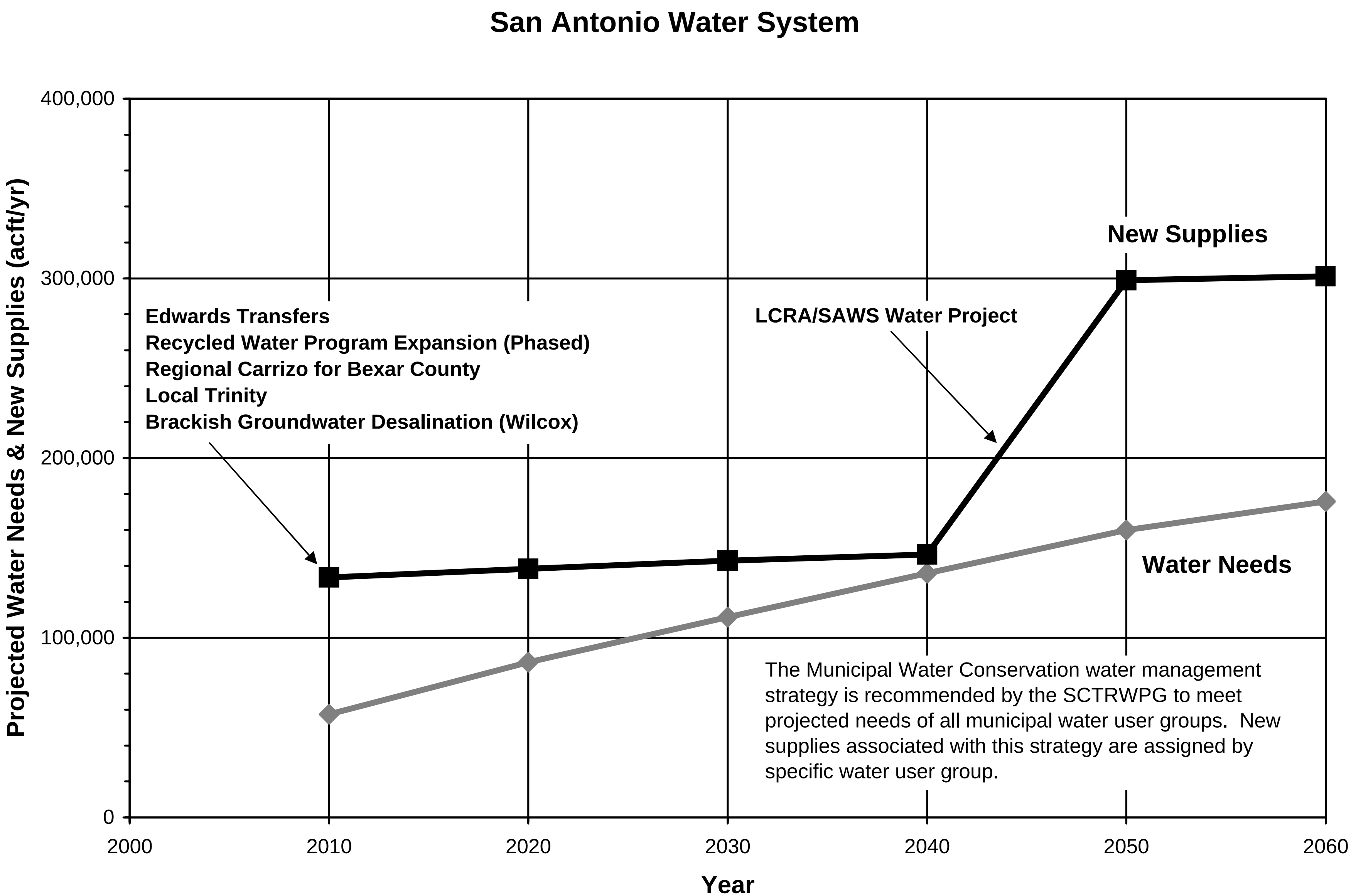
Appendix D
Wholesale Water Provider & County Summaries of Projected Water Needs and Water Management Strategies

2006 South Central Texas Regional Water Plan
Recommended Water Management Strategies

	#	Description	Short-term Unit Cost* ($/acft/yr)	Long-term Unit Cost* ($/acft/yr)	Quantity of Water (acft/yr)	First Decade Needed	Notes
Recommended Water Management Strategies	1	Municipal Water Conservation	432	-	72,570	2010	Unit Cost and Quantity at 2060.
	2	Edwards Transfers - Lease or Purchase	135	-	71,335	2010	$80/acft/yr pro-rated 574K to 340K. Quantity w/ leases & acquisitions.
	3	Regional Carrizo for Bexar County Supply	862	297	56,188	2010	Quantity excludes existing 6,400 acft/yr. Unit costs include it.
	4	SAWS Recycled Water Program – Phased Expansion	434	-	36,258	2010	Unit Cost and Quantity at 2060.
	5	Steam-Electric Water Conservation	-	-	28,459	2010	Guadalupe & Hays.
	6	Canyon Reservoir / Purchase from WWP (GBRA)	294	181	27,150	2010	Actual cost could be greater depending on customer location, etc.
	7	Local Carrizo	443	247	24,729	2010	Unit Costs range from 175-443 $/acft/yr.
	8	Local Trinity	365	115	21,208	2010	Bexar & Caldwell County sites. Unit costs range from 329-365 $/acft/yr.
	9	Irrigation Water Conservation	113	-	14,089	2010	Maximum potential for Atascosa, Bexar, Medina, & Zavala Counties.
	10	Regional Carrizo for SSLGC Project Expansion	411	260	12,800	2010	
	11	Recycled Water	-	-	10,376	2010	San Marcos, Comal (Ind&Min), Guadalupe (SE), Hays (Min).
	12	Brackish Groundwater Desalination - Wilcox Aquifer (WW White Tank Delivery)	1,502	304	5,662	2010	Well field in southeast Bexar County for peak 20 mgd capacity.
	13	CRWA Dunlap Project	956	409	5,600	2010	
	14	Wimberley and Woodcreek Water Supply from Canyon Reservoir / Purchase from WWP (GBRA	989	409	4,636	2010	Wimberley / Woodcreek with peaking capacity.
	15	Wells Ranch Project	690	260	3,400	2010	
	16	Surface Water Rights	-	-	2,867	2010	Acquisition of existing rights only. Unit costs variable. San Marcos.
	17	Mining Water Conservation	-	-	1,425	2010	Comal & Bexar.
	18	Local Gulf Coast	904	455	780	2010	Kenedy.
	19	Purchase from WWP (LNRA)	897	448	489	2010	Quantity at 2060.
	20	Local Barton Springs Edwards	135	-	200	2010	Goforth WSC & Mountain City, Hays County.
	21	Lower Guadalupe Water Supply Project for GBRA Needs / Purchase from WWP (GBRA)	1,344	441	63,072	2020	
	22	Edwards Aquifer Recharge – Type 2 Projects (Program 2A)	1,355	213	21,577	2020	Includes full spectrum of potential projects.
	23	CRWA Siesta Project	853	354	5,042	2020	
	24	Hays/Caldwell Carrizo Project	694	268	15,000	2040	San Marcos, CRWA, & Lockhart.
	25	LCRA/SAWS Water Project - Bay City to Bexar County	1,326	338	150,000	2050	Based on Project Viability Assessment and Region L costs.
	26	Seawater Desalination	1,390	619	84,012	2060	San Antonio Bay source.
Water Management Strategies Requiring Further Study & Funding	27	Brush Management	2,080		2,268		Unit Costs range from 1,952-2,080 $/acft/yr based on Blanco & Nueces basins.
	28	Weather Modification	77		2,404		Unit Costs range from 74-77 $/acft/yr based on Blanco & Nueces basins.
	29	Rainwater Harvesting	17,982		0.0574		Quantity is on a per household basis.
	30	Small Aquifer Recharge Dams					
	31	Simsboro Aquifer Project (GBRA)					
	32	Brackish Groundwater Desalination – Edwards Aquifer (SAWS)					
	33	Mesa Water Supply Project (SAWS)					
	34	Drought Management					
	35	Edwards Recharge and Recirculation Systems					
	36	Cooperation with Corpus Christi for New Water Sources					
	37	Lockhart Reservoir	1,042	200	5,627		
	38	Additional Storage (ASR and/or Surface)					

**Cost in 2nd Quarter 2002 dollars*

Recommended Water Management Strategy Total for Municipal, Industrial, Steam-Electric, and Mining Uses Only ~725,000


San Antonio Water System
400,000
300,000
200,000
100,000
0
Projected Water Needs & New Supplies (acft/yr)
New Supplies
Edwards Transfers
Recycled Water Program Expansion (Phased)
Regional Carrizo for Bexar County
Local Trinity
Brackish Groundwater Desalination (Wilcox)
LCRA/SAWS Water Project
Water Needs
The Municipal Water Conservation water management strategy is recommended by the SCTRWPG to meet projected needs of all municipal water user groups. New supplies associated with this strategy are assigned by specific water user group.
2000
2010
2020
2030
2040
2050
2060
Year

San Antonio Water System (SAWS)

Projected Demands:

Water Purchaser	2000	2010	2020	2030	2040	2050	2060
	Year (acft)						
Balcones Heights	480	514	555	578	600	633	670
China Grove	288	376	457	531	591	645	695
Elmendorf	99	112	123	132	140	148	156
Helotes	845	1,537	2,249	2,820	3,264	3,679	4,047
Leon Valley	407	397	388	382	375	372	377
Olmos Park	381	403	424	441	452	468	484
San Antonio	166,813	192,007	213,943	234,865	250,671	265,958	281,204
Terrell Hills	815	863	914	956	983	1,018	1,057
East Central WSC	2,240	0	0	0	0	0	0
East Central WSC (Palm Park)	1,120	1,120	1,120	0	0	0	0
Rural	5,595	5,661	5,747	5,796	5,796	5,884	6,012
Industrial (Bexar County)	7,723	12,000	16,000	18,000	22,000	30,000	30,000
Total Demand	**186,806**	**214,990**	**241,920**	**264,501**	**284,872**	**308,805**	**324,702**

Supply:

Source	2000	2010	2020	2030	2040	2050	2060
	Year (acft)						
Edwards Aquifer	116,931	116,931	116,931	116,931	116,931	116,931	116,931
Carrizo Aquifer	6,400	6,400	6,400	5,400	5,327	5,256	5,195
Direct Reuse	26,717	26,717	26,717	26,717	26,717	26,717	26,717
GBRA (Canyon Reservoir)	0	7,500	5,500	4,000	0	0	0
Total Supply	**150,048**	**157,548**	**155,548**	**153,048**	**148,975**	**148,904**	**148,843**

Projected Balance:

	2000	2010	2020	2030	2040	2050	2060
	Year (acft)						
System Management Supply / (Deficit)*	(36,758)	(57,442)	(86,372)	(111,453)	(135,897)	(159,901)	(175,859)

Water Management Strategies (WMS):

	2000	2010	2020	2030	2040	2050	2060
	Year (acft)						
Conservation[1]							
Edwards Transfers		48,000	48,000	48,000	48,000	48,000	48,000
Recycled Water Program Expansion[2]		18,712	23,510	28,064	31,543	34,155	36,258
Regional Carrizo for Bexar County[3,4]		56,188	56,188	56,188	56,188	56,188	56,188
Local Trinity		5,000	5,000	5,000	5,000	5,000	5,000
Brackish Groundwater Desalination (Wilcox)[5]		5,662	5,662	5,662	5,662	5,662	5,662
LCRA/SAWS Water Project[6]						150,000	150,000
Surface Water Rights							
Local Storage							
Brush Management Studies							
Brackish Groundwater Desalination (Edwards)							
Mesa Water Supply Project							
Recharge & Recirculation Studies							
Total New Supply		**133,562**	**138,360**	**142,914**	**146,393**	**299,005**	**301,108**

Projected Balance (w/ WMS):

	2000	2010	2020	2030	2040	2050	2060
	Year (acft)						
System Management Supply / (Deficit)*		**76,120**	**51,988**	**31,461**	**10,496**	**139,104**	**125,249**

[1] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.

[2] Based on SAWS goal of meeting 20% of SAWS Municipal and Bexar County Industrial demands with recycled water.

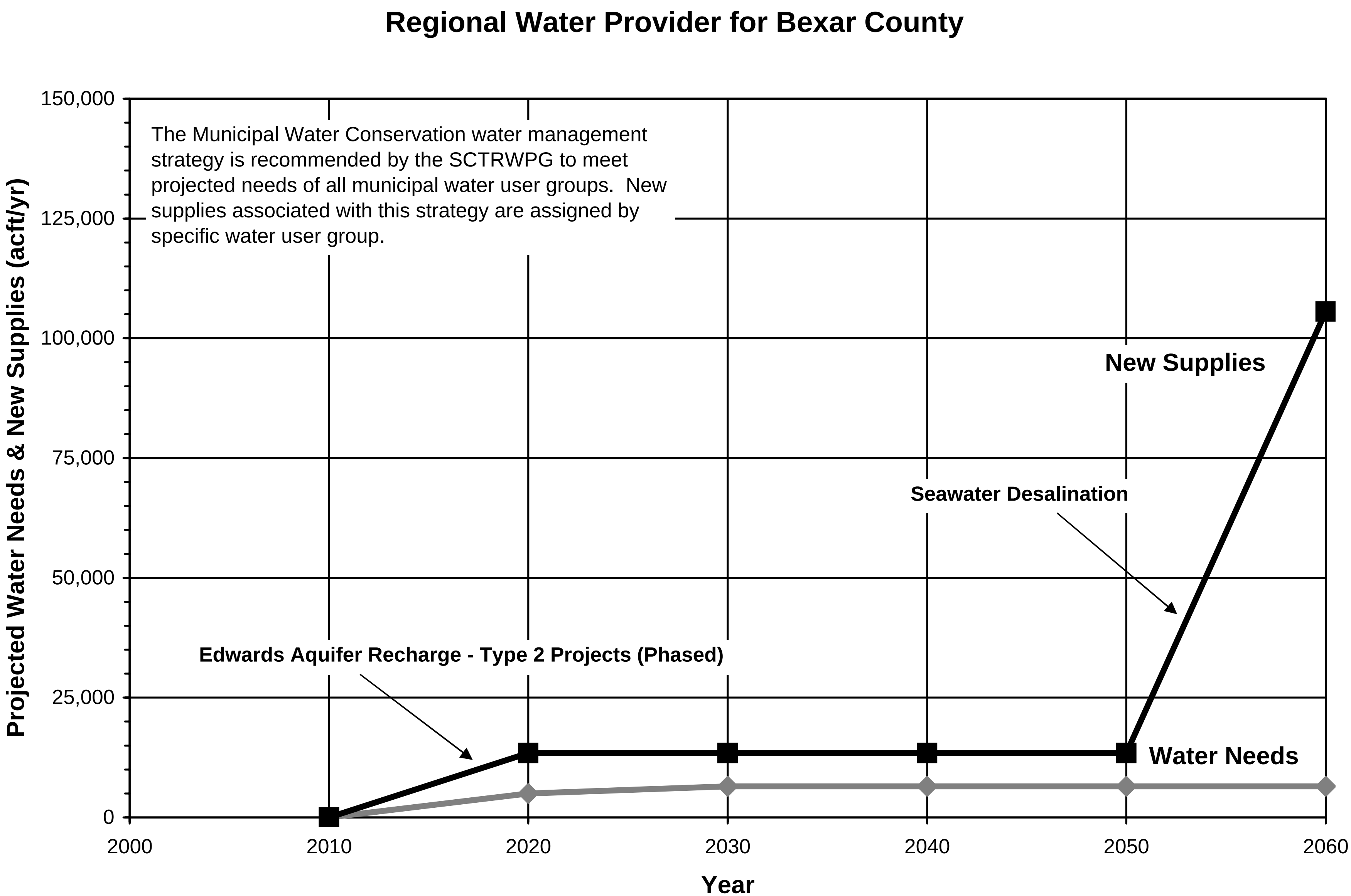
[3] Total supply associated with WMS is 62,588 acft/yr of which up to 6,400 acft/yr was included as existing supply.

[4] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. A part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD.

[5] Wilcox Aquifer in Bexar County with connection to W.W. White storage tank.

[6] Point of diversion is the subject of on-going studies, however, the Bay City diversion point used in the 2001 South Central Texas Regional Water Plan has been assumed for cost estimation purposes. Allocation of the full projected 150,000 acft/yr to this potential diversion location does not preclude development of an upstream alternative or additional diversion location.

* System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.



Regional Water Provider for Bexar County
150,000
125,000
100,000
75,000
50,000
25,000
0
Projected Water Needs & New Supplies (acft/yr)
The Municipal Water Conservation water management strategy is recommended by the SCTRWPG to meet projected needs of all municipal water user groups. New supplies associated with this strategy are assigned by specific water user group.
New Supplies
Seawater Desalination
Edwards Aquifer Recharge - Type 2 Projects (Phased)
Water Needs
2000
2010
2020
2030
2040
2050
2060
Year

Regional Water Provider for Bexar County (RWPBC)

Projected Demands:

	Year (acft)						
Water Purchaser	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Bexar Metropolitan Water District (BMWD)			4,000	4,000	4,000	4,000	4,000
Selma			1,000	1,000	1,000	1,000	1,000
County-Other (Bexar)				200	200	200	200
Mining (Bexar)				1,300	1,300	1,300	1,300
Total Demand	**0**	**0**	**5,000**	**6,500**	**6,500**	**6,500**	**6,500**

Supply:

	Year (acft)						
Source	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Total Supply	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Projected Balance:

	Year (acft)						
	2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
System Management Supply / (Deficit)*	0	0	(5,000)	(6,500)	(6,500)	(6,500)	(6,500)

Water Management Strategies (WMS):

	Year (acft)						
	2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Conservation[1]							
Edwards Aquifer Recharge - Type 2 Projects			13,451	13,451	13,451	13,451	21,577
Seawater Desalination							84,012
Surface Water Rights							
Recycled Water Programs							
Brush Management							
Weather Modification							
Cooperation w/ Corpus Christi for New Sources							
Total New Supply		**0**	**13,451**	**13,451**	**13,451**	**13,451**	**105,589**

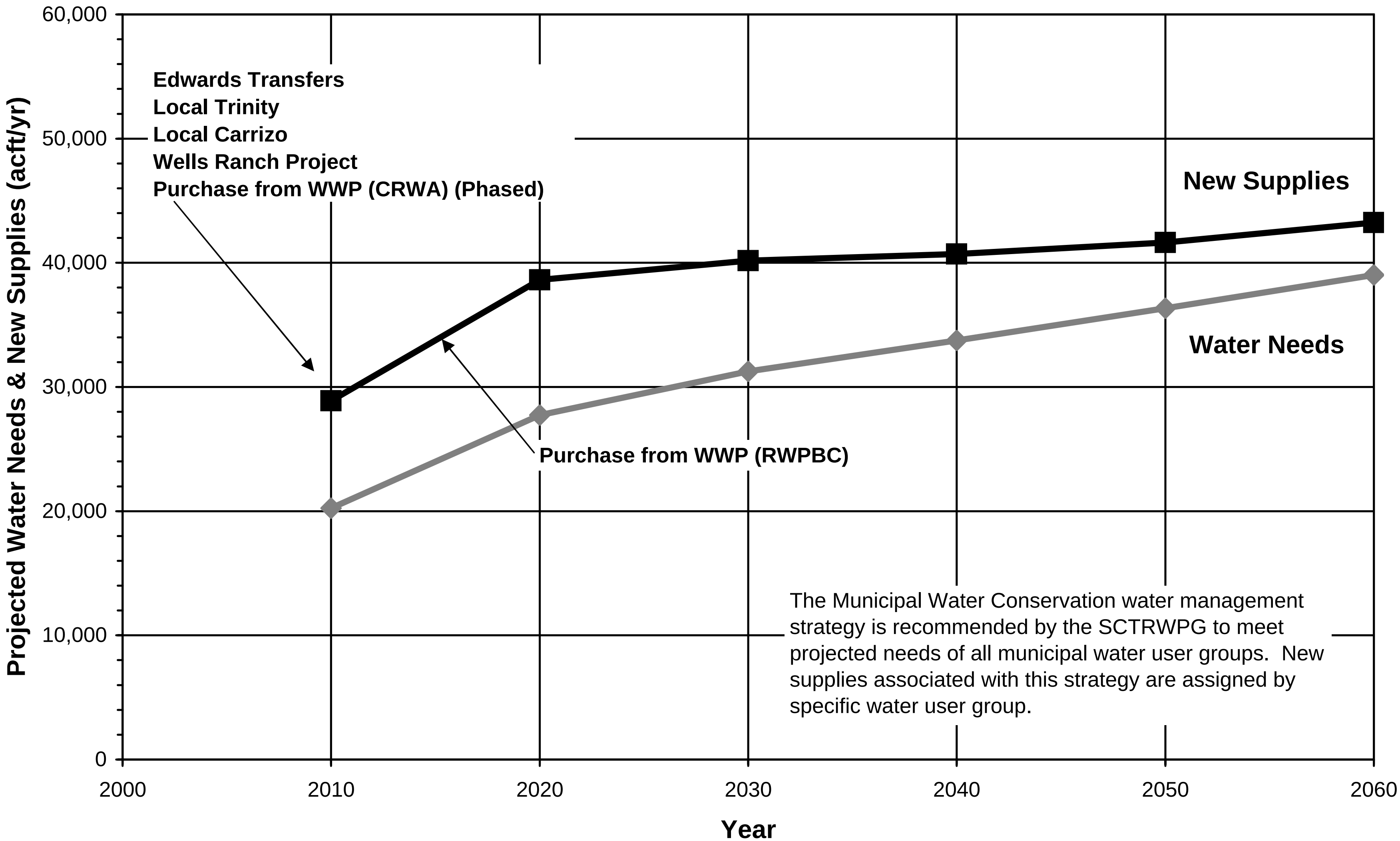
Projected Balance (w/ WMS):

	Year (acft)						
	2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
System Management Supply / (Deficit)*		**0**	**8,451**	**6,951**	**6,951**	**6,951**	**99,089**

[1] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.

* System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

Bexar Metropolitan Water District



Bexar Metropolitan Water District (BMWD)

Projected Demands:

Water Purchaser	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Bexar Met Water District (Atascosa County)	389	505	621	715	780	843	895
Bexar Met Water District (Bexar County)	8,794	8,897	9,032	9,109	9,110	9,248	9,449
Bexar Met Water District (Comal County)	230	462	748	1,059	1,344	1,654	2,001
Bexar Met Water District (Medina County)	15	24	33	41	47	54	60
Castle Hills	838	820	807	793	780	771	771
Hill Country Village	842	838	835	831	828	826	826
Hollywood Park	2,229	2,314	2,389	2,458	2,511	2,565	2,616
San Antonio	21,419	24,654	27,471	30,157	32,187	34,150	36,107
Somerset	321	405	484	552	609	660	709
East Central WSC	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Converse	0	1,500	1,500	1,500	1,500	1,500	1,500
Live Oak	0	1,000	1,000	1,000	1,000	1,000	1,000
Total Demand	**36,477**	**42,819**	**46,320**	**49,615**	**52,096**	**54,671**	**57,334**

Supply:

Source	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Run-of-River (Medina River)	4,531	4,531	4,531	4,531	4,531	4,531	4,531
CRWA (Canyon Reservoir)	4,000	4,000	0	0	0	0	0
Trinity Aquifer (Bexar & Comal Counties)	158	158	158	158	158	150	151
Carrizo Aquifer (Bexar County)	1,000	1,000	1,000	776	767	757	749
Medina Lake System	0	0	0	0	0	0	0
Edwards Aquifer	12,887	12,887	12,887	12,887	12,887	12,887	12,887
Total Supply	**22,576**	**22,576**	**18,576**	**18,352**	**18,343**	**18,325**	**18,318**

Projected Balance:

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
System Management Supply / (Deficit)*	(13,901)	(20,243)	(27,744)	(31,263)	(33,753)	(36,346)	(39,016)

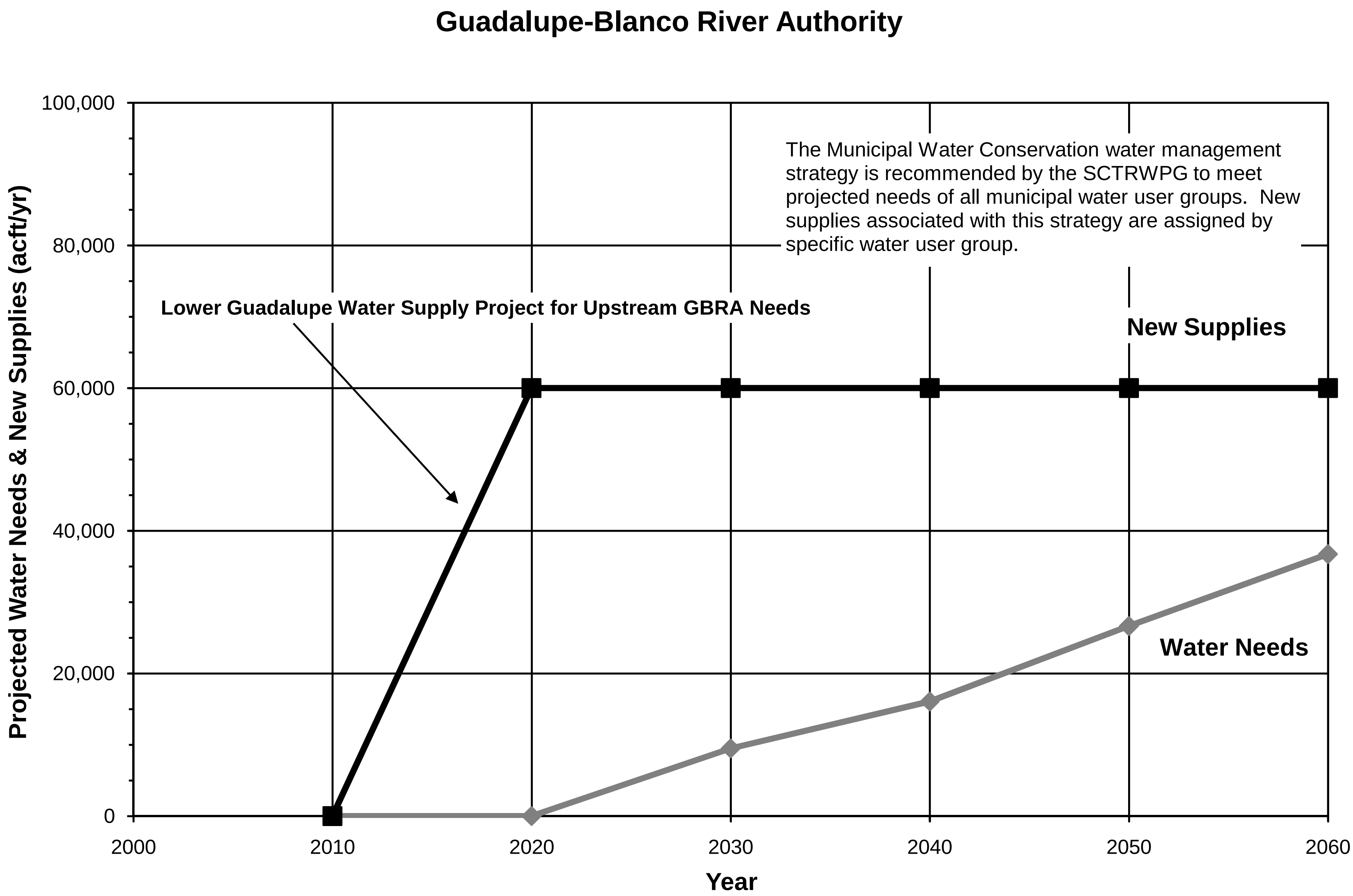
Water Management Strategies (WMS):

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Conservation[1]		1,037	1,667	2,310	2,838	3,778	5,376
Edwards Transfers		3,960	3,960	3,960	3,960	3,960	3,960
Local Trinity		15,000	15,000	15,000	15,000	15,000	15,000
Local Carrizo		4,000	4,000	4,000	4,000	4,000	4,000
Wells Ranch Project[2,3]		3,400	3,400	3,400	3,400	3,400	3,400
Purchase from WWP (CRWA)		1,500	6,600	7,500	7,500	7,500	7,500
Purchase from WWP (RWPBC)			4,000	4,000	4,000	4,000	4,000
Surface Water Rights							
Local Storage							
Total New Supply		**28,897**	**38,627**	**40,170**	**40,698**	**41,638**	**43,236**

Projected Balance (w/ WMS):

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
System Management Supply / (Deficit)*		**8,654**	**10,883**	**8,907**	**6,945**	**5,292**	**4,220**

[1] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.
[2] As up to 5,600 acft/yr of this potential 9,000 acft/yr supply is committed to the CRWA Dunlap Project, amount shown is 3,400 acft/yr.
[3] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. A part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD.
* System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


Guadalupe-Blanco River Authority
Projected Water Needs & New Supplies (acft/yr)
100,000
80,000
60,000
40,000
20,000
0
2000
2010
2020
2030
2040
2050
2060
Year
The Municipal Water Conservation water management strategy is recommended by the SCTRWPG to meet projected needs of all municipal water user groups. New supplies associated with this strategy are assigned by specific water user group.
Lower Guadalupe Water Supply Project for Upstream GBRA Needs
New Supplies
Water Needs

Guadalupe-Blanco River Authority (GBRA)

Projected Demands (acft/yr):

Water Purchaser	Basin Location	2000	2010	2020	2030	2040	2050	2060
		Year (acft)						
Municipal (Canyon Reservoir)								
Upper Basin - At or above Canyon Reservoir								
Canyon Lake WSC	U	4,000	4,000	4,769	6,838	8,898	11,034	13,331
City of Blanco	U	600	600	600	600	600	600	600
Domestic Contracts	U	25	25	25	25	25	25	25
Rebecca Creek MUD	U	130	130	130	130	130	130	130
Wimberley WSC	U	0	177	400	628	847	1,248	1,479
Woodcreek & Woodcreek Utilities	U	0	593	1,059	1,549	2,027	2,691	3,157
WW Sports	U	1	1	1	1	1	1	1
Yacht Club	U	4	4	4	4	4	4	4
Bulverde (Western Canyon)	U	0	1,053	1,742	2,528	3,310	4,123	4,995
City of Boerne (Western Canyon)	U	0	650	1,300	1,884	2,410	2,953	3,403
City of Fair Oaks Ranch (Western Canyon)	U	0	1,200	1,300	1,400	1,400	1,400	1,400
Comal County-Other (Western Canyon)	U	0	876	955	1,064	1,161	1,343	1,494
Cordillera Ranch (Western Canyon)	U	0	366	660	1,000	1,000	1,000	1,000
DH Invest.-Johnson Ranch (Western Canyon)	U	0	45	400	400	400	400	400
Kendall & Tapatio (Western Canyon)	U	0	366	500	500	500	500	500
Kendall County-Other (Western Canyon)	U	0	221	865	1,612	2,527	3,385	4,163
SARA (Western Canyon)	U	0	0	50	50	0	0	0
SAWS (Western Canyon)	U	0	7,500	5,500	4,000	0	0	0
Western Canyon Sub-Total		*0*	*12,277*	*13,272*	*14,438*	*12,708*	*15,104*	*17,355*
Total Upper Basin Municipal (Canyon Reservoir)		**4,760**	**17,807**	**20,260**	**24,213**	**25,240**	**30,837**	**36,082**
Mid Basin								
Canyon Regional Water Authority (In district after 2018)	M	10,025	10,025	10,025	10,025	10,025	10,025	10,025
NBU + 50% of Comal County-Other	M	6,720	7,687	9,136	12,382	15,586	18,979	22,688
City of Seguin	M	3,000	2,000	2,000	2,000	2,000	2,000	2,000
Dittmar, Gary	M	5	5	5	5	5	5	5
Dittmar, Ray	M	5	5	5	5	5	5	5
Gonzales County WSC	M	700	700	700	700	700	700	700
Green Valley SUD	M	200	200	300	300	700	700	700
Springs Hill WSC	M	2,500	2,500	2,500	2,500	2,500	2,500	2,500
CRWA (Hays/Caldwell or San Marcos WTP)	M	2,038	2,038	2,038	2,038	2,038	2,038	2,038
City of Buda (San Marcos WTP)	M	1,120	1,120	1,120	1,120	1,120	1,120	1,120
City of Kyle (San Marcos WTP)	M	589	2,957	3,177	3,454	3,614	4,111	4,111
City of Mustang Ridge (San Marcos WTP)	M	0	19	62	99	137	175	213
City of Niederwald (San Marcos WTP)	M	0	35	95	160	221	294	354
Plum Creek WC (San Marcos WTP)	M	0	0	73	274	479	738	941
City of San Marcos (San Marcos WTP)	M	5,000	5,000	10,000	10,000	10,000	10,000	10,000
County Line WSC (Hays/Caldwell or San Marcos WTP)	M	0	0	500	1,000	1,000	1,000	1,000
Crystal Clear WSC (Hays/Caldwell or San Marcos WTP)	M	800	800	800	1,300	1,800	1,800	1,800
Maxwell WSC (Hays/Caldwell or San Marcos WTP)	M	0	0	0	100	400	500	700
Martindale WSC (Hays/Caldwell or San Marcos WTP)	M	0	0	0	0	50	50	50
Goforth WSC (San Marcos WTP)	M	250	1,000	1,000	1,500	2,000	2,500	3,000
Hays County-Other (San Marcos WTP)	M	0	4,480	4,480	4,480	4,480	4,480	4,480
San Marcos WTP Sub-Total		*9,797*	*17,449*	*23,345*	*25,525*	*27,339*	*28,806*	*29,807*
Total Mid Basin Municipal (Canyon Reservoir)		**32,952**	**40,571**	**48,016**	**53,442**	**58,860**	**63,720**	**68,430**
Lower Basin								
Calhoun County Rural WSC	L	500	500	500	500	500	500	500
City of Port Lavaca	L	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Port O'Conner MUD	L	60	60	60	60	60	60	60
Total Lower Basin Municipal (Canyon Reservoir)		**2,060**	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**	**2,060**
Industrial/Steam-Electric (Canyon Reservoir)								
Upper Basin								
Harris Road Company	**U**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Mid Basin (Includes no new commitments for Steam-Electric supply)								
Acme	M	25	25	25	25	25	25	25
Boehm (Pecan Dr.)	M	1	1	1	1	1	1	1
Comal Fair	M	1	1	1	1	1	1	1
Comal Road Department	M	3	3	3	3	3	3	3
GPP (Panda Energy)	M	6,840	6,840	5,720	5,720	5,720	5,720	5,720
Guadalupe County	M	1	1	1	1	1	1	1
Hays Energy LP	M	2,464	2,464	2,464	2,464	2,464	2,464	2,464
SMI	M	700	700	700	700	700	700	700
Std. Gypsum	M	258	258	258	258	258	258	258
Total Mid Basin Industrial/SE (Canyon Reservoir)		**10,293**	**10,293**	**9,173**	**9,173**	**9,173**	**9,173**	**9,173**
Lower Basin								
Coleto Creek	L	4,000	4,000	6,000	6,000	6,000	6,000	6,000

BP Chemical	L	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Seadrift Coke	L	334	334	334	334	334	334	334
UCC	L	100	100	100	100	100	100	100
Total Lower Basin Industrial/SE (Canyon Reservoir)		**5,534**	**5,534**	**7,534**	**7,534**	**7,534**	**7,534**	**7,534**
Irrigation (Canyon Reservoir)								
Irrigation Contracts	**U**	**173**	**173**	**173**	**173**	**173**	**173**	**173**
Irrigation Contracts	**M**	**736**	**736**	**736**	**736**	**736**	**736**	**736**
Canyon Reservoir Total		**56,514**	**77,180**	**87,958**	**97,337**	**103,782**	**114,239**	**124,194**
Mid-Basin Municipal (Run-of-River)								
Lockhart	M	1,120	1,120	1,120	1,120	1,120	1,120	1,120
Luling	M	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Mid-Basin Municipal (Run-of-River) Total		**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**	**2,800**
Lower Basin Municipal (Run-of-River)								
Calhoun County Rural WSC	L	1,000	1,000	1,000	1,000	1,000	1,000	1,000
City of Victoria (pursuant to Canyon Amendment)	L	1,240	1,240	1,240	1,240	1,240	1,240	1,240
Port Lavaca	L	2,980	2,980	2,980	2,980	2,980	2,980	2,980
Port O'Conner MUD	L	1,060	1,060	1,060	1,060	1,060	1,060	1,060
Total Lower Basin Municipal (Run-of-River)		**6,280**	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**	**6,280**
Lower Basin Industrial/SE (Run-of-River)								
BP Chemical	L	2,200	2,200	2,200	2,200	2,200	2,200	2,200
Coleto Creek	L	0	0	0	0	0	2,010	4,842
Seadrift Coke	L	666	666	666	666	666	666	666
Victoria County Industry	L	0	0	0	0	1,008	3,624	6,566
UCC	L	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Other Existing & New Industry	L	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Total Lower Basin Industrial/SE (Run-of-River)		**42,866**	**42,866**	**42,866**	**42,866**	**43,874**	**48,500**	**54,274**
Lower Basin Irrigation (Run-of-River)								
Irrigation Agreements (Includes Losses)	**L**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**
Lower Basin (Run-of-River) Total		**75,146**	**75,146**	**75,146**	**75,146**	**76,154**	**80,780**	**86,554**
Total Demand		**134,460**	**155,126**	**165,904**	**175,283**	**182,736**	**197,819**	**213,548**
Total Upper Basin Demand	U	4,939	17,986	20,439	24,392	25,419	31,016	36,261
Total Mid Basin Demand	M	46,781	54,400	60,725	66,151	71,569	76,429	81,139
Total Lower Basin Demand	L	82,740	82,740	84,740	84,740	85,748	90,374	96,148
Total Demand		**134,460**	**155,126**	**165,904**	**175,283**	**182,736**	**197,819**	**213,548**

Supply (acft/yr):

					Year (acft)			
Source		***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Canyon Reservoir*		88,232	88,107	87,982	87,857	87,732	87,607	87,484
Mid-basin Rights*		193	193	193	193	193	193	193
Lower Basin Rights*		150,057	150,057	150,057	150,057	150,057	150,057	150,057
Total Supply		**238,482**	**238,357**	**238,232**	**238,107**	**237,982**	**237,857**	**237,734**

Projected Balance (acft/yr):

					Year (acft)			
		2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Canyon Balance/(Deficit)		31,718	10,927	24	(9,480)	(16,050)	(26,632)	(36,710)
Mid Basin Run-of-River Balance/(Deficit)		(2,607)	(2,607)	(2,607)	(2,607)	(2,607)	(2,607)	(2,607)
Lower Basin Run-of-River Balance/(Deficit)		74,911	74,911	74,911	74,911	73,903	69,277	63,503
Total System Management Supply / (Deficit)*		**104,022**	**83,231**	**72,328**	**62,824**	**55,246**	**40,038**	**24,186**

U = Upper = At or above Canyon Dam
M = Mid = Below Canyon Dam to Above Victoria
L = Lower = At or below Victoria

* Dependable supply during drought per Guadalupe-San Antonio River Basin Water Availability Model (WAM).

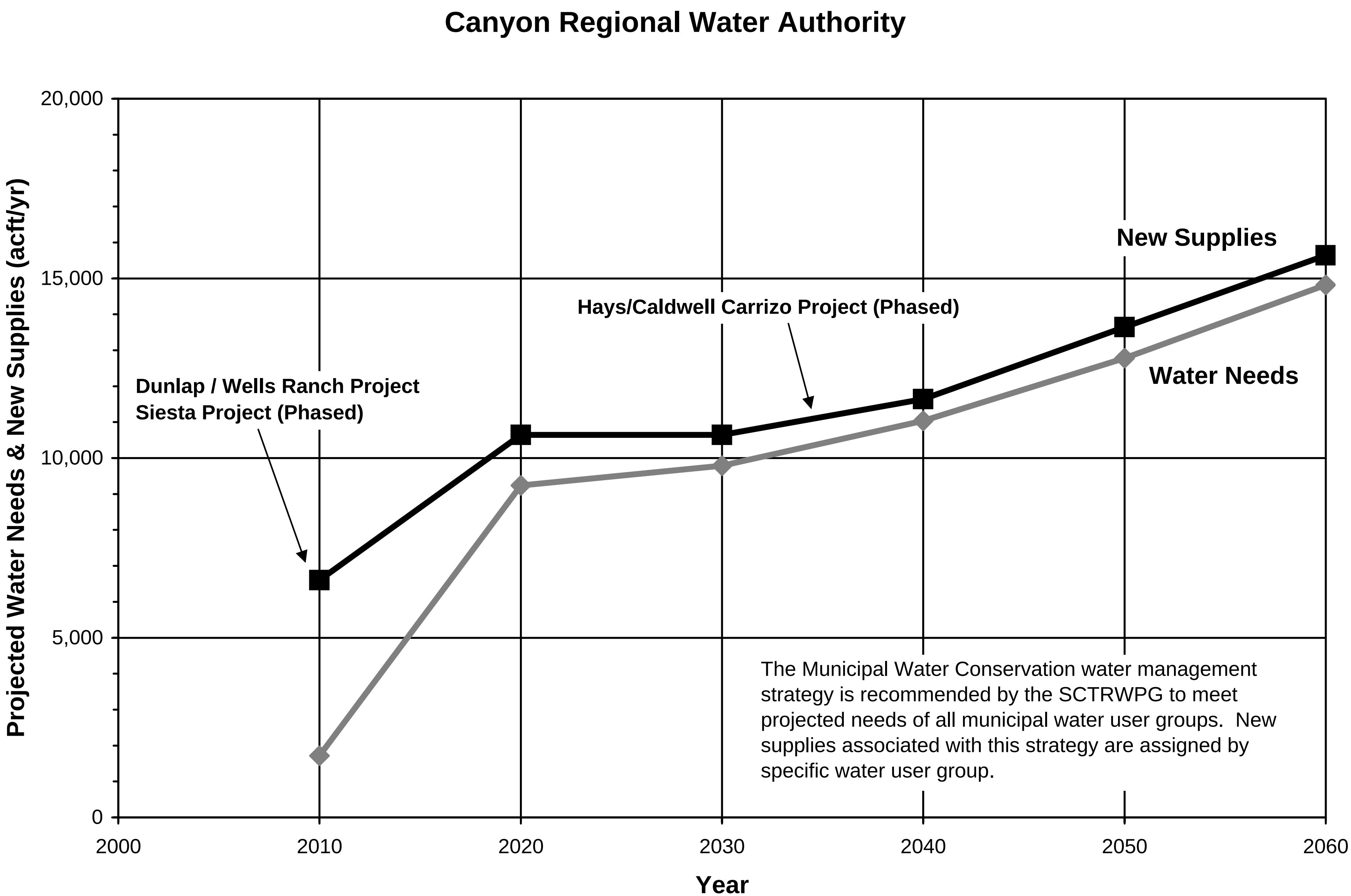
Water Management Strategies (WMS):

					Year (acft)			
		2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Conservation[1]								
Lower Guadalupe Water Supply Project for Upstream GBRA Needs[2]				60,000	60,000	60,000	60,000	60,000
Canyon Reservoir								
Western Canyon Regional Water Supply Project								
Hays/IH35 Water Supply Project								
Wimberley & Woodcreek Water Supply from Canyon								
Total New Supply			**0**	**60,000**	**60,000**	**60,000**	**60,000**	**60,000**

Projected Balance (w/ WMS):

					Year (acft)			
		2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
System Management Supply / (Deficit)*,[2]			**83,231**	**72,328**	**62,824**	**55,246**	**40,038**	**24,186**

[1] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.


Canyon Regional Water Authority
20,000
15,000
10,000
5,000
0
Projected Water Needs & New Supplies (acft/yr)
2000
2010
2020
2030
2040
2050
2060
Year
New Supplies
Water Needs
Hays/Caldwell Carrizo Project (Phased)
Dunlap / Wells Ranch Project
Siesta Project (Phased)
The Municipal Water Conservation water management strategy is recommended by the SCTRWPG to meet projected needs of all municipal water user groups. New supplies associated with this strategy are assigned by specific water user group.

Canyon Regional Water Authority (CRWA)

Projected Demands:

Water Purchaser	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Bexar Met Water District	4,000	5,500	6,600	7,500	7,500	7,500	7,500
City of Cibolo	800	866	2,800	2,800	2,800	2,800	2,800
County Line WSC	1,267	1,267	1,767	1,767	2,267	2,267	2,267
East Central WSC	1,400	1,400	1,400	551	795	1,016	1,242
Green Valley SUD	1,800	1,800	5,600	6,000	6,400	7,200	8,000
City of La Vernia	0	0	0	0	0	8	114
City of Marion	100	100	100	113	128	148	170
Martindale	158	158	158	158	158	158	158
Martindale WSC	288	288	288	288	288	288	288
Springs Hill WSC	1,925	1,925	1,925	1,925	1,925	1,925	1,925
SS WSC	0	0	0	0	0	0	690
City of Santa Clara (Served by Green Valley SUD)	0	100	300	400	500	700	900
Guadalupe County-Other	56	48	37	25	15	7	0
Maxwell WSC	867	867	867	867	867	867	867
Crystal Clear WSC	382	382	382	382	382	882	882
Total Demand	**13,043**	**14,701**	**22,224**	**22,776**	**24,025**	**25,766**	**27,803**

Supply:

Source	Year (acft) 2000	2010	2020	2030	2040	2050	2060
GBRA - Lake Dunlap	10,025	10,025	10,025	10,025	10,025	10,025	10,025
GBRA - Hays/Caldwell	2,038	2,038	2,038	2,038	2,038	2,038	2,038
Water Right Leases	924	924	924	924	924	924	924
Total Supply	**12,987**	**12,987**	**12,987**	**12,987**	**12,987**	**12,987**	**12,987**

Projected Balance:

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
System Management Supply / (Deficit)*	(56)	(1,714)	(9,237)	(9,789)	(11,038)	(12,779)	(14,816)

Water Management Strategies (WMS):

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Conservation[1]							
CRWA Dunlap / Wells Ranch Project[2,3]		5,600	5,600	5,600	5,600	5,600	5,600
CRWA Siesta Project		1,000	5,042	5,042	5,042	5,042	5,042
Hays/Caldwell Carrizo Project					1,000	3,000	5,000
Local Trinity							
Local Carrizo							
Purchase from WWP (GBRA)							
Recycled Water							
Transmission Systems							
Total New Supply		**6,600**	**10,642**	**10,642**	**11,642**	**13,642**	**15,642**

Projected Balance (w/ WMS):

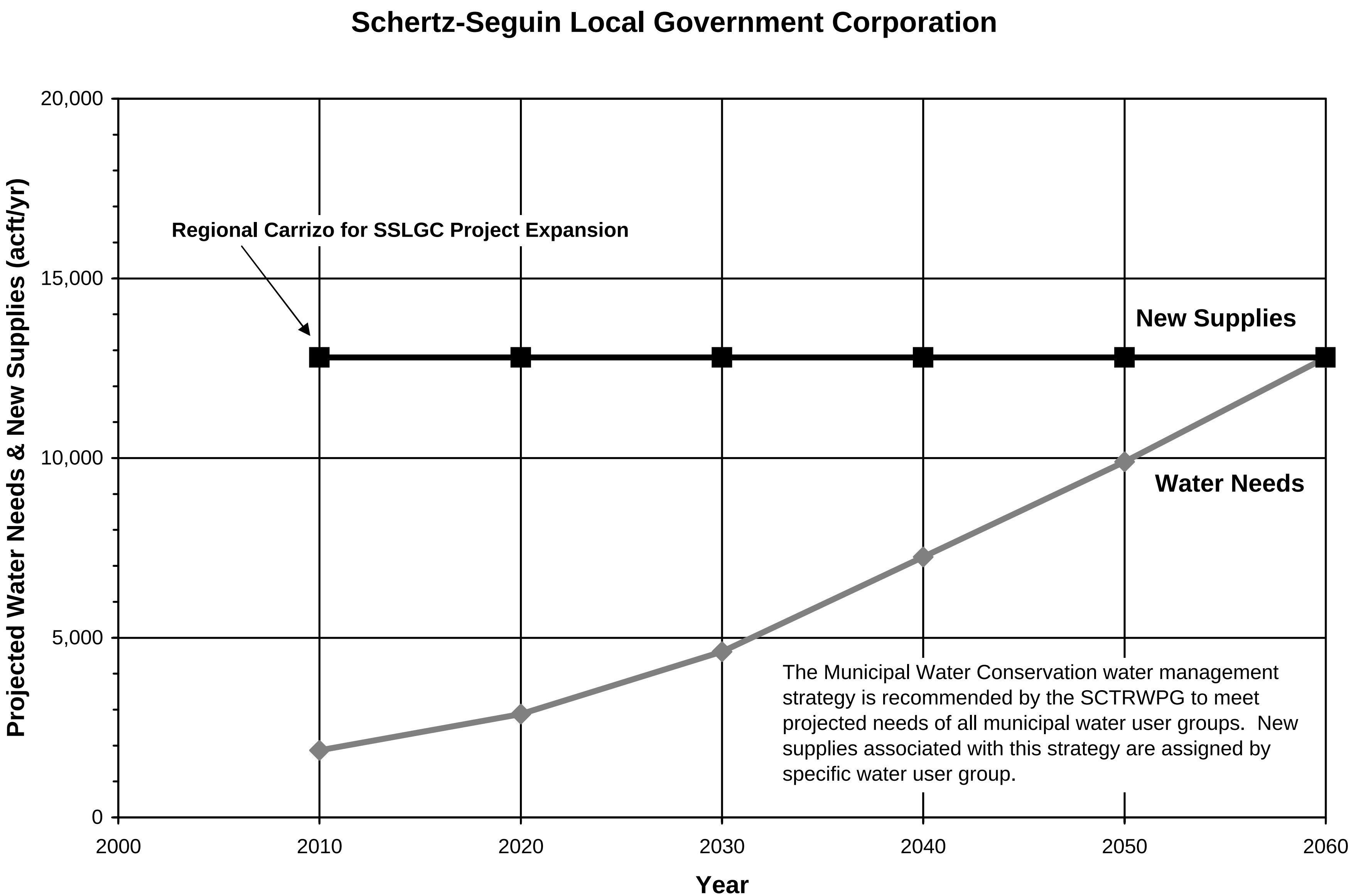
	Year (acft) 2000	2010	2020	2030	2040	2050	2060
System Management Supply / (Deficit)*		**4,886**	**1,405**	**853**	**604**	**863**	**826**

[1] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.

[2] CRWA Dunlap Project includes up to 5,600 acft/yr from the Wells Ranch Project to firm-up surface water supply.

[3] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. A part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD.

* System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


Schertz-Seguin Local Government Corporation
Projected Water Needs & New Supplies (acft/yr)
20,000
15,000
10,000
5,000
0
Regional Carrizo for SSLGC Project Expansion
New Supplies
Water Needs
The Municipal Water Conservation water management strategy is recommended by the SCTRWPG to meet projected needs of all municipal water user groups. New supplies associated with this strategy are assigned by specific water user group.
2000
2010
2020
2030
2040
2050
2060
Year

Schertz-Seguin Local Government Corporation (SSLGC)

Projected Demands:

Water Purchaser	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Schertz	5,420	5,420	5,444	6,055	7,542	9,233	11,041
Seguin	5,420	5,420	5,718	6,454	7,203	8,069	9,047
Selma	800	1,500	1,500	1,500	1,500	1,500	1,500
Springs Hill WSC	560	560	560	560	560	560	560
Universal City	800	800	800	800	800	800	800
Green Valley SUD	0	200	500	500	500	500	500
Crystal Clear WSC	0	0	300	600	900	900	900
Garden Ridge	0	170	252	346	440	537	644
Total Demand	**13,000**	**14,070**	**15,074**	**16,815**	**19,445**	**22,099**	**24,992**

Supply:

Source	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Carrizo Aquifer (Gonzales County)[1]	12,200	12,200	12,200	12,200	12,200	12,200	12,200
Total Supply	**12,200**	**12,200**	**12,200**	**12,200**	**12,200**	**12,200**	**12,200**

Projected Balance:

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
System Management Supply / (Deficit)*	(800)	(1,870)	(2,874)	(4,615)	(7,245)	(9,899)	(12,792)

Water Management Strategies (WMS):

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
Conservation[2]							
Regional Carrizo for SSLGC Project Expansion[3]		12,800	12,800	12,800	12,800	12,800	12,800
Total New Supply		**12,800**	**12,800**	**12,800**	**12,800**	**12,800**	**12,800**

Projected Balance (w/ WMS):

	Year (acft) 2000	2010	2020	2030	2040	2050	2060
System Management Supply / (Deficit)*		**10,930**	**9,926**	**8,185**	**5,555**	**2,901**	**8**

[1] Permitted production as of August 2004.

[2] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.

[3] This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. A part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD.

* System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

Springs Hill Water Supply Corporation (SHWSC)

Projected Demands:

	Year (acft)						
Water Purchaser	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Springs Hill WSC	2,076	2,349	2,679	3,056	3,424	3,849	4,330
La Vernia (via CRWA)	400	400	400	400	400	400	400
Crystal Clear WSC	250	250	250	250	250	250	250
East Central WSC (via CRWA)	385	385	385	385	385	385	385
Total Demand	**3,111**	**3,384**	**3,714**	**4,091**	**4,459**	**4,884**	**5,365**

Supply:

	Year (acft)						
Source	***2000***	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
GBRA (Canyon Reservoir)	2,500	2,500	2,500	2,500	2,500	2,500	2,500
CRWA (Canyon Reservoir)	1,925	1,925	1,925	1,925	1,925	1,925	1,925
Carrizo Aquifer (Guadalupe County)	1,605	1,605	1,605	1,605	1,605	1,605	1,605
Carrizo Aquifer (Gonzales County) (SSLGC)	560	560	560	560	560	560	560
Total Supply	**6,590**	**6,590**	**6,590**	**6,590**	**6,590**	**6,590**	**6,590**

Projected Balance:

	Year (acft)						
	2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
System Management Supply / (Deficit)*	3,479	3,206	2,876	2,499	2,131	1,706	1,225

Water Management Strategies (WMS):

	Year (acft)						
	2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
Conservation[1]							
Total New Supply		**0**	**0**	**0**	**0**	**0**	**0**

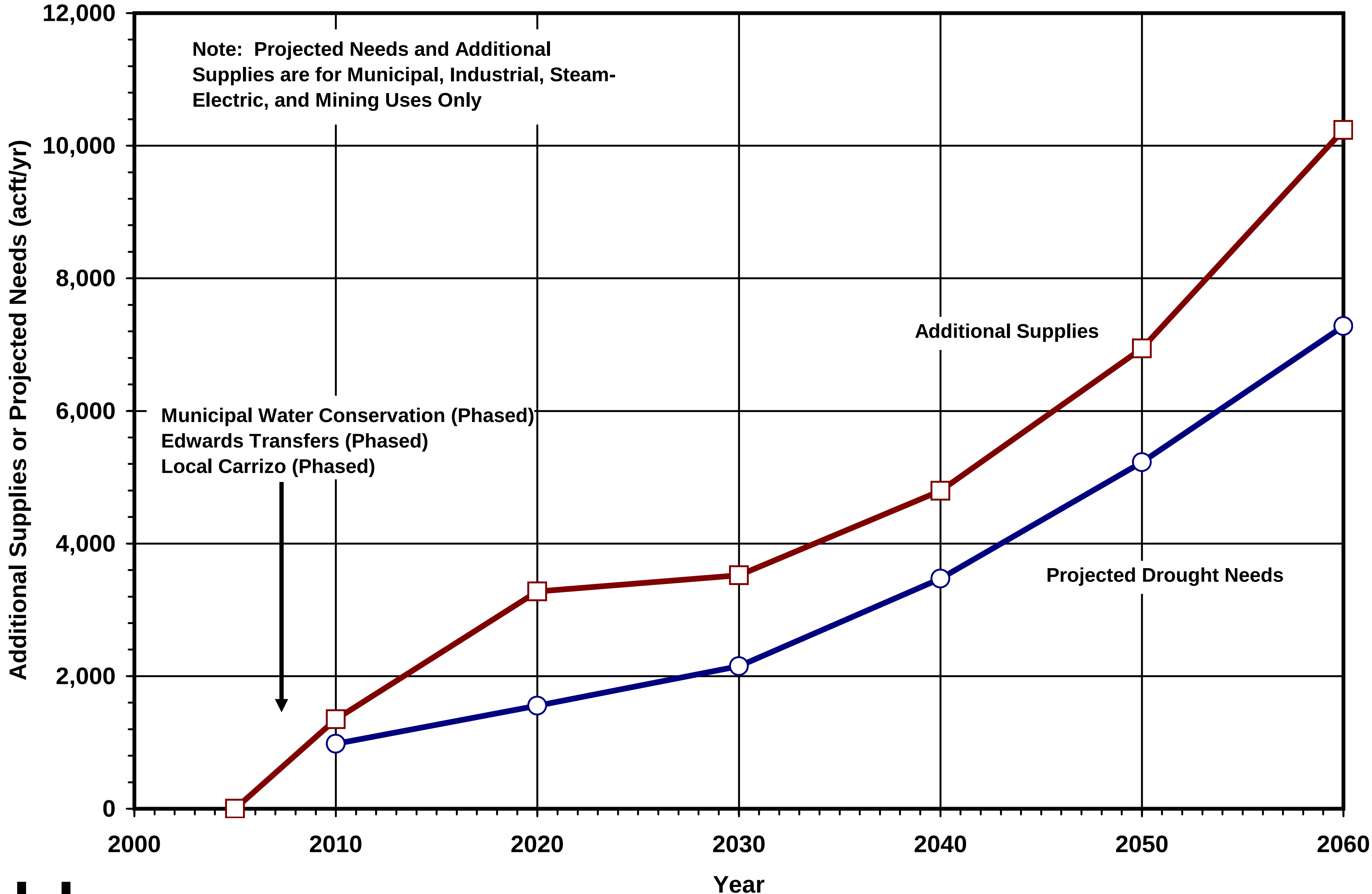
Projected Balance (w/ WMS):

	Year (acft)						
	2000	***2010***	***2020***	***2030***	***2040***	***2050***	***2060***
System Management Supply / (Deficit)*		**3,206**	**2,876**	**2,499**	**2,131**	**1,706**	**1,225**

[1] Assigned by Water User Group (WUG) based on Municipal Conservation WMS recommended by SCTRWPG.

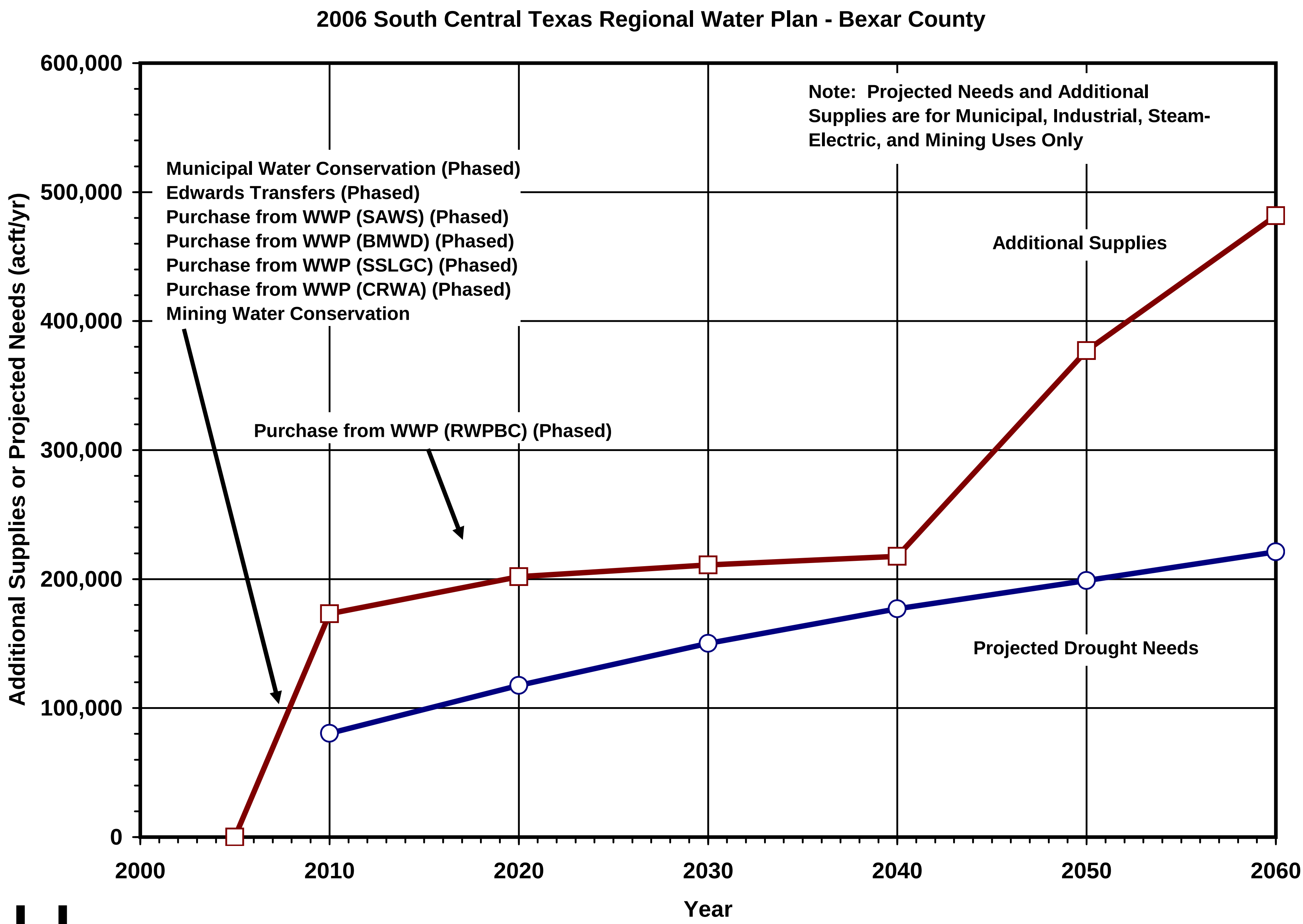
* System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

2006 South Central Texas Regional Water Plan - Atascosa County



H

2006 South Central Texas Regional Water Plan								County = Atascosa
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	981	1,555	2,149	2,597	3,013	3,326	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	874	2,212	3,952	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	1,961	1,022	111	0	0	0	
	Total Needs	**2,942**	**2,577**	**2,260**	**3,471**	**5,225**	**7,278**	
	Mun, Ind, S-E, & Min Needs	**981**	**1,555**	**2,149**	**3,471**	**5,225**	**7,278**	
	Irrigation & Livestock Needs	**1,961**	**1,022**	**111**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	345	651	885	1,032	1,240	1,482	1
Recommended	Edwards Transfers (L-15)	196	207	217	224	234	243	2
Recommended	Local Carrizo	807	2,421	2,421	3,541	5,468	8,514	3
Potential	Brush Management (SCTN-4)							4
Potential	Weather Modification (SCTN-5)							4
Potential	Rainwater Harvesting (SCTN-9)							4
Potential	Small Aquifer Recharge Dams							4
Recommended	Irrigation Water Conservation (L-10 Irr.)	1,961	1,022	111	0	0	0	5
	Total New Supplies	**3,309**	**4,301**	**3,634**	**4,797**	**6,942**	**10,239**	
	Total System Mgmt. Supply / (Deficit)	**367**	**1,724**	**1,374**	**1,326**	**1,717**	**2,961**	6
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**367**	**1,724**	**1,374**	**1,326**	**1,717**	**2,961**	6
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	6
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Benton City WSC, Charlotte, Jourdanton, Lytle, McCoy WSC, Pleasanton, Poteet, and County-Other.							
2	Lytle. Supply shown is 85 percent of the permit amount transferred after limitation of permitted Edwards pumpage to 400,000 acft/yr.							
3	Benton City WSC, McCoy WSC, and Steam-Electric use.							
4	WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.							
5	Based on use of LEPA systems with furrow dikes and conservation at 20 percent of application rate.							
6	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							


2006 South Central Texas Regional Water Plan - Bexar County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Municipal Water Conservation (Phased)
Edwards Transfers (Phased)
Purchase from WWP (SAWS) (Phased)
Purchase from WWP (BMWD) (Phased)
Purchase from WWP (SSLGC) (Phased)
Purchase from WWP (CRWA) (Phased)
Mining Water Conservation
Purchase from WWP (RWPBC) (Phased)
Additional Supplies
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
600,000
500,000
400,000
300,000
200,000
100,000
0
2000
2010
2020
2030
2040
2050
2060
Year

H

2006 South Central Texas Regional Water Plan								County = Bexar
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	77,184	110,690	139,186	162,527	181,507	200,529	
	Industrial	3,258	6,804	10,082	13,375	16,272	19,419	
	Steam-Electric	0	0	0	0	0	0	
	Mining	23	22	953	1,046	1,142	1,229	
	Irrigation & Livestock	184	150	609	573	540	508	
	Total Needs	**80,649**	**117,666**	**150,830**	**177,521**	**199,461**	**221,685**	
	Mun, Ind, S-E, & Min Needs	**80,465**	**117,516**	**150,221**	**176,948**	**198,921**	**221,177**	
	Irrigation & Livestock Needs	**184**	**150**	**609**	**573**	**540**	**508**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	7,223	10,384	13,379	16,353	22,884	32,800	1
Recommended	Edwards Transfers (L-15)	55,740	56,510	57,150	57,417	57,727	58,113	2
Recommended	Mining Water Conservation	25	25	25	25	25	25	
Recommended	Purchase from WWP (SAWS)	85,562	90,360	94,914	98,393	251,005	253,108	3
Recommended	Purchase from WWP (BMWD)	22,400	22,400	22,400	22,400	22,400	22,400	3
Recommended	Purchase from WWP (SSLGC)	700	700	700	700	700	700	3
Recommended	Purchase from WWP (CRWA)	1,500	8,000	8,900	8,900	8,900	8,900	3
Recommended	Purchase from WWP (RWPBC)		13,451	13,451	13,451	13,451	105,589	3
Recommended	Recycled Water							
Recommended	Surface Water Rights							
Recommended	Local Storage							
Potential	Brush Management (SCTN-4)							4
Potential	Weather Modification (SCTN-5)							4
Potential	Rainwater Harvesting (SCTN-9)							4
Potential	Small Aquifer Recharge Dams							4
Potential	Edwards Aquifer Recharge & Recirculation Systems							4
Potential	Cooperation w/ Corpus Christi for New Water Sources							
Recommended	Local Carrizo (Livestock)			91	91	91	91	5
Recommended	Irrigation Water Conservation (L-10 Irr.)	529	529	529	529	529	529	6
	Total New Supplies	**173,679**	**202,359**	**211,539**	**218,259**	**377,712**	**482,255**	
	Total System Mgmt. Supply / (Deficit)	**93,030**	**84,693**	**60,709**	**40,738**	**178,251**	**260,570**	7
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**92,685**	**84,314**	**60,698**	**40,691**	**178,171**	**260,458**	7
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**345**	**379**	**11**	**47**	**80**	**112**	7

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Alamo Heights, Atascosa Rural WSC, Balcones Heights, Bexar Metropolitan Water District, Castle Hills, China Grove, Converse, East Central WSC, Elmendorf, Fairoaks Ranch, Helotes, Hill Country Village, Hollywood Park, Lackland AFB, Leon Valley, Olmos Park, San Antonio, Selma, Shavano Park, Somerset, St. Hedwig, Terrell Hills, Universal City, Water Services, Inc., Windcrest, and County-Other.

2 Alamo Heights, Atascosa Rural WSC, BMWD, Kirby, Lackland AFB (CDP), SAWS, Shavano Park, Universal City, and Water Services, Inc. Supply shown is 85 percent of the permit amount transferred after limitation of permitted Edwards pumpage to 400,000 acft/yr.

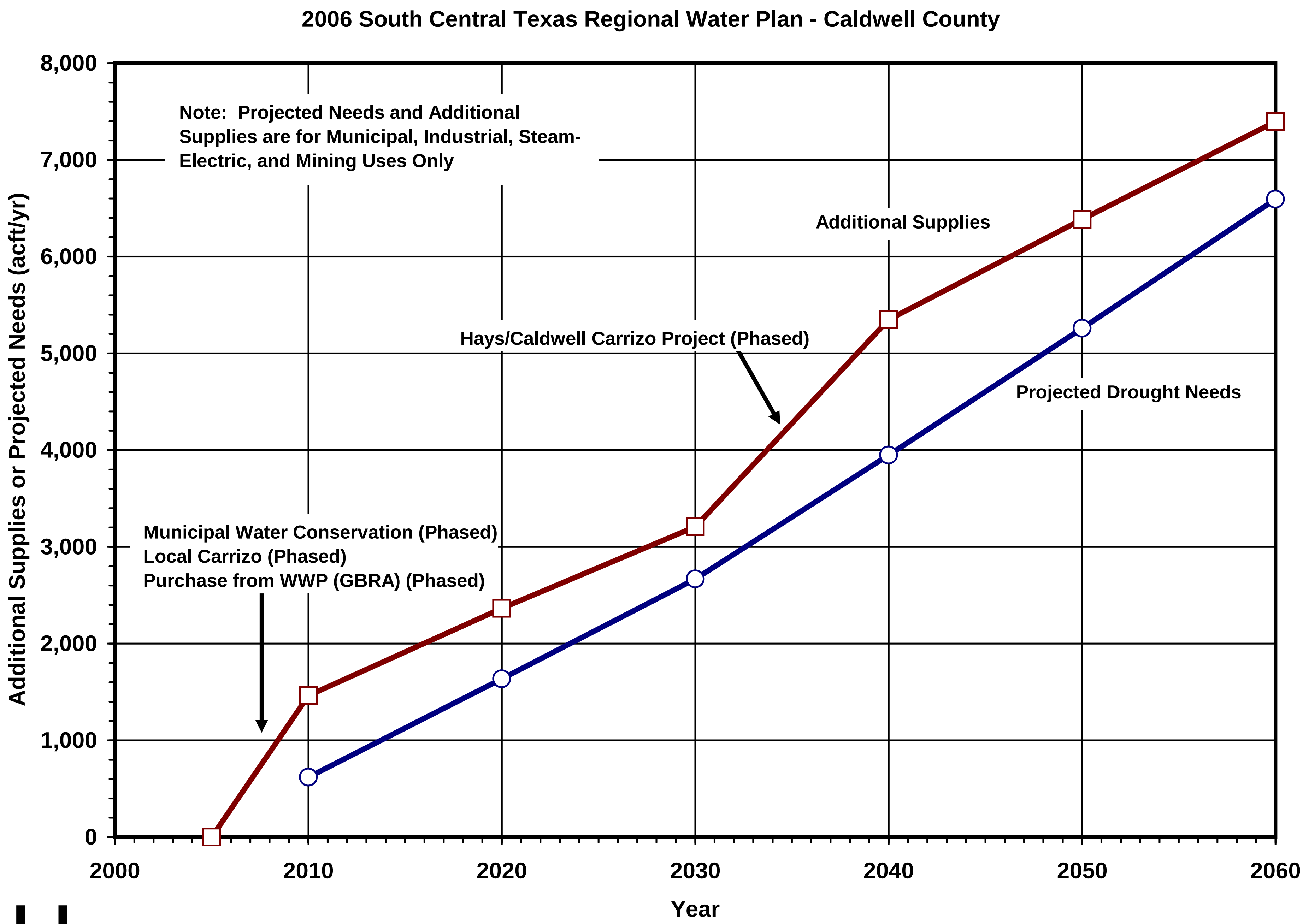
3 See Wholesale Water Provider (WWP) tables for specific Water Management Strategies (WMS).

4 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.

5 Allocation exceeds availability estimated for the 1997 State Water Plan in some decades.

6 Based on use of LEPA systems with furrow dikes and conservation at 20 percent of application rate.

7 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.



2006 South Central Texas Regional Water Plan - Caldwell County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Hays/Caldwell Carrizo Project (Phased)
Projected Drought Needs
Municipal Water Conservation (Phased)
Local Carrizo (Phased)
Purchase from WWP (GBRA) (Phased)
Additional Supplies or Projected Needs (acft/yr)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2000
2010
2020
2030
2040
2050
2060
Year

H

2006 South Central Texas Regional Water Plan								County = Caldwell
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	618	1,635	2,668	3,948	5,260	6,593	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**618**	**1,635**	**2,668**	**3,948**	**5,260**	**6,593**	
	Mun, Ind, S-E, & Min Needs	**618**	**1,635**	**2,668**	**3,948**	**5,260**	**6,593**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	102	154	219	325	486	756	1
Recommended	Local Carrizo	1,342	2,148	2,791	3,435	3,675	3,675	2
Recommended	Purchase from WWP (GBRA)	19	62	99	137	175	213	3
Recommended	Purchase from WWP (GBRA)			100	450	550	750	4
Recommended	Hays/Caldwell Carrizo Project				1,000	1,500	2,000	10
Alternative	LCRA-SAWS Water Project - Bastrop Diversion							5
Alternative	Hays/Caldwell Carrizo Project							6
Alternative	Local Trinity							7
Potential	Small Aquifer Recharge Dams							8
Potential	Lockhart Reservoir							9
	Total New Supplies	**1,463**	**2,364**	**3,209**	**5,347**	**6,386**	**7,394**	
	Total System Mgmt. Supply / (Deficit)	**845**	**729**	**541**	**1,399**	**1,126**	**801**	11
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**845**	**729**	**541**	**1,399**	**1,126**	**801**	11
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Aqua WSC, Creedmoor-Maha WSC, Lockhart, Luling, Martindale WSC, Maxwell WSC, Mustang Ridge, Polonia WSC, and County-Other.

2 Aqua WSC, Lockhart, Luling, and Polonia WSC.

3 Mustang Ridge.

4 Martindale WSC and Maxwell WSC. Water treatment by CRWA.

5 Alternative for Aqua WSC, Creedmoor-Maha WSC, and Mustang Ridge.

6 Creedmoor-Maha WSC, Martindale WSC, Maxwell WSC, and Polonia WSC.

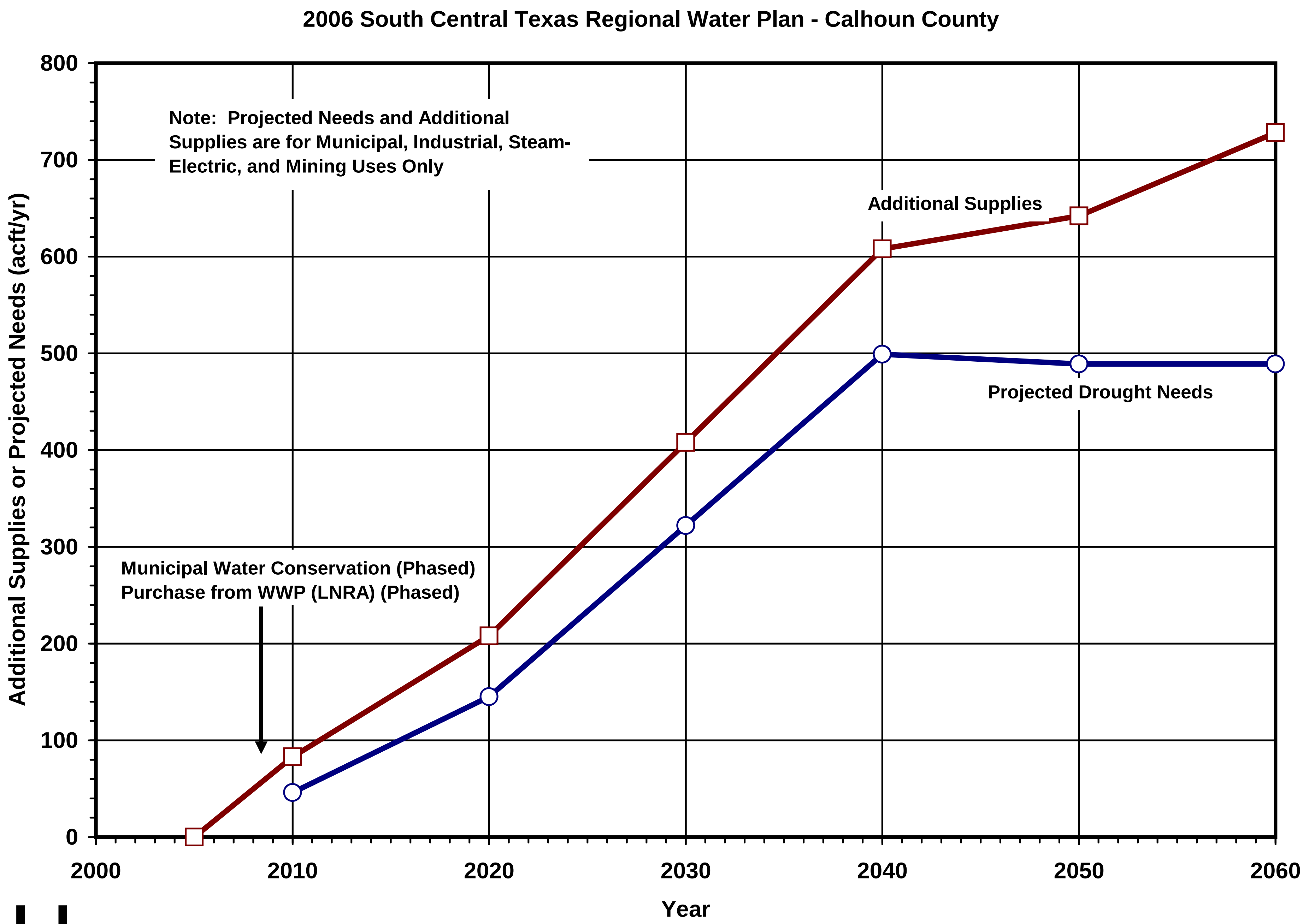
7 Martindale WSC and Maxwell WSC. Caldwell County source, located at CRWA Hays/Caldwell WTP site.

8 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.

9 Potential supply for Lockhart and others. May be considered as an amendment to the Regional Water Plan.

10 Lockhart. This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD.

11 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


2006 South Central Texas Regional Water Plan - Calhoun County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Projected Drought Needs
Municipal Water Conservation (Phased)
Purchase from WWP (LNRA) (Phased)
Additional Supplies or Projected Needs (acft/yr)
Year
0
100
200
300
400
500
600
700
800
2000
2010
2020
2030
2040
2050
2060

H

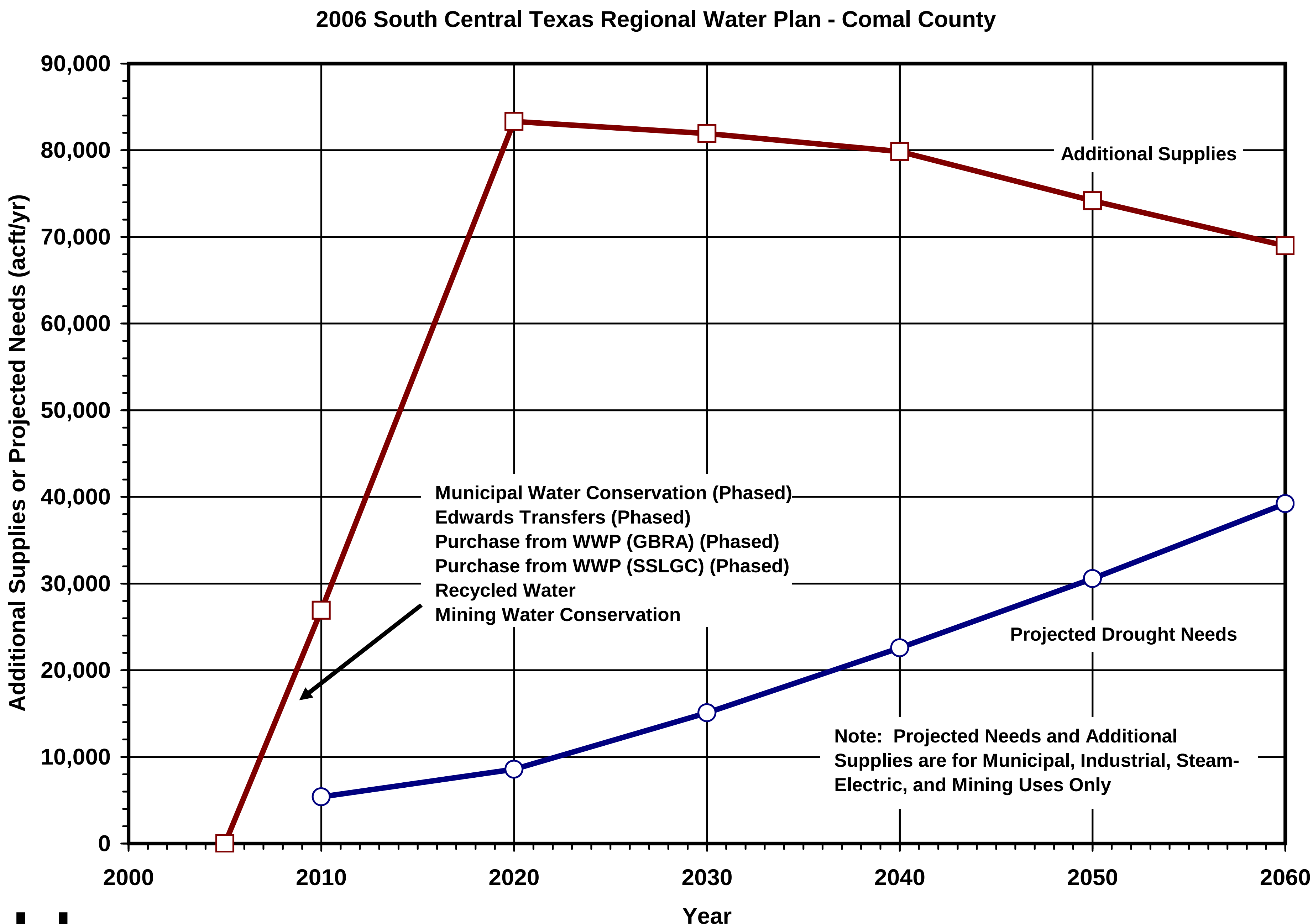
2006 South Central Texas Regional Water Plan							County = Calhoun
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							
Projected Water Needs (acft/yr)							
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	46	145	322	499	489	489	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**46**	**145**	**322**	**499**	**489**	**489**	
	Mun, Ind, S-E, & Min Needs	**46**	**145**	**322**	**499**	**489**	**489**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	37	63	86	109	153	239	1
Recommended	Purchase from WWP (LNRA)	46	145	322	499	489	489	2
	Total New Supplies	**83**	**208**	**408**	**608**	**642**	**728**	
	Total System Mgmt. Supply / (Deficit)	**37**	**63**	**86**	**109**	**153**	**239**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**37**	**63**	**86**	**109**	**153**	**239**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Point Comfort, Port Lavaca, Seadrift, and County-Other.

2 Additional contracted supplies from the Lavaca-Navidad River Authority.

3 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

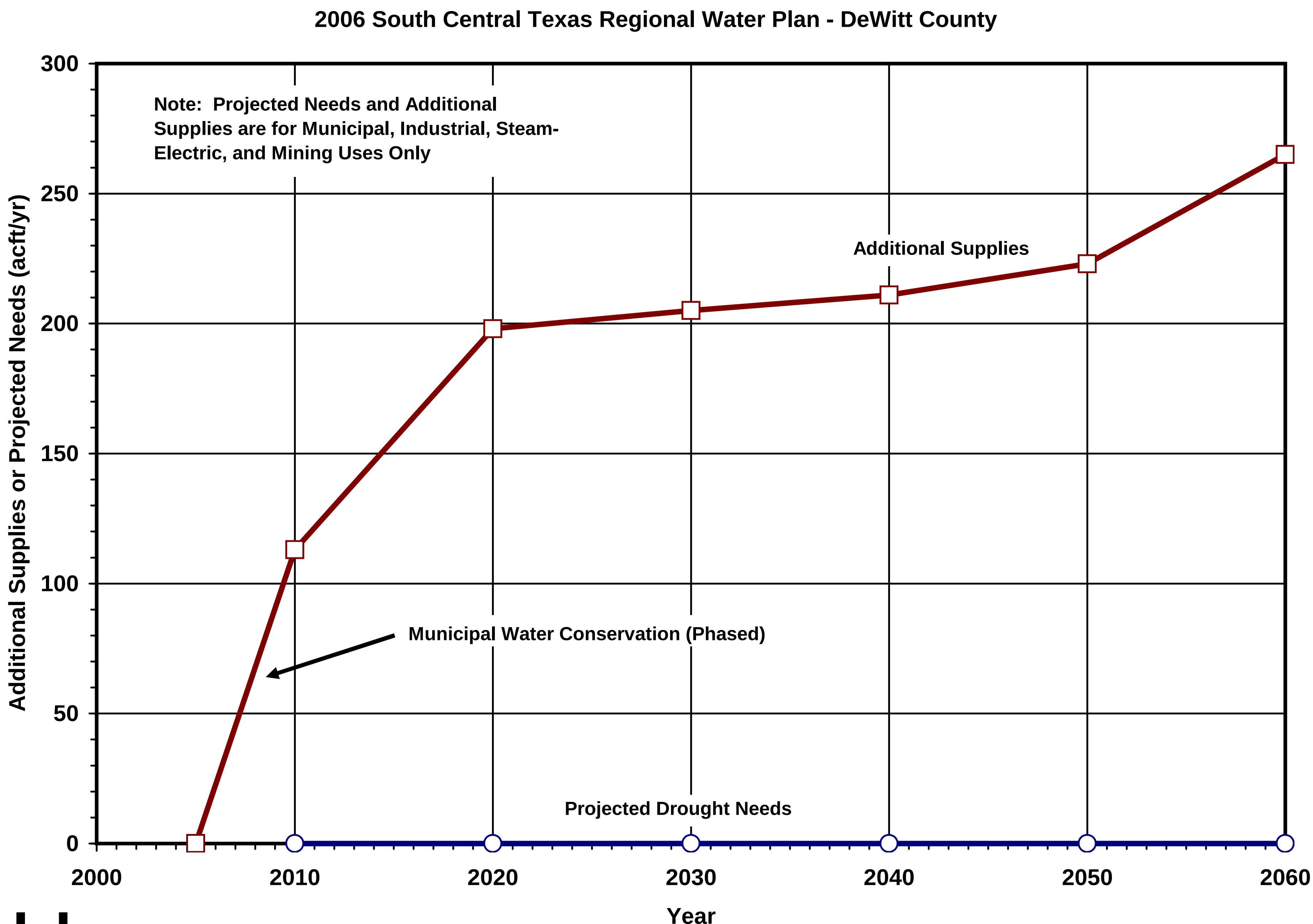

2006 South Central Texas Regional Water Plan - Comal County
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Additional Supplies or Projected Needs (acft/yr)
2000
2010
2020
2030
2040
2050
2060
Year
Additional Supplies
Municipal Water Conservation (Phased)
Edwards Transfers (Phased)
Purchase from WWP (GBRA) (Phased)
Purchase from WWP (SSLGC) (Phased)
Recycled Water
Mining Water Conservation
Projected Drought Needs
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only

H

2006 South Central Texas Regional Water Plan								County = Comal
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	3,482	6,481	12,816	19,469	26,574	34,234	
	Industrial	0	0	59	789	1,416	2,297	
	Steam-Electric	0	0	0	0	0	0	
	Mining	1,905	2,094	2,210	2,324	2,590	2,694	
	Irrigation & Livestock	109	111	111	112	120	120	
	Total Needs	**5,496**	**8,686**	**15,196**	**22,694**	**30,700**	**39,345**	
	Mun, Ind, S-E, & Min Needs	**5,387**	**8,575**	**15,085**	**22,582**	**30,580**	**39,225**	
	Irrigation & Livestock Needs	**109**	**111**	**111**	**112**	**120**	**120**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	857	2,165	4,111	6,399	8,218	10,542	1
Recommended	Purchase from WWP (GBRA)	23,873	78,636	74,968	69,608	61,049	52,349	2
Recommended	Edwards Transfers (L-15)	115	171	234	298	364	436	3
Recommended	Purchase from WWP (SSLGC)	170	252	346	440	537	644	7
Recommended	Recycled Water	505	694	869	1,713	2,606	3,591	4
Recommended	Mining Water Conservation	1,400	1,400	1,400	1,400	1,400	1,400	5
Alternative	Local Trinity							6
Alternative	Regional Carrizo							8
Potential	Brush Management (SCTN-4)							9
Potential	Weather Modification (SCTN-5)							9
Potential	Rainwater Harvesting (SCTN-9)							9
Potential	Small Aquifer Recharge Dams							9
Recommended	Local Trinity (Livestock)	120	120	120	120	120	120	6
	Total New Supplies	**27,040**	**83,438**	**82,048**	**79,978**	**74,294**	**69,082**	
	Total System Mgmt. Supply / (Deficit)	**21,544**	**74,752**	**66,852**	**57,284**	**43,594**	**29,737**	10
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**21,533**	**74,743**	**66,843**	**57,276**	**43,594**	**29,737**	10
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**11**	**9**	**9**	**8**	**0**	**0**	10

Notes:

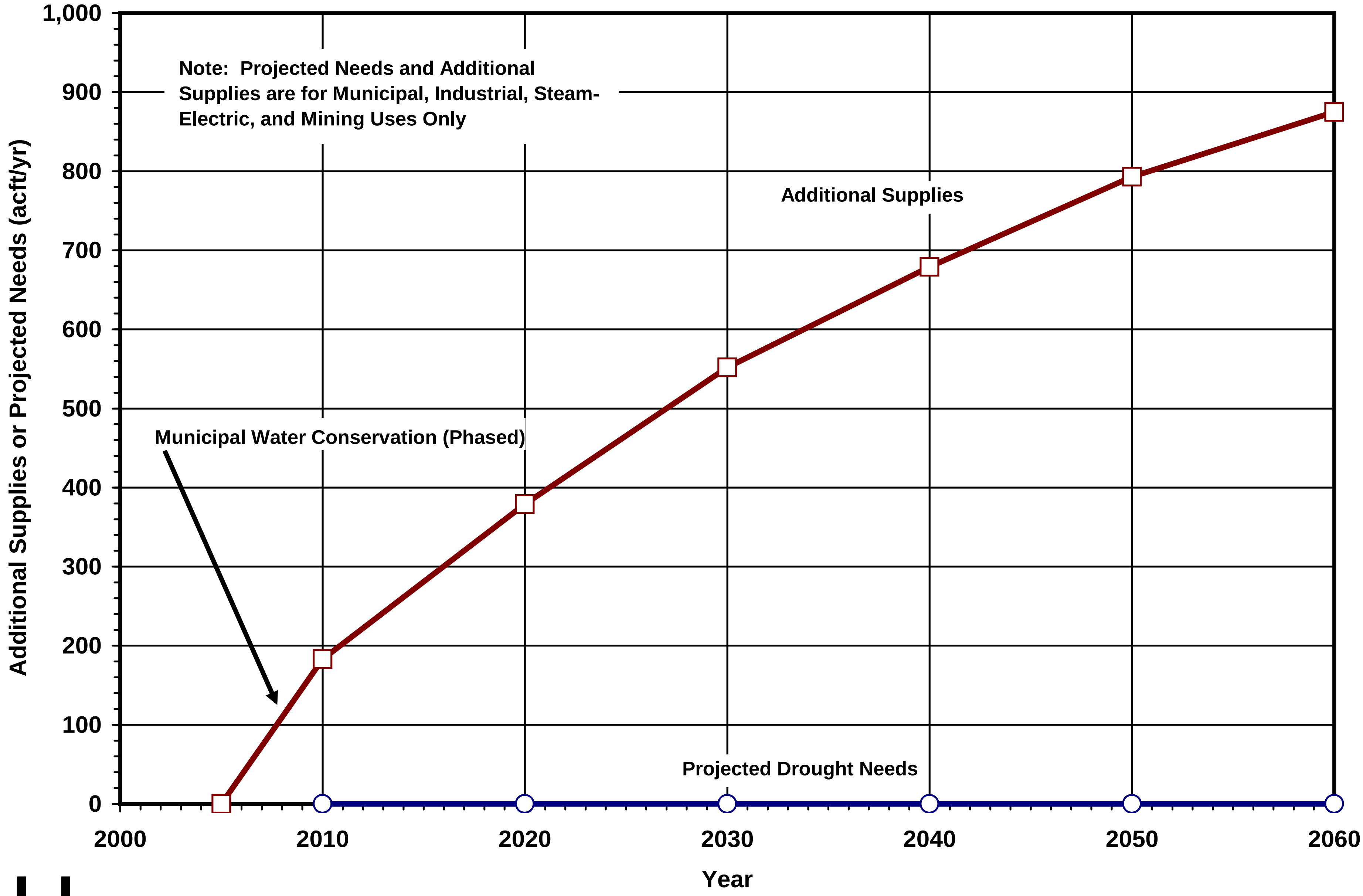
1 Supplies shown reflect implementation of additional conservation measures by Bulverde, Canyon Lake WSC, Garden Ridge, New Braunfels, and County-Other.
2 Bulverde, Canyon Lake WSC, New Braunfels, County-Other, and Uncommitted (Canyon & LGWSP). Alternative for Industrial.
3 Garden Ridge. Supply shown is 85 percent of the permit amount transferred after limitation of permitted Edwards pumpage to 400,000 acft/yr. Additional constraints on transfers across Cibolo Creek per EAA rules.
4 Industrial and Mining. Alternative for New Braunfels. Increased recycled water availability with growth of New Braunfels.
5 On-site water recycling. Other reliable and economically feasible supply sources limited.
6 Garden Ridge and Livestock. Allocation exceeds availability estimated for the 1997 State Water Plan. Potentially increase pumping capacity in existing wells or drill additional wells.
7 Garden Ridge.
8 New Braunfels, County-Other, Industrial, and Mining.
9 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.
10 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


2006 South Central Texas Regional Water Plan - DeWitt County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Municipal Water Conservation (Phased)
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
300
250
200
150
100
50
0
2000
2010
2020
2030
2040
2050
2060
Year

H

2006 South Central Texas Regional Water Plan								County = DeWitt
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	113	198	205	211	223	265	1
	Total New Supplies	**113**	**198**	**205**	**211**	**223**	**265**	
	Total System Mgmt. Supply / (Deficit)	**113**	**198**	**205**	**211**	**223**	**265**	2
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**113**	**198**	**205**	**211**	**223**	**265**	2
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Cuero, Yoakum, Yorktown, and County-Other.							
2	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							

2006 South Central Texas Regional Water Plan - Dimmit County



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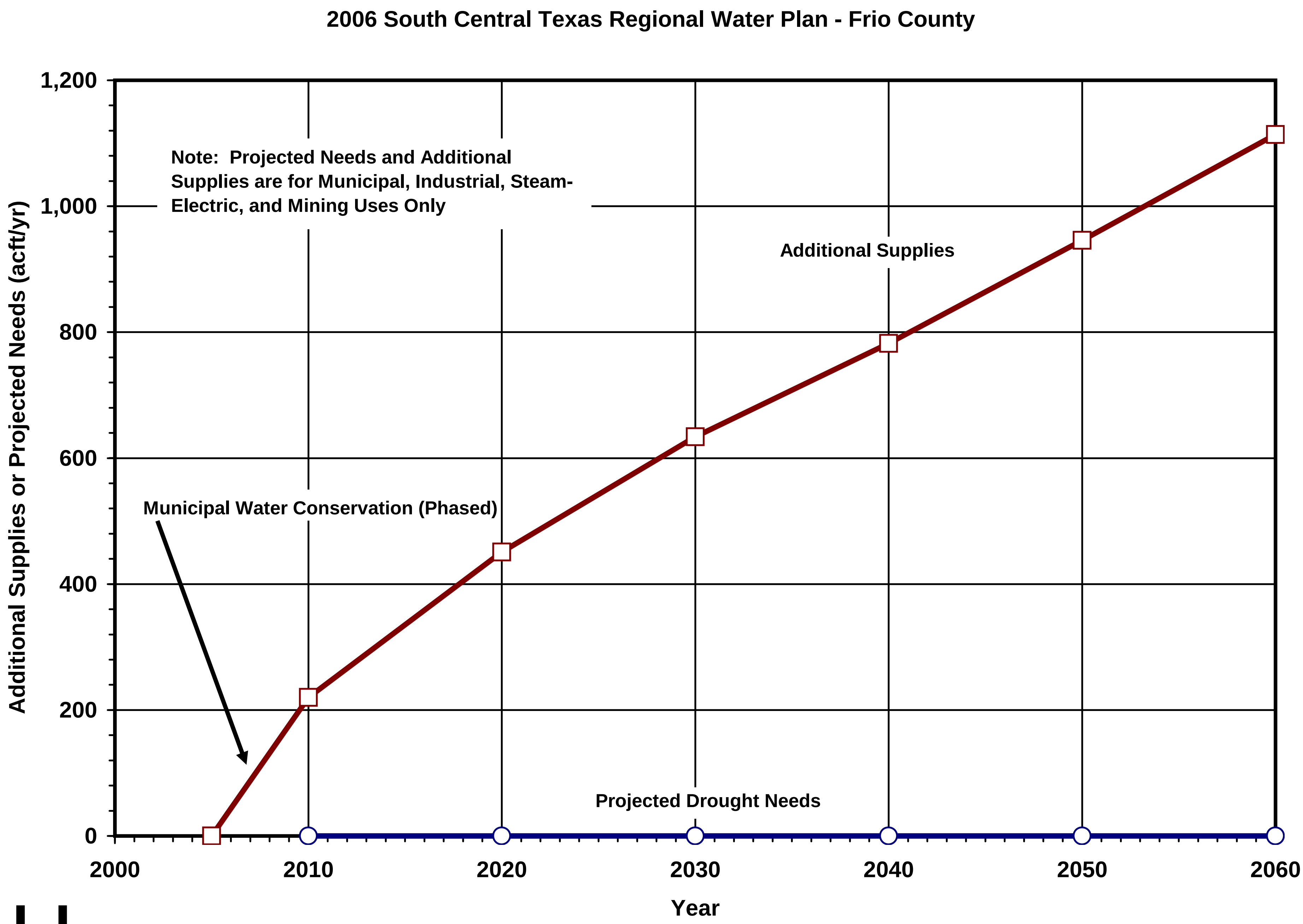
2006 South Central Texas Regional Water Plan								County = Dimmit
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	183	379	552	679	793	875	1
Potential	Brush Management (SCTN-4)							2
Potential	Weather Modification (SCTN-5)							2
Potential	Rainwater Harvesting (SCTN-9)							2
Potential	Small Aquifer Recharge Dams							2
	Total New Supplies	**183**	**379**	**552**	**679**	**793**	**875**	
	Total System Mgmt. Supply / (Deficit)	**183**	**379**	**552**	**679**	**793**	**875**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**183**	**379**	**552**	**679**	**793**	**875**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Asherton, Big Wells, and Carrizo Springs.

2 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.

3 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


2006 South Central Texas Regional Water Plan - Frio County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Municipal Water Conservation (Phased)
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
0
200
400
600
800
1,000
1,200
2000
2010
2020
2030
2040
2050
2060
Year

H

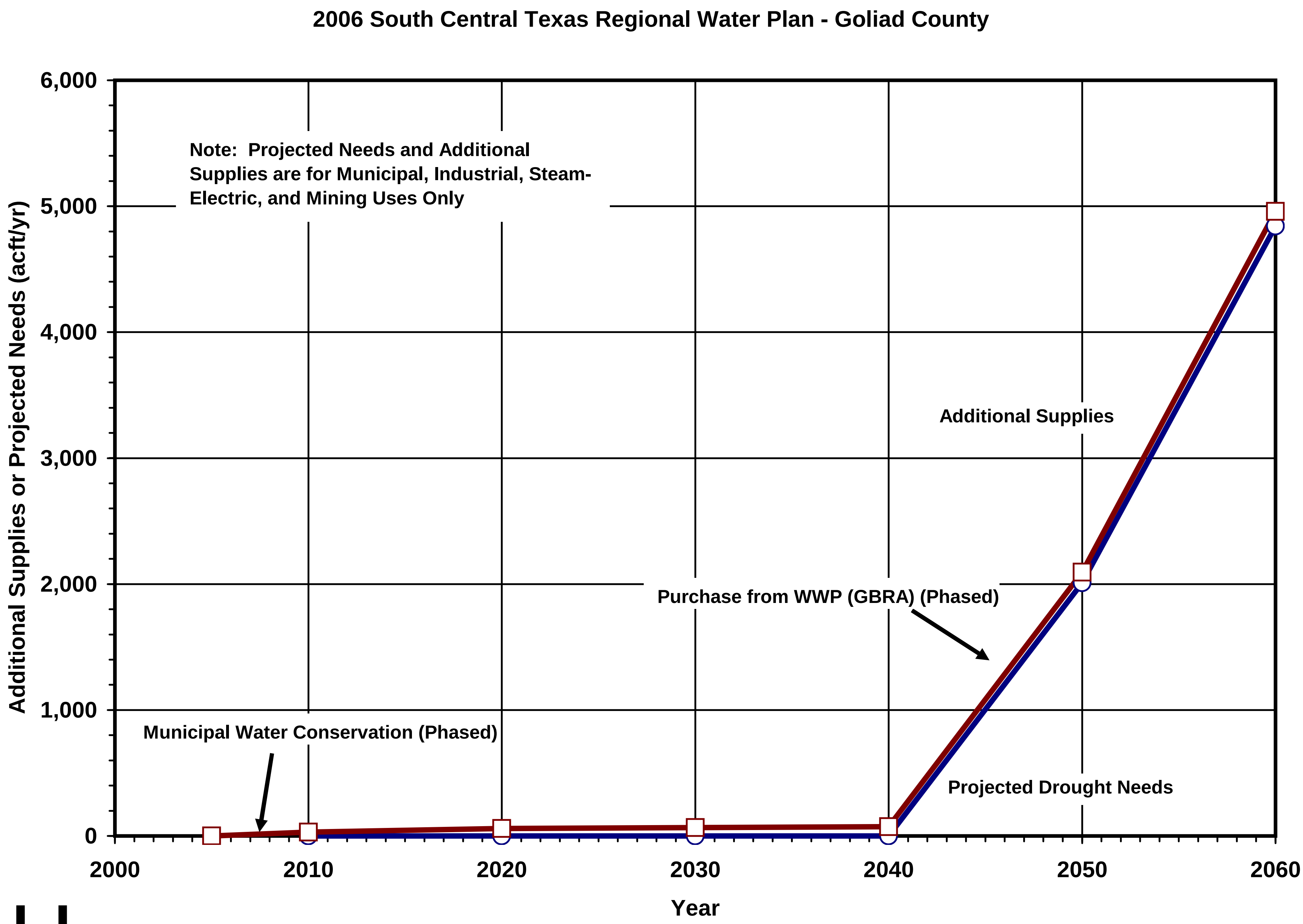
2006 South Central Texas Regional Water Plan								County = Frio
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	220	451	634	782	946	1,114	1
Potential	Brush Management (SCTN-4)							2
Potential	Weather Modification (SCTN-5)							2
Potential	Rainwater Harvesting (SCTN-9)							2
Potential	Small Aquifer Recharge Dams							2
	Total New Supplies	**220**	**451**	**634**	**782**	**946**	**1,114**	
	Total System Mgmt. Supply / (Deficit)	**220**	**451**	**634**	**782**	**946**	**1,114**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**220**	**451**	**634**	**782**	**946**	**1,114**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Dilley, Pearsall, and County-Other.

2 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.

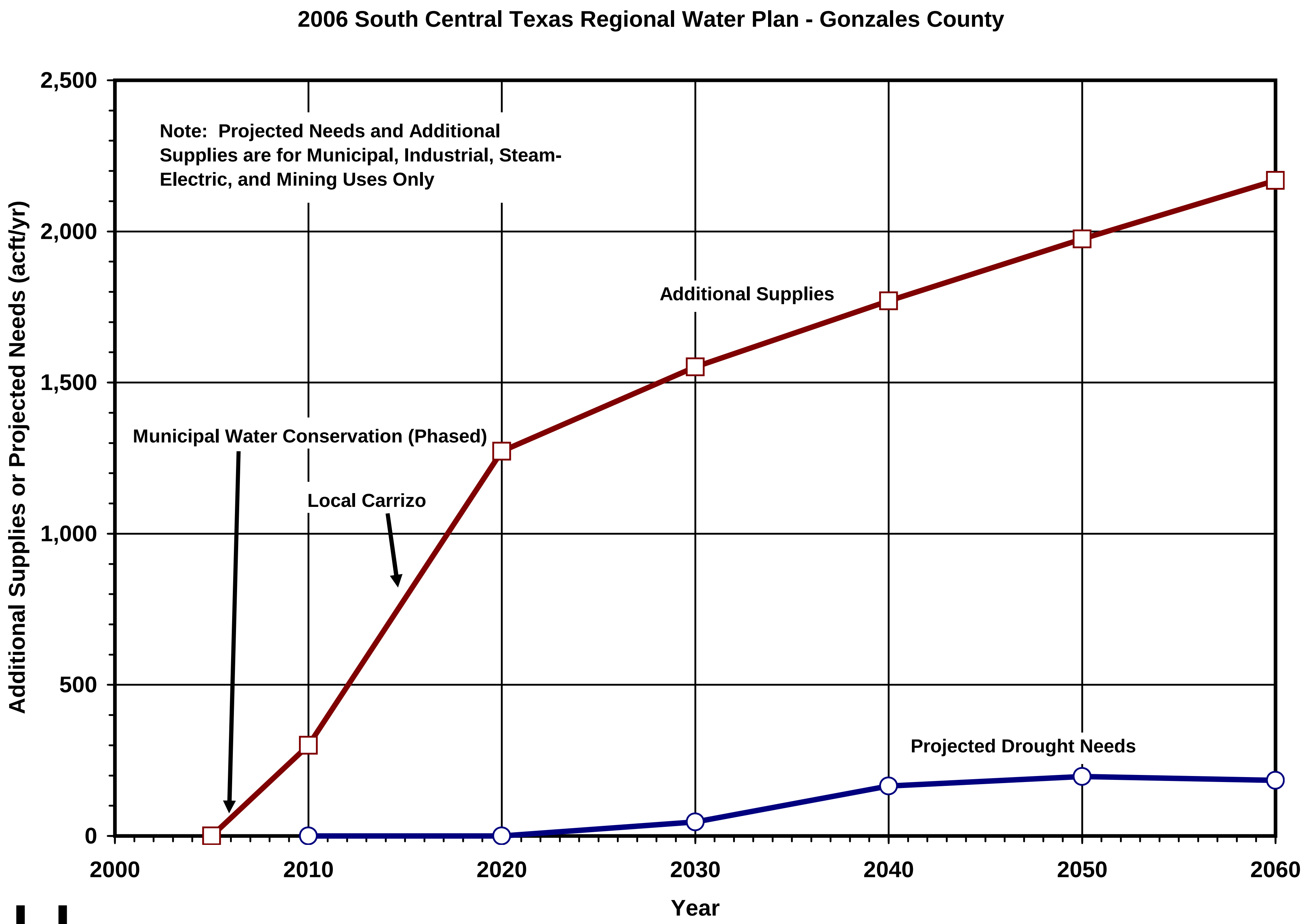
3 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.



2006 South Central Texas Regional Water Plan - Goliad County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Purchase from WWP (GBRA) (Phased)
Municipal Water Conservation (Phased)
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
6,000
5,000
4,000
3,000
2,000
1,000
0
2000
2010
2020
2030
2040
2050
2060
Year

H

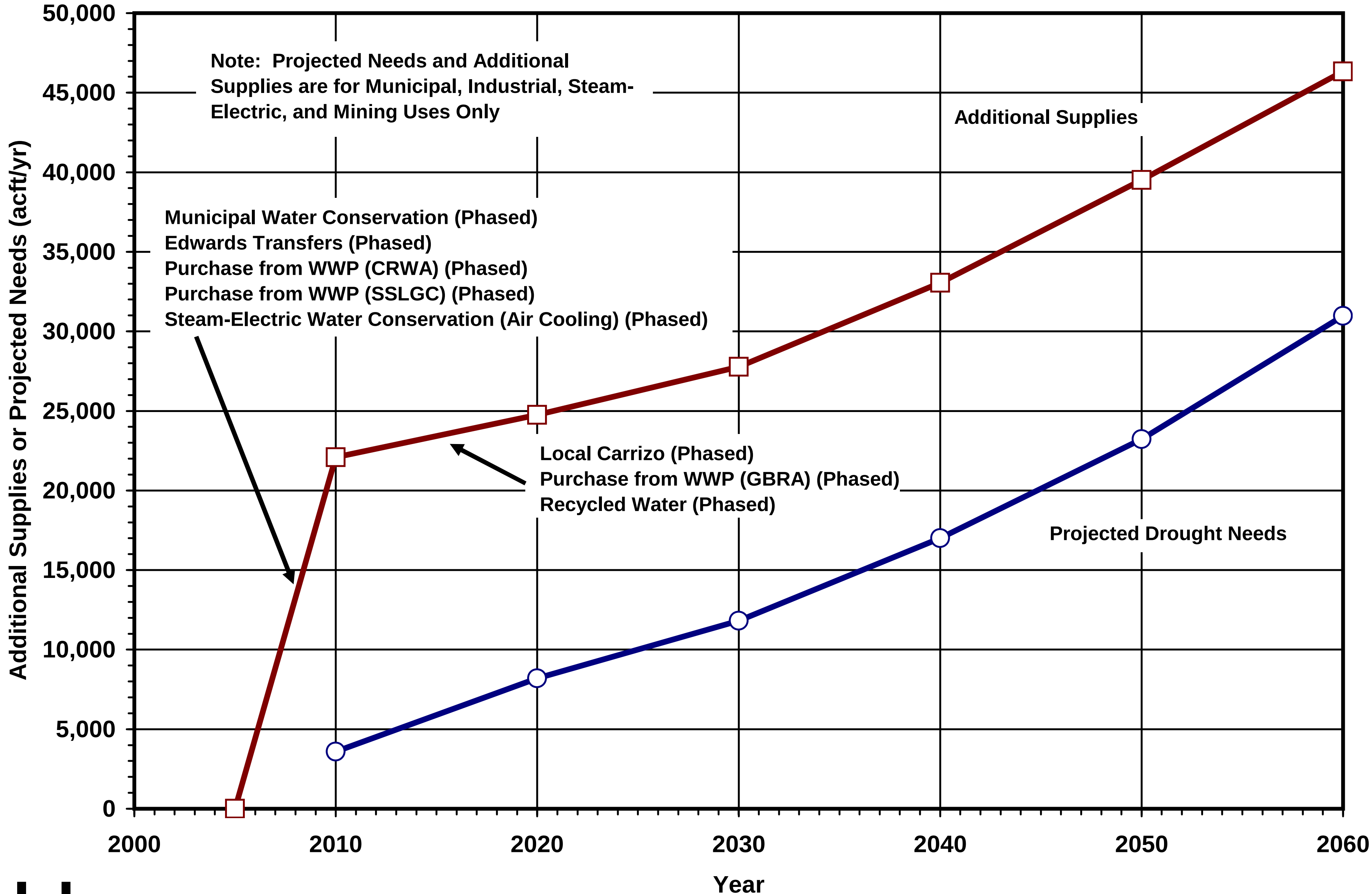
2006 South Central Texas Regional Water Plan							County = Goliad
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							
Projected Water Needs (acft/yr)							
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	2010	4842	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**0**	**2,010**	**4,842**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**2,010**	**4,842**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	30	59	67	73	85	117	1
Recommended	Purchase from WWP (GBRA)					2,010	4,842	2
	Total New Supplies	**30**	**59**	**67**	**73**	**2,095**	**4,959**	
	Total System Mgmt. Supply / (Deficit)	**30**	**59**	**67**	**73**	**85**	**117**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**30**	**59**	**67**	**73**	**85**	**117**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Goliad and County-Other.							
2	Steam-Electric use at Coleto Creek Power Station. Supply from GBRA lower basin run-of-river rights.							
3	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							


2006 South Central Texas Regional Water Plan - Gonzales County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Municipal Water Conservation (Phased)
Local Carrizo
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
2,500
2,000
1,500
1,000
500
0
2000
2010
2020
2030
2040
2050
2060
Year

H

2006 South Central Texas Regional Water Plan						County = Gonzales		
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	46	165	197	184	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**46**	**165**	**197**	**184**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**46**	**165**	**197**	**184**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	300	628	907	1,125	1,330	1,524	1
Recommended	Local Carrizo		645	645	645	645	645	2
	Total New Supplies	**300**	**1,273**	**1,552**	**1,770**	**1,975**	**2,169**	
	Total System Mgmt. Supply / (Deficit)	**300**	**1,273**	**1,506**	**1,605**	**1,778**	**1,985**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**300**	**1,273**	**1,506**	**1,605**	**1,778**	**1,985**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Gonzales, Gonzales County WSC, Nixon, Waelder, and County-Other.							
2	Gonzales County WSC.							
3	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							

2006 South Central Texas Regional Water Plan - Guadalupe County



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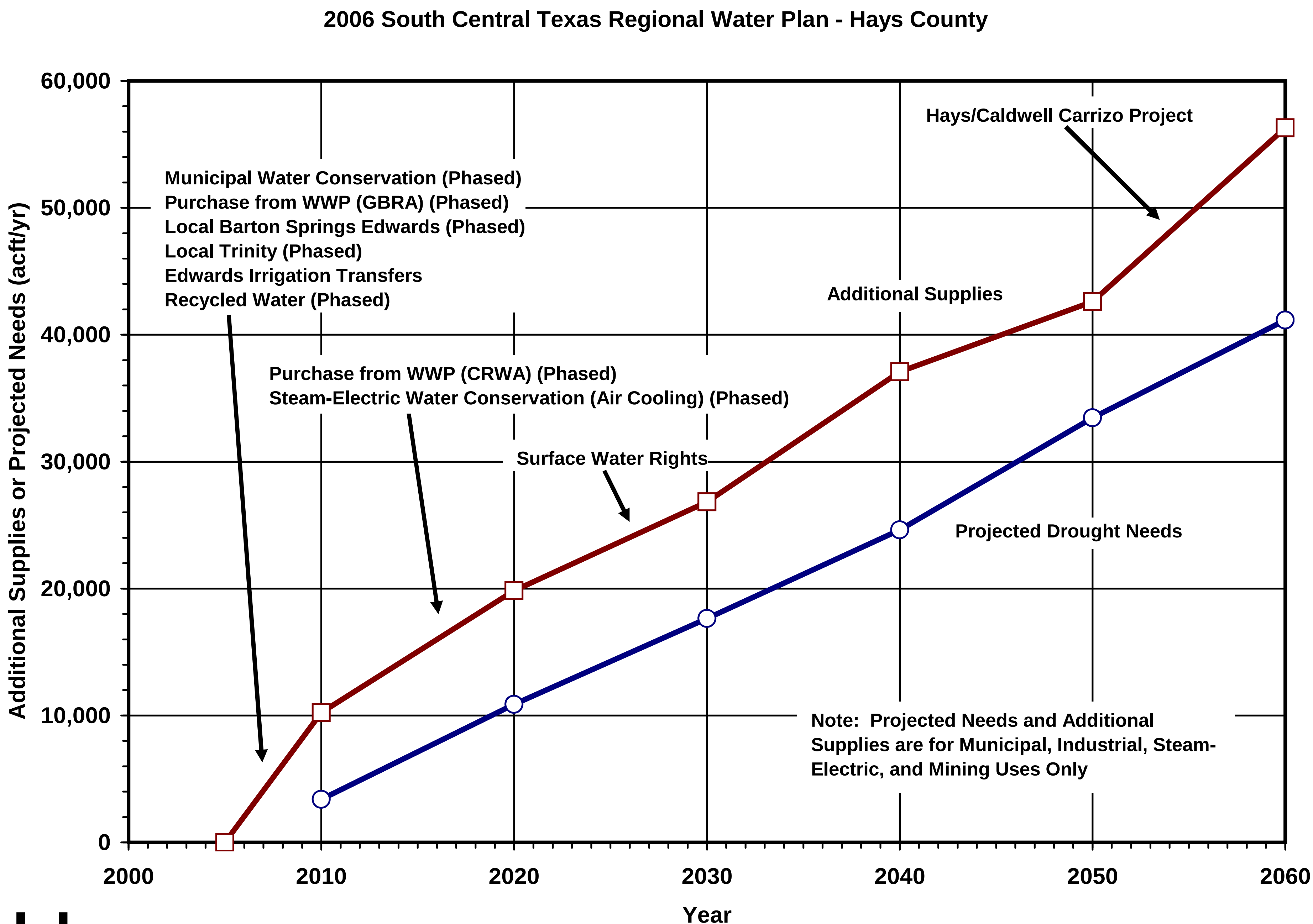
2006 South Central Texas Regional Water Plan								County = Guadalupe
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	366	635	1,816	4,039	6,630	9,965	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	3,225	7,567	10,004	12,974	16,595	21,008	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**3,591**	**8,202**	**11,820**	**17,013**	**23,225**	**30,973**	
	Mun, Ind, S-E, & Min Needs	**3,591**	**8,202**	**11,820**	**17,013**	**23,225**	**30,973**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	640	1,498	2,178	2,780	3,729	5,034	1
Recommended	Local Carrizo		200	600	1,000	1,000	1,000	2
Recommended	Edwards Transfers	1,200	1,400	1,400	1,400	1,400	1,400	3
Recommended	Purchase from WWP (GBRA)		100	600	1,500	1,500	1,500	4
Recommended	Purchase from WWP (CRWA)	5,100	2,142	1,242	1,742	3,734	4,938	5
Recommended	Purchase from WWP (SSLGC)	11,930	11,848	11,754	11,660	11,563	11,456	6
Recommended	Recycled Water		300	600	800	900	900	7
Recommended	Steam-Electric Water Conservation (Air Cooling)	3,225	7,267	9,404	12,174	15,695	20,108	13
Alternative	Local Trinity							8, 9
Alternative	Hays/Caldwell Carrizo Project							10
Alternative	Purchase from WWP (SHWSC)							10
Alternative	Recycled Water							10
Potential	Wells Ranch Carrizo Project							11
Potential	Recycled Water							12
	Total New Supplies	**22,095**	**24,755**	**27,778**	**33,056**	**39,521**	**46,336**	
	Total System Mgmt. Supply / (Deficit)	**18,504**	**16,553**	**15,958**	**16,043**	**16,296**	**15,363**	14
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**18,504**	**16,553**	**15,958**	**16,043**	**16,296**	**15,363**	14
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1	Supplies shown reflect implementation of additional conservation measures by Cibolo, Crystal Clear WSC, Green Valley SUD, Marion, Santa Clara, Schertz, Seguin, Springs Hill WSC, and County-Other.
2	Crystal Clear WSC. Wilcox Aquifer near Kingsbury.
3	Crystal Clear WSC and Green Valley SUD. Additional constraints on transfers across Cibolo Creek per EAA rules.
4	Crystal Clear WSC and Green Valley SUD (via NBU or CRWA).
5	Cibolo, Crystal Clear WSC, Green Valley SUD, Marion, Santa Clara, County-Other, and Uncommitted.
6	Crystal Clear WSC, Green Valley SUD, Schertz, Seguin, and Uncommitted.
7	Steam-Electric.
8	Green Valley SUD. Comal County source. WMS exceeds availability estimated for the 1997 State Water Plan.
9	Crystal Clear WSC. Caldwell County source.
10	Crystal Clear WSC.
11	Potential supply for Green Valley SUD and Crystal Clear WSC. May be considered as an amendment to the Regional Plan.
12	Potential supply for all water user groups.
13	Limited available proximate water sources and somewhat arbitrary assignment of steam-electric water demands to Guadalupe County necessitate that the SCTRWPG recommend installation of air, rather than water, cooling systems for any power generation facility expansions in Guadalupe County. Recycled water may also be a viable alternative. It is further recognized that it may not be economically feasible to satisfy all projected water needs for steam-electric power generation assigned to Guadalupe County.
14	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


2006 South Central Texas Regional Water Plan - Hays County
Additional Supplies or Projected Needs (acft/yr)
60,000
50,000
40,000
30,000
20,000
10,000
0
2000
2010
2020
2030
2040
2050
2060
Year
Hays/Caldwell Carrizo Project
Municipal Water Conservation (Phased)
Purchase from WWP (GBRA) (Phased)
Local Barton Springs Edwards (Phased)
Local Trinity (Phased)
Edwards Irrigation Transfers
Recycled Water (Phased)
Additional Supplies
Purchase from WWP (CRWA) (Phased)
Steam-Electric Water Conservation (Air Cooling) (Phased)
Surface Water Rights
Projected Drought Needs
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only

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2006 South Central Texas Regional Water Plan							County = Hays
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							
Projected Water Needs (acft/yr)							
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	3,308	9,567	15,038	20,442	27,344	32,695	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	1,231	2,522	4,095	6,013	8,351	
	Mining	82	87	91	94	106	107	
	Irrigation & Livestock	82	82	82	82	82	82	
	Total Needs	**3,472**	**10,967**	**17,733**	**24,713**	**33,545**	**41,235**	
	Mun, Ind, S-E, & Min Needs	**3,390**	**10,885**	**17,651**	**24,631**	**33,463**	**41,153**	
	Irrigation & Livestock Needs	**82**	**82**	**82**	**82**	**82**	**82**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	518	872	1,451	2,211	3,369	4,863	1
Recommended	Purchase from WWP (GBRA)	7,673	15,195	17,456	19,079	21,473	22,933	2
Recommended	Purchase from WWP (CRWA)		500	500	1,000	1,000	1,000	3
Recommended	Local Barton Springs Edwards	150	150	150	150	200	200	4
Recommended	Local Trinity	804	804	804	804	804	1,208	5
Recommended	Edwards Transfers (L-15)	1,000	1,000	1,000	1,000	1,000	1,000	6
Recommended	Surface Water Rights			2,867	2,867	2,867	2,867	7
Recommended	Recycled Water	82	87	91	5,872	5,884	5,885	8
Recommended	Hays/Caldwell Carrizo Project						8,000	9
Recommended	Steam-Electric Water Conservation (Air Cooling)		1,231	2,522	4,095	6,013	8,351	12
Alternative	LCRA-SAWS Water Project - Bastrop Diversion							10
Potential	Brush Management (SCTN-4)							11
Potential	Weather Modification (SCTN-5)							11
Potential	Rainwater Harvesting (SCTN-9)							11
Potential	Small Aquifer Recharge Dams							11
Potential	Brackish Groundwater Desalination (Edwards)							11
Recommended	Local Trinity (Livestock)	82	82	82	82	82	82	13
	Total New Supplies	**10,309**	**19,921**	**26,923**	**37,160**	**42,692**	**56,389**	
	Total System Mgmt. Supply / (Deficit)	**6,837**	**8,954**	**9,190**	**12,447**	**9,147**	**15,154**	14
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**6,837**	**8,954**	**9,190**	**12,447**	**9,147**	**15,154**	14
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by County Line WSC, Goforth WSC, Kyle, Mountain City, Niederwald, Plum Creek Water Company, San Marcos, Wimberley WSC, Woodcreek, Woodcreek Utilities, and County-Other.

2 County Line WSC, Goforth WSC, Kyle, Niederwald, Plum Creek WC, San Marcos, Wimberley WSC, Woodcreek, Woodcreek Utilities, and County-Other (4 mgd).

3 County Line WSC.

4 Goforth WSC and Mountain City.

5 County Line WSC & Goforth WSC. Caldwell County supply (Hays County allocations exceed availability estimated for the 1997 State Water Plan).

6 County Line WSC. Supply shown is 85 percent of the permit amount transferred after limitation of permitted Edwards pumpage to 400,000 acft/yr. Additional constraints on transfers across Cibolo Creek per EAA rules.

7 San Marcos. Potentially including off-channel storage.

8 San Marcos and Mining. Alternative for County Line WSC and Steam-Electric.

9 San Marcos and Kyle. Alternative for County Line WSC, Goforth WSC, and Wimberley WSC. This project was evaluated in conformance with the existing rules of the Gonzales County UWCD. Part of the supply developed by this project exceeds the amount of available water identified in the current Gonzales County UWCD management plan. The amount of water needed by the project that exceeds the available water in the management plan cannot be implemented unless and until permits are received from the Gonzales County UWCD.

10 Alternative for County Line WSC, Goforth WSC, Kyle, Mountain City, Niederwald, Plum Creek WC, San Marcos, and County-Other.

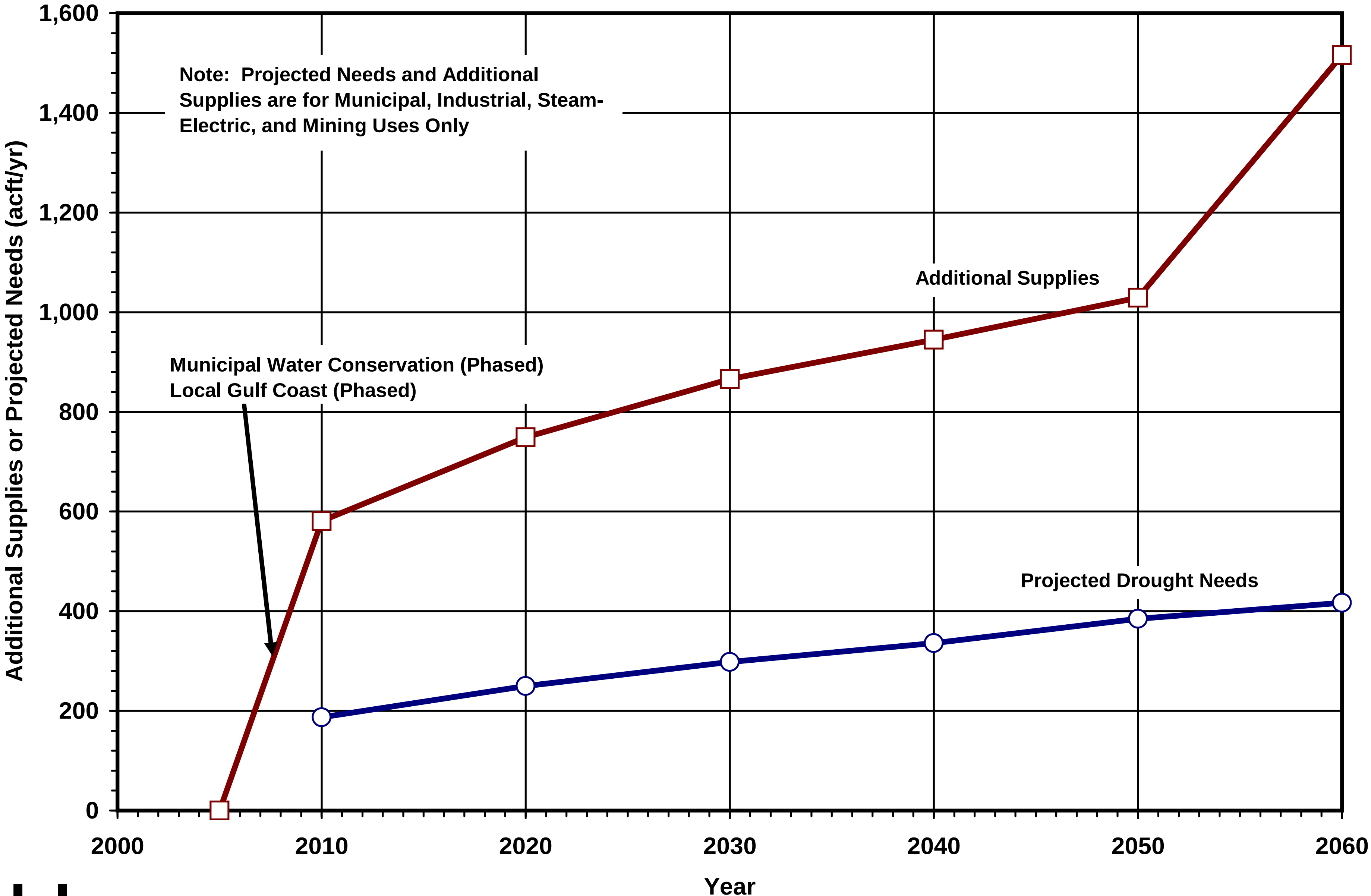
11 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.

12 Limited available proximate water sources and somewhat arbitrary assignment of steam-electric water demands to Hays County necessitate that the SCTRWPG recommend installation of air, rather than water, cooling systems for any power generation facility expansions in Hays County. Recycled water may also be a viable alternative. It is further recognized that it may not be economically feasible to satisfy all projected water needs for steam-electric power generation assigned to Hays County.

13 Livestock. Allocation exceeds availability estimated for the 1997 State Water Plan.

14 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

2006 South Central Texas Regional Water Plan - Karnes County



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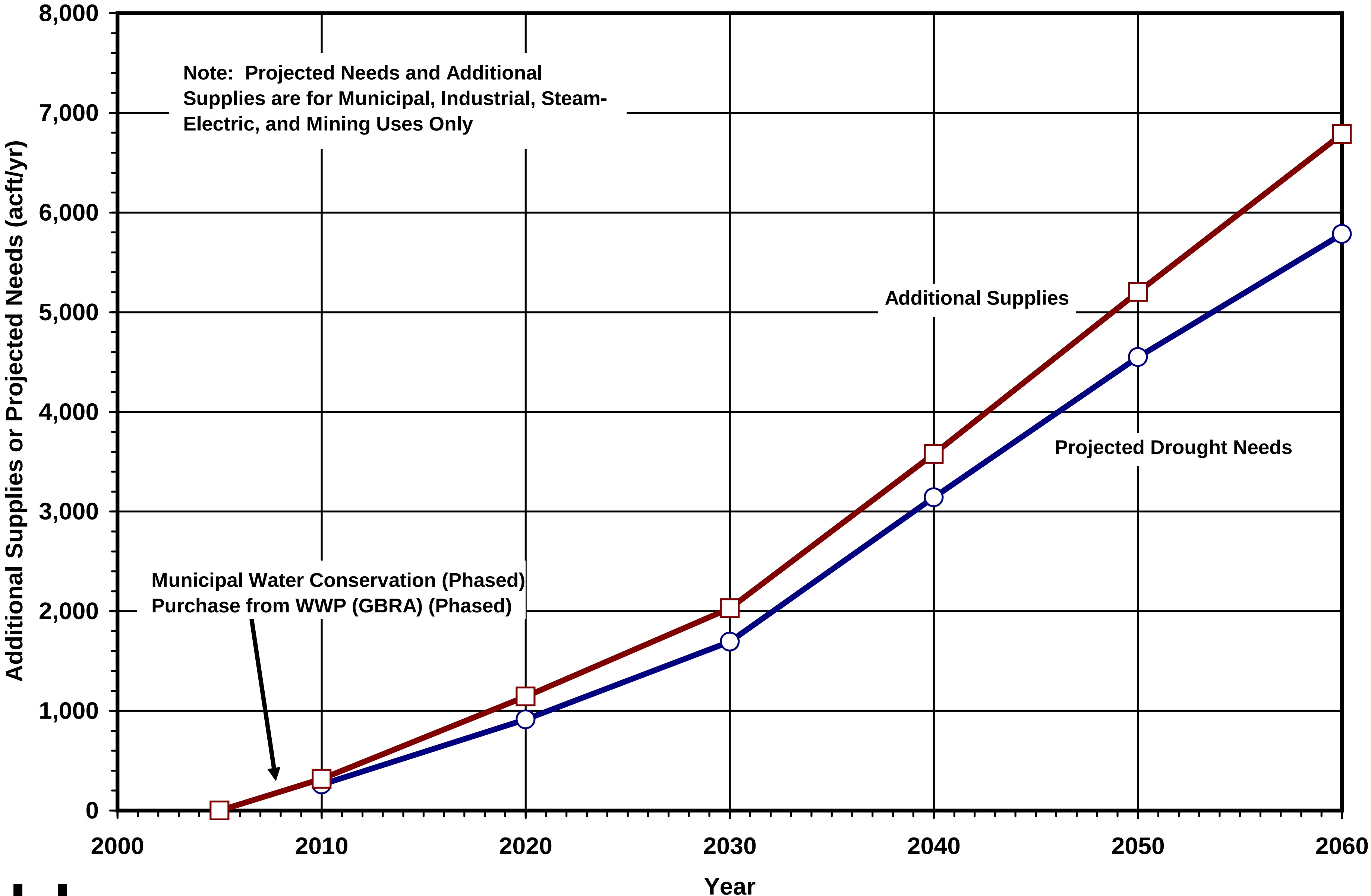
2006 South Central Texas Regional Water Plan							County = Karnes	
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	187	250	298	336	385	417	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**187**	**250**	**298**	**336**	**385**	**417**	
	Mun, Ind, S-E, & Min Needs	**187**	**250**	**298**	**336**	**385**	**417**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	191	359	476	555	639	736	1
Recommended	Local Gulf Coast	390	390	390	390	390	780	2
Alternative	Surface Water Rights							2
Alternative	Purchase from WWP (El Oso WSC or Karnes City)							2
	Total New Supplies	**581**	**749**	**866**	**945**	**1,029**	**1,516**	
	Total System Mgmt. Supply / (Deficit)	**394**	**499**	**568**	**609**	**644**	**1,099**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**394**	**499**	**568**	**609**	**644**	**1,099**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by El Oso WSC, Falls City, Karnes City, Kenedy, Runge, and County-Other.							
2	Kenedy. Groundwater quality (potential change in arsenic standard) may necessitate additional treatment or alternative supplies.							
3	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							

2006 South Central Texas Regional Water Plan - Kendall County



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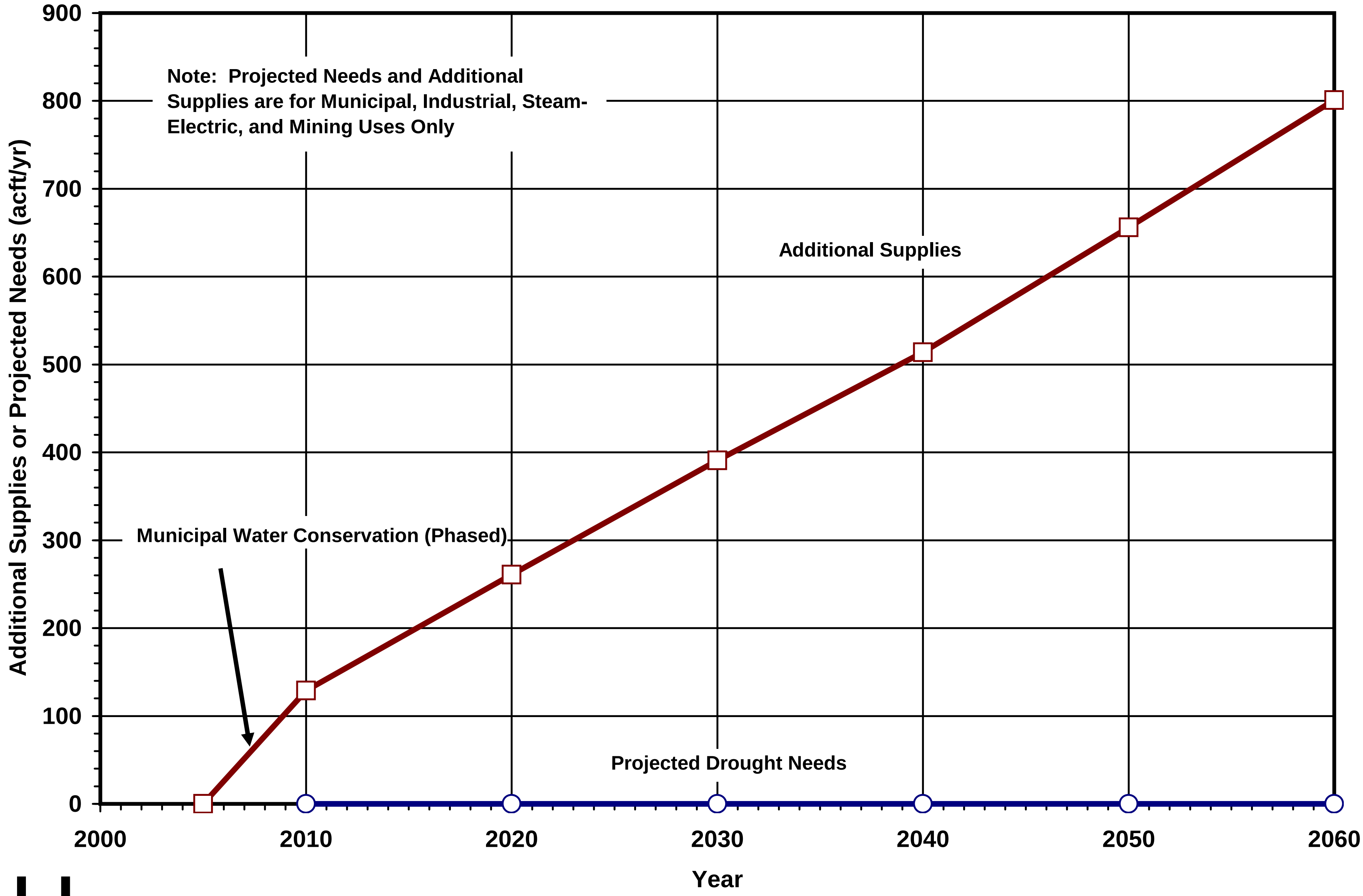
2006 South Central Texas Regional Water Plan								County = Kendall
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	262	915	1,694	3,143	4,550	5,784	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	173	170	166	163	171	168	
	Total Needs	**435**	**1,085**	**1,860**	**3,306**	**4,721**	**5,952**	
	Mun, Ind, S-E, & Min Needs	**262**	**915**	**1,694**	**3,143**	**4,550**	**5,784**	
	Irrigation & Livestock Needs	**173**	**170**	**166**	**163**	**171**	**168**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	98	280	394	502	725	1,081	1
Recommended	Purchase from WWP (GBRA)	221	865	1,635	3,076	4,477	5,705	2
Potential	Brush Management (SCTN-4)							3
Potential	Weather Modification (SCTN-5)							3
Potential	Rainwater Harvesting (SCTN-9)							3
Potential	Small Aquifer Recharge Dams							3
Recommended	Local Trinity (Irrigation)	148	148	148	148	148	148	4
Recommended	Local Trinity (Livestock)	28	28	28	28	28	28	5
	Total New Supplies	**495**	**1,321**	**2,205**	**3,754**	**5,378**	**6,962**	
	Total System Mgmt. Supply / (Deficit)	**60**	**236**	**345**	**448**	**657**	**1,010**	6
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**57**	**230**	**335**	**435**	**652**	**1,002**	6
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**3**	**6**	**10**	**13**	**5**	**8**	6
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Boerne and County-Other.							
2	Boerne and County-Other.							
3	WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.							
4	Allocation exceeds availability estimated for the 1997 State Water Plan. Data indicates that there is insufficient irrigated							
	acreage for the Irrigation Water Conservation WMS to meet projected needs by demand reduction. SCTRWPG has							
	determined that it is not economically feasible for agricultural producers to pay for additional supplies to meet projected needs.							
5	Allocation exceeds availability estimated for the 1997 State Water Plan.							
6	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop							
	and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							

2006 South Central Texas Regional Water Plan - LaSalle County



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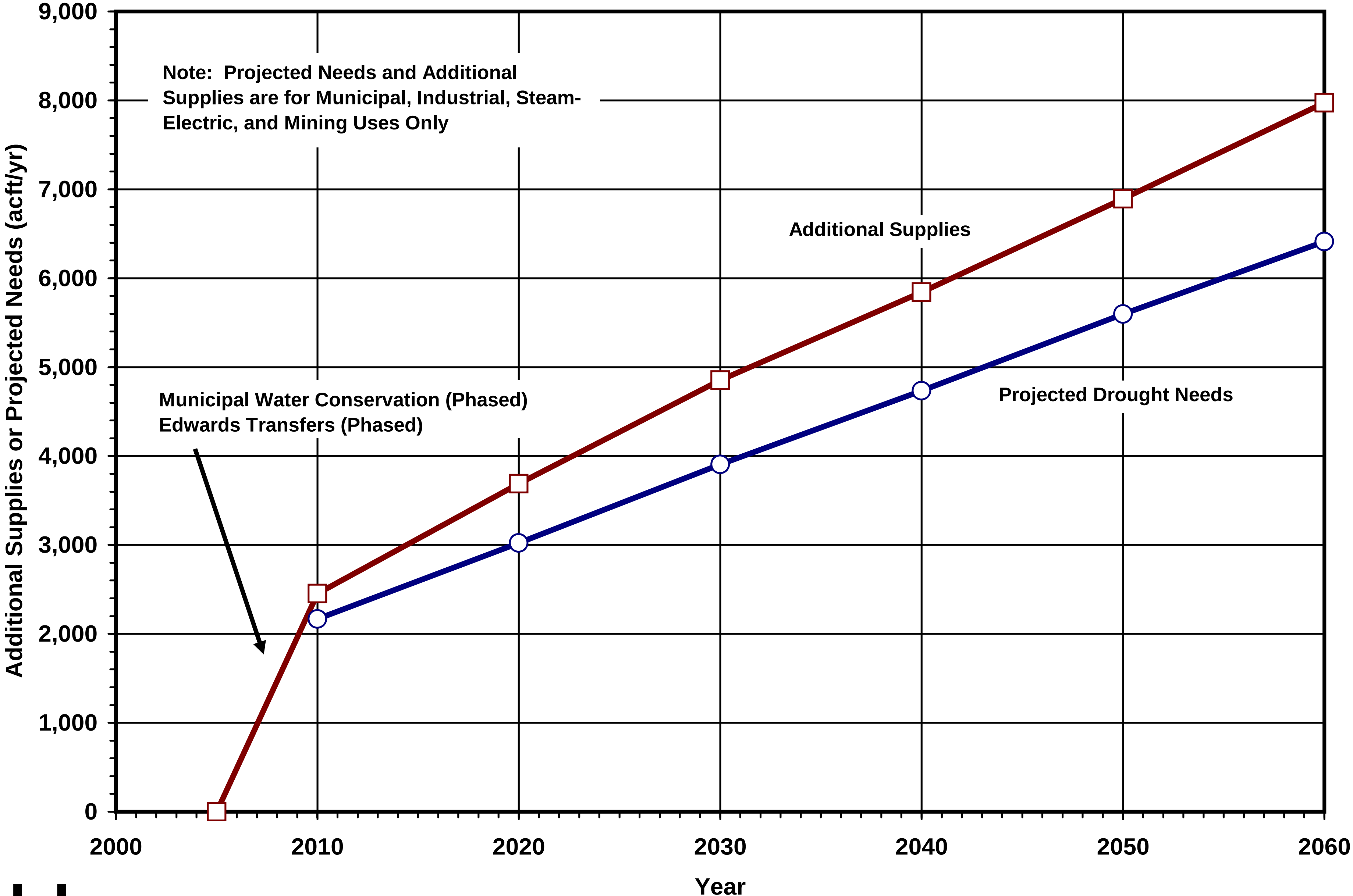
2006 South Central Texas Regional Water Plan							County = La Salle
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							
Projected Water Needs (acft/yr)							
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	129	261	391	514	656	801	1
	Total New Supplies	**129**	**261**	**391**	**514**	**656**	**801**	
	Total System Mgmt. Supply / (Deficit)	**129**	**261**	**391**	**514**	**656**	**801**	2
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**129**	**261**	**391**	**514**	**656**	**801**	2
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Cotulla, Encinal, and County-Other.

2 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

2006 South Central Texas Regional Water Plan - Medina County



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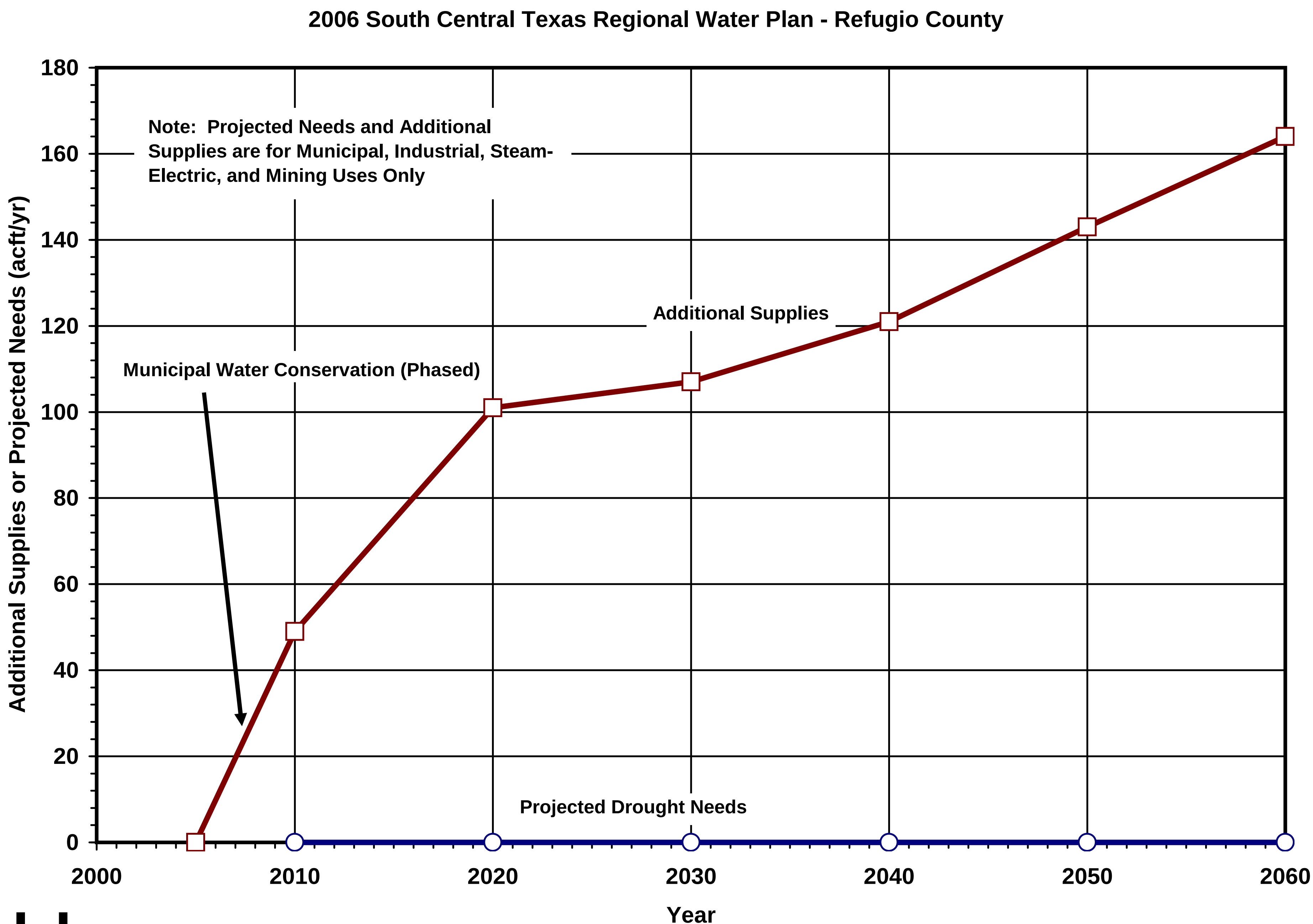
2006 South Central Texas Regional Water Plan								County = Medina
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	2,167	3,023	3,905	4,734	5,596	6,411	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	4,651	2,887	1,200	0	0	0	
	Total Needs	**6,818**	**5,910**	**5,105**	**4,734**	**5,596**	**6,411**	
	Mun, Ind, S-E, & Min Needs	**2,167**	**3,023**	**3,905**	**4,734**	**5,596**	**6,411**	
	Irrigation & Livestock Needs	**4,651**	**2,887**	**1,200**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	325	712	999	1,224	1,496	1,836	1
Recommended	Edwards Transfers (L-15)	2,129	2,978	3,853	4,618	5,397	6,138	2
Alternative	Local Carrizo							3
Potential	Brush Management (SCTN-4)							4
Potential	Weather Modification (SCTN-5)							4
Potential	Rainwater Harvesting (SCTN-9)							4
Potential	Small Aquifer Recharge Dams							4
Recommended	Irrigation Water Conservation (L-10 Irr.)	4,651	2,887	1,200	0	0	0	5
	Total New Supplies	**7,105**	**6,577**	**6,052**	**5,842**	**6,893**	**7,974**	
	Total System Mgmt. Supply / (Deficit)	**287**	**667**	**947**	**1,108**	**1,297**	**1,563**	6
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**287**	**667**	**947**	**1,108**	**1,297**	**1,563**	6
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	6
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Castroville, Devine, East Medina SUD,							
	Hondo, Lacoste, Natalia, Yancey WSC, and County-Other.							
2	Castroville, East Medina SUD, Hondo, La Coste, Natalia, Yancey WSC, and County-Other. Supply shown is 85 percent							
	of the permit amount transferred after limitation of permitted Edwards pumpage to 400,000 acft/yr.							
3	County-Other.							
4	WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.							
5	Based on use of LEPA systems with furrow dikes and conservation at 20 percent of application rate.							
6	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop							
	and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							

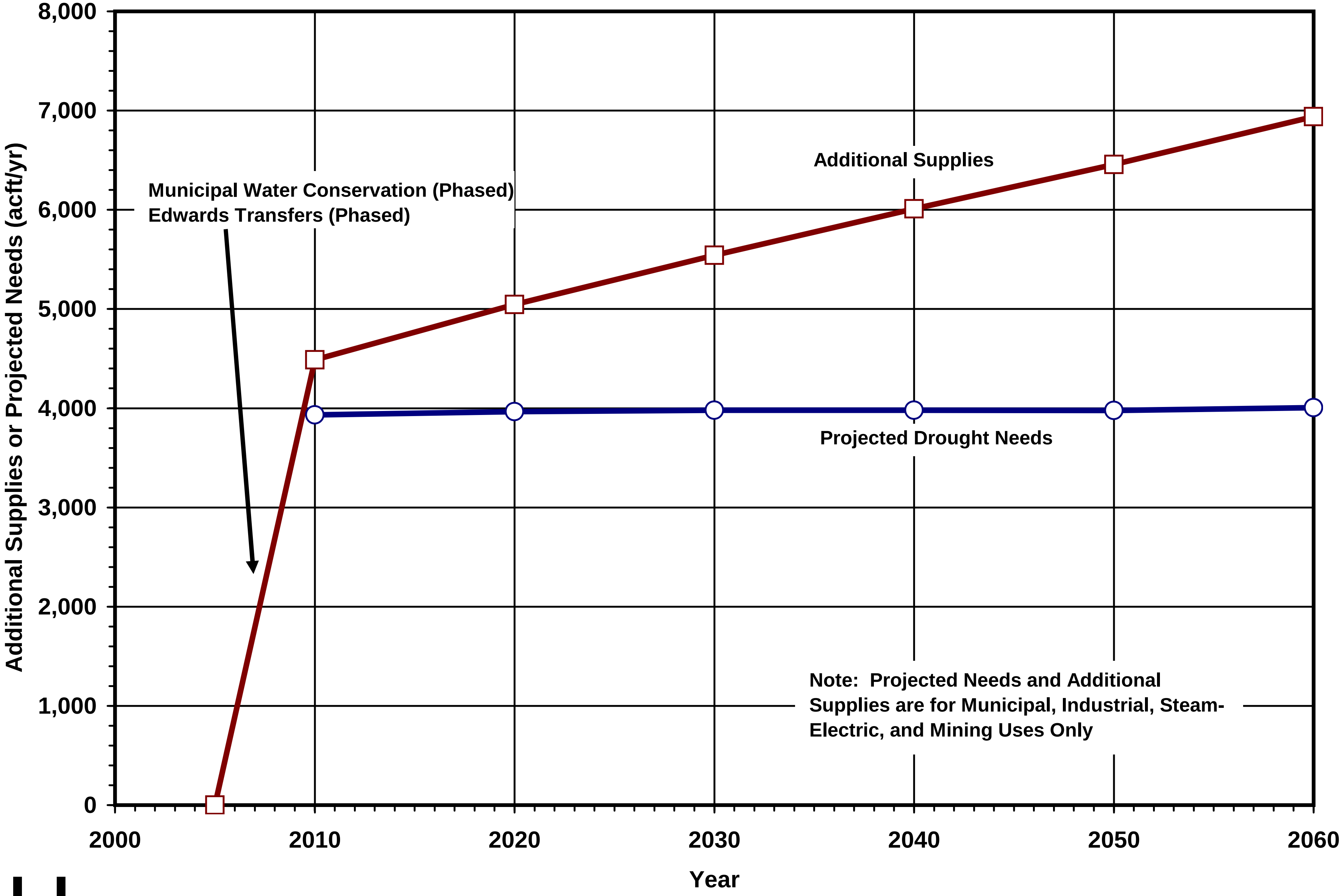


2006 South Central Texas Regional Water Plan - Refugio County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Municipal Water Conservation (Phased)
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
180
160
140
120
100
80
60
40
20
0
2000
2010
2020
2030
2040
2050
2060
Year

H

2006 South Central Texas Regional Water Plan							County = Refugio	
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	49	101	107	121	143	164	1
Alternative	Local Gulf Coast							2
Alternative	Brackish Groundwater Desalination (Gulf Coast)							2
Alternative	Purchase from WWP (Corpus Christi, Surface Water)							2
	Total New Supplies	**49**	**101**	**107**	**121**	**143**	**164**	
	Total System Mgmt. Supply / (Deficit)	**49**	**101**	**107**	**121**	**143**	**164**	3
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**49**	**101**	**107**	**121**	**143**	**164**	3
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	
Notes:								
1	Supplies shown reflect implementation of additional conservation measures by Refugio and Woodsboro.							
2	Woodsboro and County-Other. Groundwater quality (potential change in arsenic standard) may necessitate additional treatment or alternative supplies.							
3	System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.							

2006 South Central Texas Regional Water Plan - Uvalde County



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2006 South Central Texas Regional Water Plan								County = Uvalde
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								

Projected Water Needs (acft/yr)

	User Group(s)	2010	2020	2030	2040	2050	2060	Notes
	Municipal	3,932	3,965	3,980	3,979	3,977	4,005	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**3,932**	**3,965**	**3,980**	**3,979**	**3,977**	**4,005**	
	Mun, Ind, S-E, & Min Needs	**3,932**	**3,965**	**3,980**	**3,979**	**3,977**	**4,005**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	

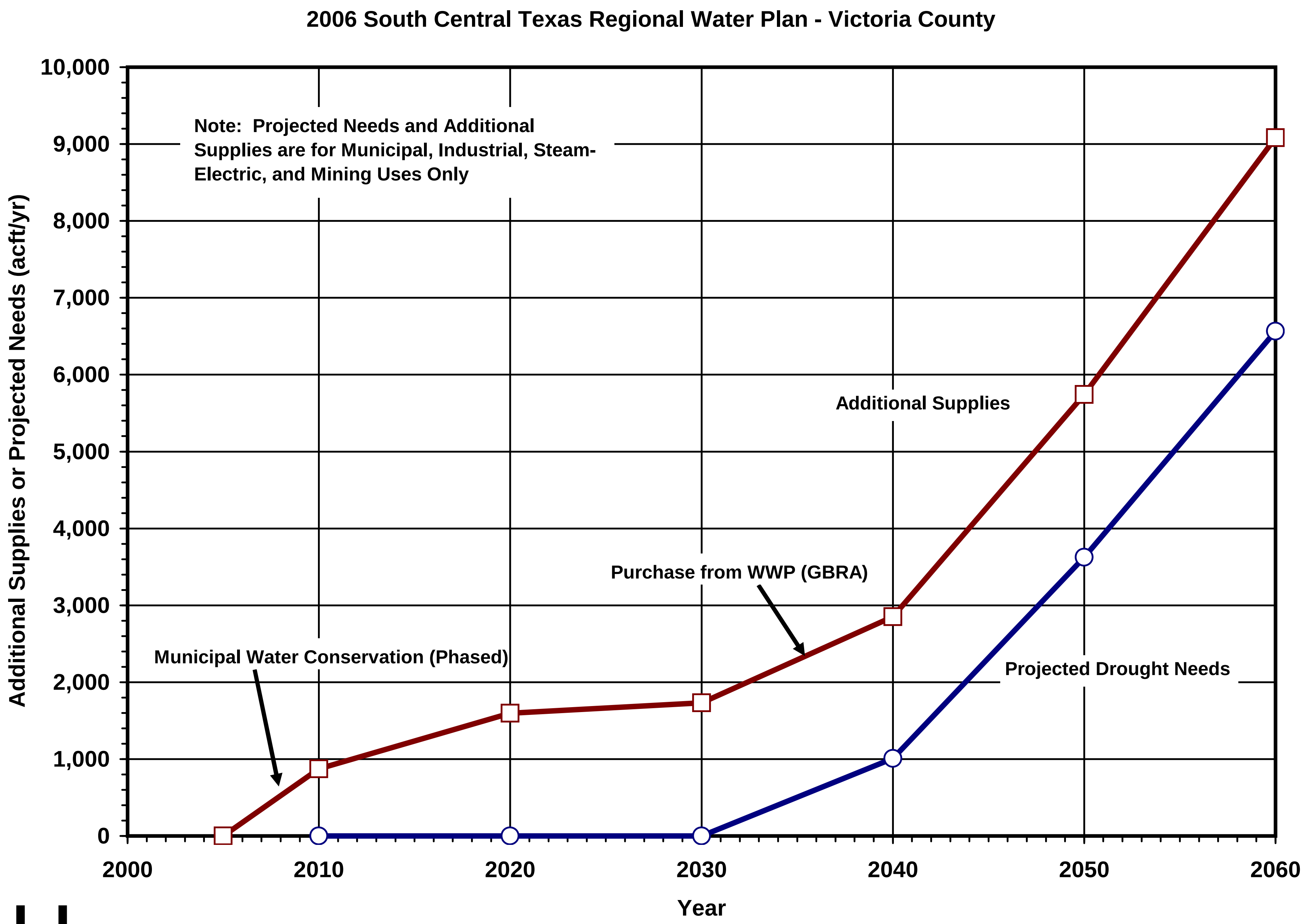
Water Management Strategies and New Supplies (acft/yr)

Status	Description	2010	2020	2030	2040	2050	2060	Notes
Recommended	Municipal Water Conservation (L-10 Mun.)	555	1,081	1,562	2,031	2,481	2,934	1
Recommended	Edwards Transfers (L-15)	3,932	3,965	3,980	3,979	3,977	4,005	2
Potential	Brush Management (SCTN-4)							3
Potential	Weather Modification (SCTN-5)							3
Potential	Rainwater Harvesting (SCTN-9)							3
Potential	Small Aquifer Recharge Dams							3
	Total New Supplies	**4,487**	**5,046**	**5,542**	**6,010**	**6,458**	**6,939**	

		2010	2020	2030	2040	2050	2060	Notes
	Total System Mgmt. Supply / (Deficit)	**555**	**1,081**	**1,562**	**2,031**	**2,481**	**2,934**	4
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**555**	**1,081**	**1,562**	**2,031**	**2,481**	**2,934**	4
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Sabinal, Uvalde, and County-Other.
2 Sabinal and Uvalde. Supply shown is 85 percent of the permit amount transferred after limitation of permitted Edwards pumpage to 400,000 acft/yr.
3 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.
4 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


2006 South Central Texas Regional Water Plan - Victoria County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Purchase from WWP (GBRA)
Municipal Water Conservation (Phased)
Projected Drought Needs
Additional Supplies or Projected Needs (acft/yr)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2000
2010
2020
2030
2040
2050
2060
Year

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2006 South Central Texas Regional Water Plan — County = Victoria

County Summary of Projected Water Needs (Shortages) and Water Management Strategies

Projected Water Needs (acft/yr)

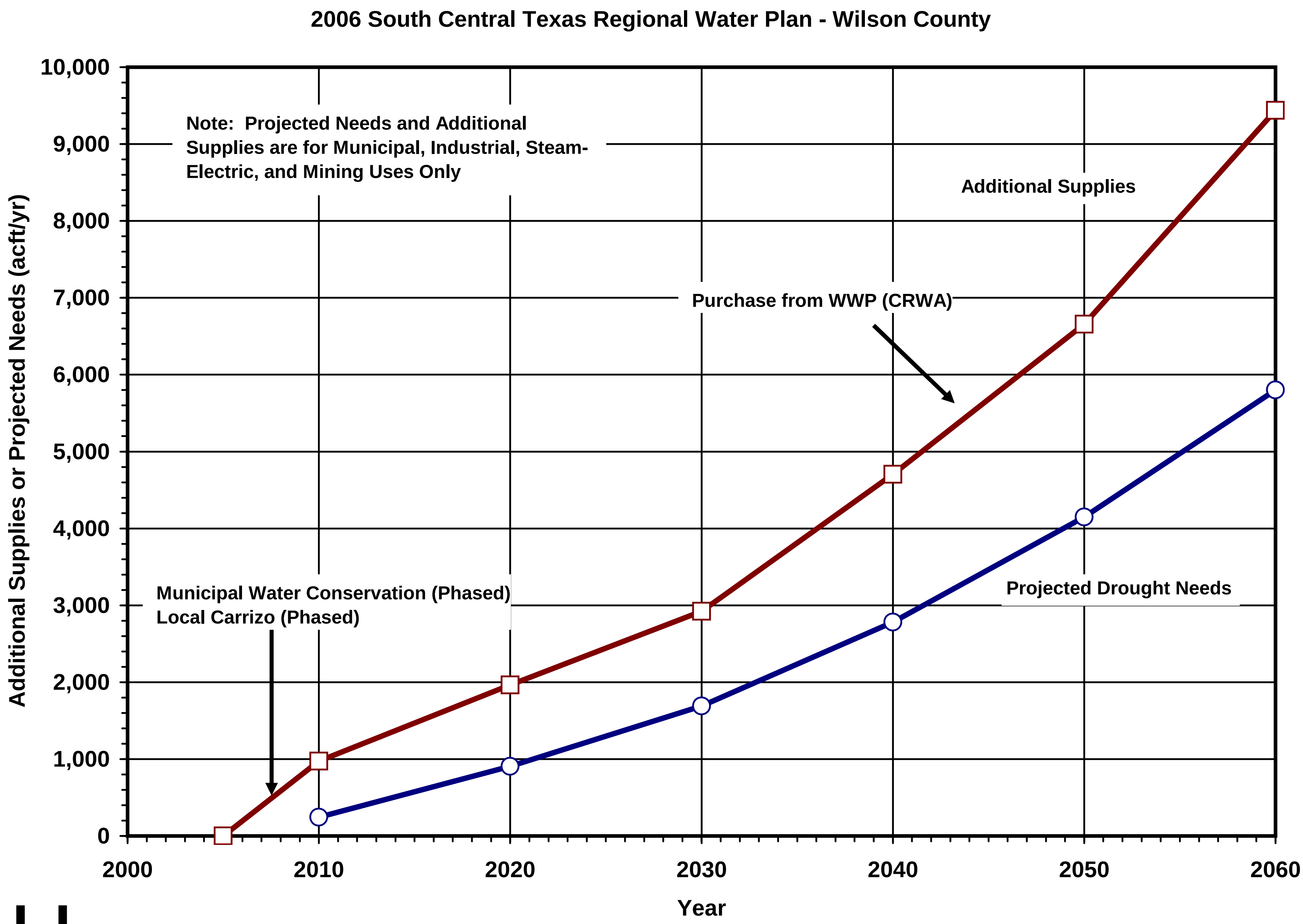
	User Group(s)	2010	2020	2030	2040	2050	2060	Notes
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	1,008	3,624	6,566	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**0**	**0**	**0**	**1,008**	**3,624**	**6,566**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**1,008**	**3,624**	**6,566**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	

Water Management Strategies and New Supplies (acft/yr)

Status	Description	2010	2020	2030	2040	2050	2060	Notes
Recommended	Municipal Water Conservation (L-10 Mun.)	874	1,597	1,733	1,844	2,118	2,517	1
Recommended	Purchase from WWP (GBRA)				1,008	3,624	6,566	2
Potential	Local Storage							3
Potential	Surface Water Rights							4
	Total New Supplies	**874**	**1,597**	**1,733**	**2,852**	**5,742**	**9,083**	
	Total System Mgmt. Supply / (Deficit)	**874**	**1,597**	**1,733**	**1,844**	**2,118**	**2,517**	5
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**874**	**1,597**	**1,733**	**1,844**	**2,118**	**2,517**	5
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Victoria and County-Other.
2 Industrial supply from GBRA lower basin run-of-river rights.
3 Potential supply from existing gravel pits for Industrial needs.
4 City of Victoria.
5 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.


2006 South Central Texas Regional Water Plan - Wilson County
Note: Projected Needs and Additional Supplies are for Municipal, Industrial, Steam-Electric, and Mining Uses Only
Additional Supplies
Purchase from WWP (CRWA)
Projected Drought Needs
Municipal Water Conservation (Phased)
Local Carrizo (Phased)
Additional Supplies or Projected Needs (acft/yr)
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
2000
2010
2020
2030
2040
2050
2060
Year

H

2006 South Central Texas Regional Water Plan								County = Wilson
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								
Projected Water Needs (acft/yr)								
	User Group(s)	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
	Municipal	245	906	1,692	2,783	4,148	5,802	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	0	0	0	0	0	0	
	Total Needs	**245**	**906**	**1,692**	**2,783**	**4,148**	**5,802**	
	Mun, Ind, S-E, & Min Needs	**245**	**906**	**1,692**	**2,783**	**4,148**	**5,802**	
	Irrigation & Livestock Needs	**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies and New Supplies (acft/yr)								
Status	**Description**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**	**Notes**
Recommended	Municipal Water Conservation (L-10 Mun.)	208	432	665	873	1,246	1,740	1
Recommended	Local Carrizo	766	1,532	2,258	3,831	5,403	6,895	2
Recommended	Purchase from WWP (CRWA)					8	804	3
Potential	Small Aquifer Recharge Dams							4
	Total New Supplies	**974**	**1,964**	**2,923**	**4,704**	**6,657**	**9,439**	
	Total System Mgmt. Supply / (Deficit)	**729**	**1,058**	**1,231**	**1,921**	**2,509**	**3,637**	5
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**729**	**1,058**	**1,231**	**1,921**	**2,509**	**3,637**	5
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

1 Supplies shown reflect implementation of additional conservation measures by Floresville, LaVernia, Oak Hills WSC, Poth, SSWSC, Stockdale, Sunko WSC, and County Other.

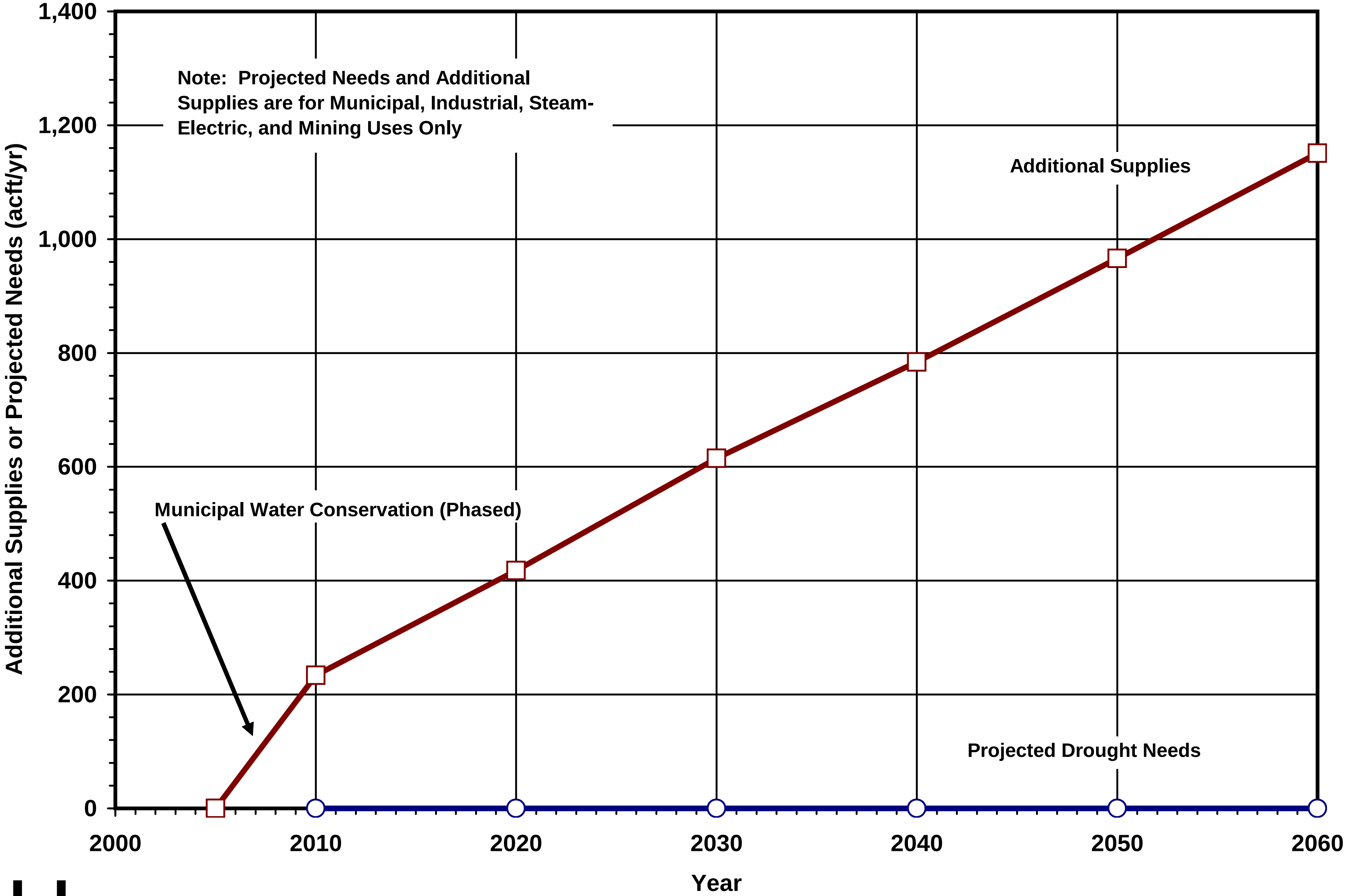
2 Floresville, Oak Hills WSC, SS WSC, and Sunko WSC.

3 La Vernia and SS WSC.

4 WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.

5 System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

2006 South Central Texas Regional Water Plan - Zavala County



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2006 South Central Texas Regional Water Plan — County = Zavala

County Summary of Projected Water Needs (Shortages) and Water Management Strategies

Projected Water Needs (acft/yr)

	User Group(s)	2010	2020	2030	2040	2050	2060	Notes
	Municipal	0	0	0	0	0	0	
	Industrial	0	0	0	0	0	0	
	Steam-Electric	0	0	0	0	0	0	
	Mining	0	0	0	0	0	0	
	Irrigation & Livestock	48,165	45,344	42,621	40,005	37,492	35,078	
	Total Needs	**48,165**	**45,344**	**42,621**	**40,005**	**37,492**	**35,078**	
	Mun, Ind, S-E, & Min Needs	**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation & Livestock Needs	**48,165**	**45,344**	**42,621**	**40,005**	**37,492**	**35,078**	

Water Management Strategies and New Supplies (acft/yr)

Status	Description	2010	2020	2030	2040	2050	2060	Notes
Recommended	Municipal Water Conservation (L-10 Mun.)	234	418	615	784	966	1,151	1
Potential	Brush Management (SCTN-4)							2
Potential	Weather Modification (SCTN-5)							2
Potential	Rainwater Harvesting (SCTN-9)							2
Potential	Small Aquifer Recharge Dams							2
Recommended	Irrigation Water Conservation (L-10 Irr.)	6,948	6,948	6,948	6,948	6,948	6,948	3
	Total New Supplies	**7,182**	**7,366**	**7,563**	**7,732**	**7,914**	**8,099**	
	Total System Mgmt. Supply / (Deficit)	**(40,983)**	**(37,978)**	**(35,058)**	**(32,273)**	**(29,578)**	**(26,979)**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / (Deficit)	**234**	**418**	**615**	**784**	**966**	**1,151**	4
	Irrigation & Livestock System Mgmt. Supply / (Deficit)	**(41,217)**	**(38,396)**	**(35,673)**	**(33,057)**	**(30,544)**	**(28,130)**	

Notes:

1. Supplies shown reflect implementation of additional conservation measures by Crystal City and County-Other. measures in the Cities of Batesville, Crystal City, and LaPryor.
2. WMS expected to provide additional water supply in many years, but dependable supply during drought presently unquantified.
3. Based on use of LEPA systems with furrow dikes on 75 percent of irrigated acres in year 2000 and conservation at 20 percent of application rate. SCTRWPG has determined that it is not economically feasible for agricultural producers to pay for additional supplies to meet projected needs.
4. System Management Supplies are included so that WMSs are identified to replace planned strategies that fail to develop and/or to serve as additional supplies in the event that rules, regulations, or other restrictions limit use of planned strategies.

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Appendix E
Socioeconomic Impacts of Unmet Water Needs in the South Central Water Planning Area

Socioeconomic Impacts of Unmet Water Needs in the South Central Water Planning Area

Prepared by:

Stuart Norvell and Kevin Kluge of The Texas Water Development Board's Office of Water Resources Planning

Prepared in support of the:

South Central Water Planning Group and the 2006 Texas State Water Plan

April 2005

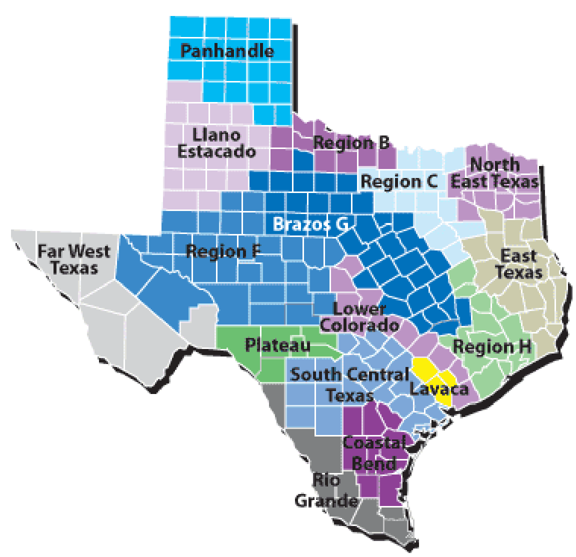

Table of Contents

Executive Summary

Background

Water shortages due to severe drought combined with infrastructure limitations would likely curtail or eliminate economic activity in business and industries heavily reliant on water. For example, without water farmers cannot irrigate; refineries cannot produce gasoline and paper mills cannot make paper. Unreliable water supplies would not only have an immediate and real impact on business and industry, but they might also bias corporate decision makers against plant expansion or plant location in Texas. From a societal perspective, water supply reliability is critical as well. Shortages would disrupt activity in homes, schools and government and could adversely affect public health and safety. For all of the above reasons, it is important to analyze and understand how restricted water supplies during drought could affect communities throughout the state.

Section 357.7(4) of the rules for implementing Texas Senate Bill 1 requires regional water planning groups to evaluate the social and economic impacts of projected water shortages (i.e., "unmet water needs") as part of the planning process. The rules contain provisions that direct the Texas Water Development Board (TWDB) to provide technical assistance to complete socioeconomic impact assessments. In response to requests from regional planning groups, staff of the TWDB's Office of Water Resources Planning designed and conducted analyses to evaluate socioeconomic impacts of unmet water needs.

Overview of Methodology

Two components make up the overall approach to this study: 1) an economic impact module and 2) a social impact module. Economic analysis addresses potential impacts of unmet water needs including effects on residential water consumers and losses to regional economies stemming from reductions in economic output for agricultural, industrial and commercial water uses. Impacts to agriculture, industry and commercial enterprises were estimated using regional "input-output" models commonly used by researchers to estimate how reductions in business activity might affect a given economy. Details regarding the methodology and assumptions for individual water use categories (i.e., municipal consumers including residential and commercial water users, manufacturing, steam-electric, mining, and agriculture) are in the main body of the report (see Section 2).

The social component focuses on demographic effects including changes in population and school enrollment. Methods are based on population projection models developed by the TWDB for regional and state water planning. With the assistance of the Texas State Data Center, TWDB staff modified these models and applied them for use here. Basically, the social impact module incorporates results from the economic impact module and assesses how changes in a region's economy due to water shortages could affect patterns of migration in a region.

Several clarifications regarding this study are warranted. For one, estimated impacts are *independent* and distinct "what if" scenarios for a given point in time (i.e., 2010, 2020, 2030, 2040, 2050 and 2060). Reported figures are scenarios that illustrate what could happen in a given year if: 1) water supply infrastructure and/or water management strategies do not change through time, 2) the drought of record recurs.

Given, that reported figures are not cumulative in nature, it is incorrect to sum impacts over the entire planning horizon. Doing so would imply that the analysis predicts that drought of record conditions will occur every ten years in the future, which is not the case. Similarly, authors of this report recognize that in many communities needs are driven by population growth, and in the future total population will exceed the amount of water available due to infrastructure limitations *regardless of whether or not there is a drought*. This implies that infrastructure limitations would constrain economic growth. Conversely, in cases such as the Texas Panhandle communities face shortages due to declining aquifer levels. However, since needs as defined by planning rules are based upon water supply and demand under the assumption of drought of record conditions, it is not possible to conduct economic analysis that focuses on growth related impacts over the planning horizon. Estimating lost economic activity related to constraints on population and commercial growth would require developing water supply and demand forecasts under “average” or “most likely” future climatic conditions.

In addition, although useful for planning purposes, this study is not a benefit-cost analysis. Benefit-cost analysis (BCA) is a tool widely used to evaluate the economic feasibility of specific policies or projects designed to mitigate water shortages as opposed to estimating the economic impacts of unmet water needs. One could include monetary impacts measured here as part of a BCA. However, since this is not a BCA, future impacts are not weighted differently in this report. In other words, estimates are not “discounted.” If used as a measure of benefits in a BCA, one should consider the uncertainty of future monetary impacts. All monetary figures are reported in constant year 2000 dollars. Other clarifications, limitations and assumptions can be found in the main body of the report (see Section 1.3).

Summary of Results

Table and Figure E-1 summarize estimated economic impacts. Variables shown include:[1]

- **sales** - economic output measured by sales revenue;
- **jobs** - number of full and part-time jobs required by a given industry including self-employment;
- **regional income** - total payroll costs (wages and salaries plus benefits) paid by industries, corporate income, rental income and interest payments for the region; and
- **business taxes** - sales, excise, fees, licenses and other taxes paid during normal operation of an industry (does not include any type of income tax).

If drought of record conditions return and water supplies are not developed, study results indicate that the South Central Texas Water Planning Area would suffer significant losses. If such conditions occurred 2010 lost income to residents in the region could total $665 million with associated job losses as high 10,200. State and local governments could lose roughly $32 million in tax receipts. If such conditions occurred in 2060, income losses could run $5,476 million, and job losses could be as high 97,940. Nearly $335 million worth of state and local taxes would be lost. Reported figures are probably conservative because they are based on estimated costs for a single year; but in much of Texas, the drought of record lasted several years. For example, in 2030 models indicate that shortages would cost residents and businesses in the region about $2,258 million in lost income. Thus, if shortages lasted for three years total losses related to unmet needs could easily exceed $7,000 million.

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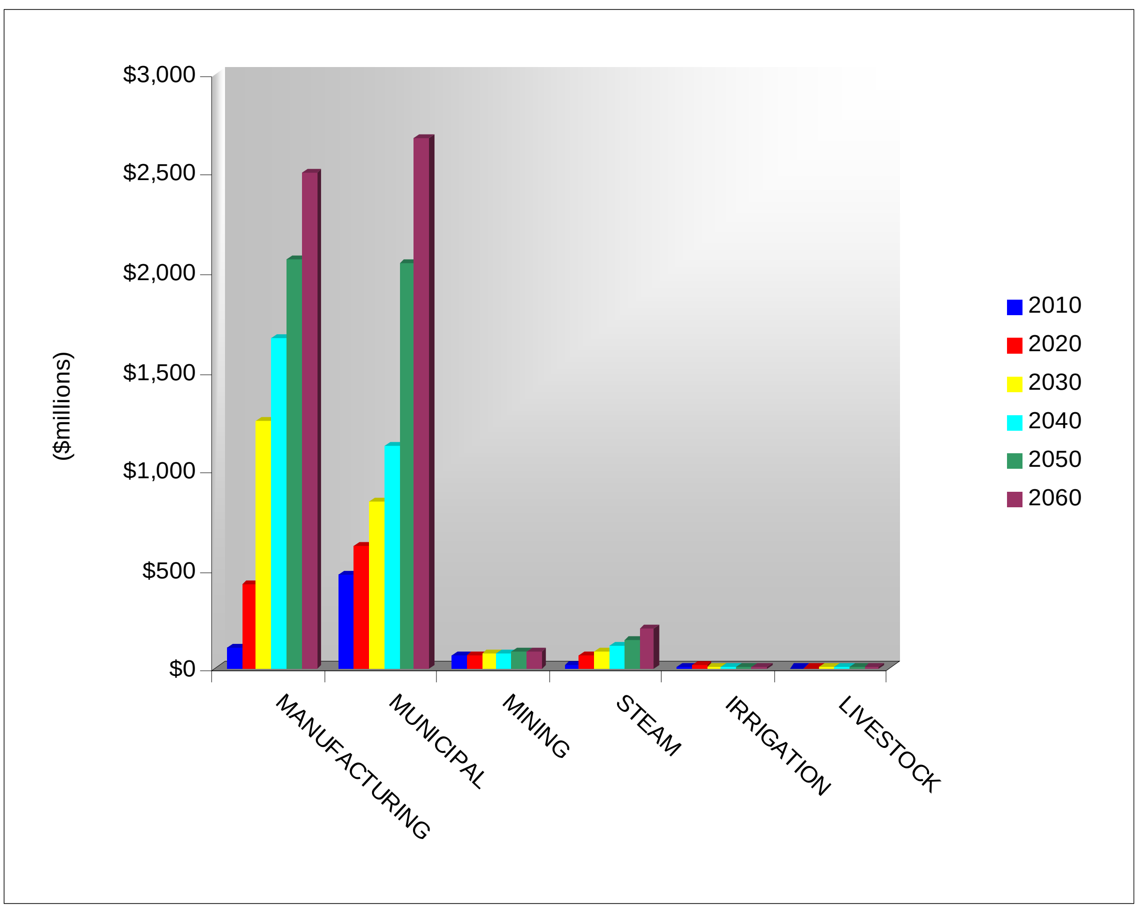
[1] Total sales are not a good measure of economic prosperity because they include sales to other industries for further processing. For example, a farmer sells rice to a rice mill, which the rice mill processes and sells it to another consumer. Both transactions are counted in an input-output model. Thus, total sales “double count.” Regional income plus business taxes are more suitable because they are a better measure of net economic returns.

Table E-1: Annual Economic Impacts of Unmet Water Needs
(years, 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)

Year	Sales ($millions)	Income ($millions)	Jobs	State and Local Taxes ($millions)
2010	$910.46	$664.22	10,200	$32.34
2020	$2,065.88	$1,174.59	17,745	$62.42
2030	$4,697.88	$2,257.88	34,230	$118.06
2040	$6,160.05	$2,979.21	44,215	$153.74
2050	$8,707.37	$4,351.33	76,005	$258.36
2060	$10,810.83	$5,476.64	97,940	$335.19

Source: Texas Water Development Board, Office of Water Resources Planning

Figure E-1: Distribution of Lost Income by Water Use Category
(years, 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)



Source: Analysis of the Texas Water Development Boards, Office of Water Resource Planning

Table E-2 shows potential losses in population and school enrollment. Changes in population stem directly from the number of lost jobs estimated as part of the economic impact module. In other words, many – but not all - people would likely relocate due to a job loss and some have families with school age children. Section 1.2 in the main body of the report discusses methodology in detail.

Table E-2: Estimated Regional Social Impacts of Unmet Water Needs
(years, 2010, 2020, 2030, 2040, 2050 and 2060)

Year	Population Losses	Declines in School Enrollment
2010	14,230	3,620
2020	25,080	6,370
2030	49,180	12,490
2040	62,970	15,990
2050	107,830	27,390
2060	138,890	35,280

Source: Based on models developed by the Texas Water Development Board, Office of Water Resources Planning and the Texas State Data Center.

Introduction

Texas is one the nation's fastest growing states. From 1950 to 2000, population in the state grew from about 8 million to nearly 21 million. By the year 2050, the total number of people living in Texas is expected to reach 40 million. Rapid growth combined with Texas' susceptibility to severe drought makes water supply a crucial issue. If water infrastructure and water management strategies are not improved, Texas could face serious social, economic and environmental consequences - not only in our large metropolitan cities, but also on our farms and rural areas.

Water shortages due to severe drought combined with infrastructure limitations would likely curtail or eliminate economic activity in business and industries heavily reliant on water. For example, without water farmers cannot irrigate; refineries cannot produce gasoline and paper mills cannot make paper. Unreliable water supplies would not only have an immediate and real impact on business and industry, but they might also bias corporate decision makers against plant expansion or plant location in Texas. From a societal perspective, water supply reliability is critical as well. Shortages would disrupt activity in homes, schools and government and could adversely affect public health and safety. For all of the above reasons, it is important to analyze and understand how restricted water supplies during drought could affect communities throughout the state.

Section 357.7(4) of the rules for implementing Texas Senate Bill 1 requires regional water planning groups to evaluate the social and economic impacts of unmet water needs as part of the planning process. The rules contain provisions that direct the Texas Water Development Board (TWDB) to provide technical assistance to complete socioeconomic impact analyses. In response to requests from regional planning groups, TWDB staff designed and conducted required studies. The following document prepared by the TWDB's Office of Water Resources Planning summarizes analysis and results for the South Central Texas Water Planning Area (Region L). Section 1 provides an overview of concepts and methodologies used in the study. Sections 2 and 3 provide detailed information and analyses for each water use category employed in the planning process (i.e., irrigation, livestock, municipal, manufacturing, mining and steam-electric).

1. Overview of Terms and Methodology

Section 1 provides a general overview of how economic and social impacts were measured. In addition, it summarizes important clarifications, assumptions and limitations of the study.

1.1 Measuring Economic Impacts

Economic analysis as it relates to water resources planning generally falls into two broad areas. Supply side analysis focuses on costs and alternatives of developing new water supplies or implementing programs that provide additional water from current supplies. Demand side analysis concentrates on impacts and benefits of providing water to people, businesses and the environment. Analysis in this report focuses strictly on demand side impacts. Specifically, it addresses the potential economic impacts of unmet water needs including: 1) losses to regional economies stemming from reductions in economic output, and 2) costs to residential water consumers associated with implementing emergency water procurement and conservation programs.

1.1.1 Impacts to Agriculture, Business and Industry

As mentioned earlier, severe water shortages would likely affect the ability of business and industry to operate resulting in lost output, which would adversely affect the regional economy. A variety tools are available to estimate such impacts, but by far, the most widely used today are input-output models (IO models) combined with social accounting matrices (SAMs). Referred to as IO/SAM models, these tools formed the basis for estimating economic impacts for agriculture (irrigation and livestock water uses) and industry (manufacturing, mining, steam-electric and commercial business activity for municipal water uses).

Basically, an IO/SAM model is an accounting framework that traces spending and consumption between different economic sectors including businesses, households, government and “foreign” economies in the form of exports and imports. As an example, Table 1 shows a highly aggregated segment of an IO/SAM model that focuses on key agricultural sectors in a local economy. The table contains transactions data for three agricultural sectors (cattle ranchers, dairies and alfalfa farms). Rows in Table 1 reflect sales from each sector to other local industries and institutions including households, government and consumers outside of the region in the form of exports. Columns in the table show purchases by each sector in the same fashion. For instance, the dairy industry buys $11.62 million worth of goods and services needed to produce milk. Local alfalfa farmers provide $2.11 million worth of hay and local households provide about $1.03 million worth of labor. Dairies import $4.17 million worth of inputs and pay $2.37 million in taxes and profits. Total economic activity in the region amounts to about $807.45 million. The entire table is like an accounting balance sheet where total sales equal total purchases.

Table 1: Example of a County-level Transaction and Social Accounting Matrix for Agricultural Sectors ($millions)

Sectors	Cattle	Dairy	Alfalfa	All other Industries	Taxes, govt. & profits	Households	Exports	Total
Cattle	$3.10	$0.01	$0.00	$0.03	$0.02	$0.06	$10.76	$13.98
Dairy	$0.07	$0.13	$0.00	$0.25	$0.01	$0.00	$11.14	$11.60
Alfalfa	$0.00	$2.11	$0.00	$0.01	$0.02	$0.01	$10.38	$12.53
Other industries	$2.20	$1.56	$2.90	$50.02	$70.64	$66.03	$48.48	$241.83
Taxes, govt. & profits	$2.37	$2.61	$5.10	$77.42	$0.23	$49.43	$83.29	$220.45
Households	$0.82	$1.03	$1.38	$50.94	$45.36	$7.13	$14.64	$121.30
Imports	$5.41	$4.17	$3.16	$63.32	$104.17	$5.53	$0.00	$185.76
Total	$13.97	$11.62	$12.54	$241.99	$220.45	$128.19	$178.69	$807.45

* Columns contain purchases and rows represent sales. Source: Adapted from Harris, T.R., Narayanan, R., Englin, J.E., MacDiarmid, T.R., Stoddard, S.W. and Reid, M.E. “*Economic Linkages of Churchill County.*” University of Nevada Reno. May 1993.

To understand how an IO/SAM model works, first visualize that $1 of additional sales of milk is injected into the dairy industry in Table 1. For every $1 the dairies receive in revenue, they spend 18 cents on alfalfa to feed their cows; nine cents is paid to households who provide farm labor, and another 13 cents goes to the category “other industries” to buy items such as machinery, fuel, transportation, accounting services etc. Nearly 22 cents is paid out in the form of profits (i.e., returns to dairy owners) and taxes/fees to local, state and federal government. The value of the initial $1 of revenue in the dairy sector is referred to as a first-round or **direct effect.**

As the name implies, first-round or direct effects are only part of the story. In the example above, alfalfa farmers must make 18 cents worth of hay to supply the increased demand for their product. To do so, they purchase their own inputs, and thus, they spend part of the original 18 cents that they received from the dairies on firms that support their own operations. For example, 12 cents is spent on fertilizers and other chemicals needed to grow alfalfa. The fertilizer industry in turn would take these 12 cents and spend them on inputs in its production process and so on. The sum of all re-spending is referred to as the **indirect effect** of an initial increase in output in the dairy sector.

While direct and indirect impacts capture how industries respond to a change, **induced impacts** measure the behavior of the labor force. As demand for production increases, employees in base industries and supporting industries will have to work more; or alternatively, businesses will have to hire more people. As employment increases, household spending rises. Thus, seemingly unrelated businesses such as video stores, supermarkets and car dealers also feel the effects of an initial change.

Collectively, indirect and induced effects are referred to as **secondary impacts**. In their entirety, all of the above changes (direct and secondary) are referred to as **total economic impacts**. By nature, total impacts are greater than initial changes because of secondary effects. The magnitude of the increase is what is popularly termed a multiplier effect. Input-output models generate numerical multipliers that estimate indirect and induced effects.

In an IO/SAM model impacts stem from changes in output measured by sales revenue that in turn come from changes in consumer demand. In the case of water shortages, one is not assuming a change in demand, but rather a supply shock – in this case severe drought. Demand for a product such as corn has not necessarily changed during a drought. However, farmers in question lack a crucial input (i.e., irrigation water) for which there is no *short-term* substitute. Without irrigation, she cannot grow irrigated crops. As a result, her cash flows decline or cease all together depending upon the severity of the situation. As cash flows dwindle, the farmer's income falls, and she has to reduce expenditures on farm inputs such as labor. Lower revenues not only affect her operation and her employees directly, but they also indirectly affect businesses who sell her inputs such as fuel, chemicals, seeds, consultant services, fertilizer etc.

The methodology used to estimate regional economic impacts consists of three steps: 1) develop IO/SAM models for each county in the region and for the region as whole, 2) estimate direct impacts to economic sectors resulting from water shortages, and 3) calculate total economic impacts (i.e., direct plus secondary effects).

Step 1*: Generate IO/SAM Models and Develop Economic Baseline*

IO/SAM models were estimated using propriety software known as IMPLAN PRO™ (Impact for Planning Analysis). IMPLAN is a modeling system originally developed by the U.S. Forestry Service in the late 1970s. Today, the Minnesota IMPLAN Group (MIG Inc.) owns the copyright and distributes data and software. It is probably the most widely used economic impact model in existence. IMPLAN comes with databases containing the most recently available economic data from a variety of sources.[2] Using IMPLAN software and data, transaction tables

[2]The basic IMPLAN database consists of national level technology matrices based on the Benchmark Input-Output Accounts generated the U.S. Bureau of Economic Analysis and estimates of final demand, final payments, industry output and employment for various economic sectors. IMPLAN's regional data (i.e. states, a counties or groups of counties within a state) are divided into two basic categories: 1) data on an industry basis including value-added, output and employment and 2) data on a commodity basis including final demands and institutional sales. State-level data are balanced to the national totals using a matrix ratio allocation system and county data are balanced to state totals. In other words, much of the data in IMPLAN is based on a national average for all industries.

conceptually similar to the one discussed previously (see Table 1 on page 9) were estimated for each county in the region and for the region as a whole. Each transaction table contains 528 economic sectors and allows one to estimate a variety of economic statistics including:

- **total sales -** total production measured by sales revenues;
- **intermediate sales -** sales to other businesses and industry within a given region;
- **final sales** – sales to end users in a region and exports out of a region;
- **employment -** number of full and part-time jobs (annual average) required by a given industry including self-employment;
- **regional income -** total payroll costs (wages and salaries plus benefits) paid by industries, corporate income, rental income and interest payments; and
- **business taxes -** sales, excise, fees, licenses and other taxes paid during normal operation of an industry (does not include income taxes).

TWDB analysts developed an economic baseline containing each of the above variables using year 2000 data. Since the planning horizon extends through 2060, economic variables in the baseline were allowed to change in accordance with projected changes in demographic and economic activity. Growth rates for municipal water use sectors (i.e., commercial, residential and institutional) are based on TWDB population forecasts. Projections for manufacturing, agriculture, and mining and steam-electric activity are based on the same underlying economic forecasts used to estimate future water use for each category. Monetary impacts in future years are reported in year 2000 dollars.

It is important to stress that employment, income and business taxes are the most useful variables when comparing the relative contribution of an economic sector to a regional economy. Total sales as reported in IO/SAM models are less desirable and can be misleading because they include sales to other industries in the region for use in the production of other goods. For example, if a mill buys grain from local farmers and uses it to produce feed, sales of both the processed feed and raw corn are counted as “output” in an IO model. Thus, total sales double-count or overstate the true economic value of goods and services produced in an economy. They are not consistent with commonly used measures of output such as Gross National Product (GNP), which counts only final sales.

Another important distinction relates to terminology. Throughout this report, the term *sector* refers to economic subdivisions used in the IMPLAN database and resultant input-output models (528 individual sectors based on Standard Industrial Classification Codes). In contrast, the phrase *water use category* refers to water user groups employed in state and regional water planning including irrigation, livestock, mining, municipal, manufacturing and steam electric. All sectors in the IMPLAN database were assigned to a specific water use category (see Attachment A of this report).

Step 2: *Estimate Direct Economic Impacts of Water Shortages*

As mentioned above, direct impacts accrue to immediate businesses and industries that rely on water. Without water industrial processes could suffer. However, output responses would likely vary depending upon the severity of a shortage. A small shortage relative to total water use may have a nominal effect, but as shortages became more critical, effects on productive capacity would increase.

For example, farmers facing small shortages might fallow marginally productive acreage to save water for more valuable crops. Livestock producers might employ emergency culling strategies, or they may consider hauling water by truck to fill stock tanks. In the case of manufacturing, a good example occurred in the summer of 1999 when Toyota Motor

Manufacturing experienced water shortages at a facility near Georgetown, Kentucky. As water levels in the Kentucky River fell to historic lows due to drought, plant managers sought ways to curtail water use such as reducing rinse operations to a bare minimum and recycling water by funneling it from paint shops to boilers. They even considered trucking in water at a cost of 10 times what they were paying. Fortunately, rains at the end of the summer restored river levels, and Toyota managed to implement cutbacks without affecting production. But it was a close call. If rains had not replenished the river, shortages could have severely reduced output.[3]

Note that the efforts described above are not planned programmatic or long-term operational changes. They are emergency measures that individuals might pursue to alleviate what they consider a temporary condition. Thus, they are not characteristic of long-term management strategies designed to ensure more dependable water supplies such as capital investments in conservation technology or development of new water supplies.

To account for uncertainty regarding the relative magnitude of impacts to farm and business operations, the following analysis employs the concept of elasticity. Elasticity is a number that shows how a change in one variable will affect another. In this case, it measures the relationship between a percentage reduction in water availability and a percentage reduction in output. For example, an elasticity of 1.0 indicates that a 1.0 percent reduction in water availability would result in a 1.0 percent reduction in economic output. An elasticity of 0.50 would indicate that for every 1.0 percent of unavailable water, output is reduced by 0.50 percent and so on. Output elasticities used in this study are:[4]

- if unmet water needs are 0 to 5 percent of total water demand, no corresponding reduction in output is assumed;

- if water shortages are 5 to 30 percent of total water demand, for every 1.0 one percent of unmet need, there is a corresponding 0.25 percent reduction in output;

- if water shortages are 30 to 50 percent of total water demand, for every 1.0 one percent of unmet need, there is a corresponding 0.50 percent reduction in output; and

- if water shortages are greater than 50 percent of total water demand, for every 1.0 one percent of unmet need, there is a corresponding 1.0 percent (i.e., a proportional reduction).

Once output responses to water shortages were estimated, direct impacts to total sales, employment, regional income and business taxes were derived using regional level economic multipliers estimating using IO/SAM models. When calculating direct effects for the municipal, steam electric, manufacturing and livestock water use categories, sales to final demand were applied to avoid double counting impacts. The formula for a given IMPLAN sector is:

$$D_{i,t} = Q_{i,t} *_{,} S_{i,t} * E_Q * RFD_i * DM_{i(Q, L, I, T)}$$

where:

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[3] See, Royal, W. "*High And Dry - Industrial Centers Face Water Shortages*." in Industry Week, Sept, 2000.

[4] Elasticities are based on one of the few empirical studies that analyze potential relationships between economic output and water shortages in the United States. The study, conducted in California, showed that a significant number of industries would suffer reduced output during water shortages. Using a survey based approach researchers posed two scenarios to different industries. In the first scenario, they asked how a 15 percent cutback in water supply lasting one year would affect operations. In the second scenario, they asked how a 30 percent reduction lasting one year would affect plant operations. In the case of a 15 percent shortage, reported output elasticities ranged from 0.00 to 0.76 with an average value of 0.25. For a 30 percent shortage, elasticities ranged from 0.00 to 1.39 with average of 0.47. For further information, see, California Urban Water Agencies, "*Cost of Industrial Water Shortages*." Prepared by Spectrum Economics, Inc. November, 1991.

$D_{i,t}$ = direct economic impact to sector *i* in period *t*

$Q_{i,t}$ = total sales for sector *i* in period *t* in an affected county

$RFD_{i,}$ = ratio of final demand to total sales for sector *i* for a given region

$S_{i,t}$ = water shortage as percentage of total water use in period *t*

E_Q = elasticity of output and water use

$DM_{i(L, I, T)}$ = direct output multiplier coefficients for labor (L), income (I) and taxes (T) for sector *i*.

Direct impacts to irrigation and mining are based upon the same formula; however, total sales as opposed to final sales were used. To avoid double counting, secondary impacts in sectors other than irrigation and mining (e.g., manufacturing) were reduced by an amount equal to or less than direct losses to irrigation and mining. In addition, in some instances closely linked sectors were moved from one water use category to another. For example, although meat packers and rice mills are technically manufacturers, in some regions they were reclassified as either livestock or irrigation. All direct effects were estimated at the county level and then summed to arrive at a regional figure. See Section 2 of this report for additional discussion regarding methodology and caveats used when estimating direct impacts for each water use category.

Step 3: *Estimate Secondary and Total Economic Impacts of Water Shortages*

As noted earlier, the effects of reduced output would extend well beyond sectors directly affected. Secondary impacts were derived using the same formula used to estimate direct impacts; however, regional level *indirect* and *induced* multiplier coefficients were applied and only final sales were multiplied.

1.1.2 Impacts Associated with Domestic Water Uses

IO/SAM models are not well suited for measuring impacts of shortages for domestic uses, which make up the majority of the municipal category.[5] To estimate impacts associated with domestic uses, municipal water demand and thus needs were subdivided into two categories – residential and commercial. Residential water is considered “domestic” and includes water that people use in their homes for things such as cooking, bathing, drinking and removing household waste and for outdoor purposes including lawn watering, car-washing and swimming pools. Shortages to residential uses were valued using a tiered approach. In other words, the more severe the shortage, the more costly it becomes. For instance, a 2 acre-foot shortage for a group of households that use 10 acre-feet per year would not be as severe as a shortage that amounted to 8 acre-feet. In the case of a 2 acre-foot shortage, households would probably have to eliminate some or all outdoor water use, which could have implicit and explicit economic costs including losses to the horticultural and landscaping industry. In the case of an 8 acre-foot shortage, people would have to forgo all outdoor water use and most indoor water consumption. Economic costs would be much higher in this case because people could probably not live with such a reduction, and would be forced to find emergency alternatives. The alternative assumed in this study is a very uneconomical and worst-case scenario (i.e., hauling water in from other communities by truck or rail). Section 2.3.3 of this report discusses methodology for municipal uses in greater detail.

[5] A notable exception is the potential impacts to the nursery and landscaping industry that could arise due to reductions in outdoor residential uses and impacts to “water intensive” commercial businesses (see Section 2.3.3).

1.2 Measuring Social Impacts

As the name implies, the effects of water shortages can be social or economic. Distinctions between the two are both semantic and analytical in nature – more so analytic in the sense that social impacts are much harder to measure in quantitative terms. Nevertheless, social effects associated with drought and water shortages usually have close ties to economic impacts. For example, they might include:

- demographic effects such as changes in population,
- disruptions in institutional settings including activity in schools and government,
- conflicts between water users such as farmers and urban consumers,
- health-related low-flow problems (e.g., cross-connection contamination, diminished sewage flows, increased pollutant concentrations),
- mental and physical stress (e.g., anxiety, depression, domestic violence),
- public safety issues from forest and range fires and reduced fire fighting capability,
- increased disease caused by wildlife concentrations,
- loss of aesthetic and property values, and
- reduced recreational opportunities.[6]

Social impacts measured in this study focus strictly on demographic effects including changes in population and school enrollment. Methods are based on models used by the TWDB for state water planning and by the U.S. Census Bureau for national level population projections. With the assistance of the Texas State Data Center (TSDC), TWDB staff modified population projection models used for state water planning and applied them here. Basically, the social impact model incorporates results from the economic component of the study and assesses how changes in labor demand due to unmet water needs could affect migration patterns in a region. Before discussing particulars of the approach model, some background information regarding population projection models is useful in understanding the overall approach.

1.2.1 Overview of Demographic Projection Models

More often than not, population projections are reported as a single number that represents the size of an overall population. While useful in many cases, a single number says nothing about the composition of projected populations, which is critical to public officials who must make decisions regarding future spending on public services. For example, will a population in the future have more elderly people relative to today, or will it have more children? More children might mean that more schools are needed. Conversely, a population with a greater percentage of elderly people may need additional healthcare facilities. When projecting future populations, cohort-survival models break down a population into groups (i.e., cohorts) based on factors such as age, sex and race. Once a population is separated into cohorts, one can estimate the magnitude and composition of future population changes.

Changes in a population's size and makeup in survival cohort models are driven by three factors:

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[6] Based on information from the website of the National Drought Mitigation Center at the University of Nebraska Lincoln. Available online at: http://www.drought.unl.edu/risk/impacts.htm. See also, Vanclay, F. "*Social Impact Assessment.*" in Petts, J. (ed) International Handbook of Environmental Impact Assessment. 1999.

1. *Births:* Obviously, more babies mean more people. However, only certain groups in a population are physically capable of bearing children– typically women between the ages of 13 and 49. The U.S. Census Bureau and the TSDC continually updates fertility rates for different cohorts. For each race/ethnicity category, birth rates decline and then stabilize in the future.

2. *Deaths:* When people die, populations shrink. Unlike giving birth, however, everyone is capable of dying and mortality rates are applied to all cohorts in a given population. Hence their name, cohort-survival models use survival rates as opposed to mortality rates. A survival rate is simply the probability that a given person with certain attributes (i.e., race, age and sex) will survive over a given period of time.

3. *Migration*: Migration is the movement of people in or out of a region. Migration rates used to project future changes in a region are usually based on historic population data. When analyzing historic data, losses or increases that are not attributed to births or deaths are assumed to be the result of migration. Migration can be further broken down into changes resulting from economic and non-economic factors. Economic migrants include workers and their families that relocate because of job losses (or gains), while non-economic migrants move due to lifestyles choices (e.g., retirees fleeing winter cold in the nation's heartland and moving to Texas).

In summary, knowledge of a population's composition in terms of age, sex and race combined with information regarding birth and survival rates, and migratory patterns, allows a great deal of flexibility and realism when estimating future populations. For example, an analyst can isolate population changes due to deaths and births from changes due to people moving in and out of a region. Or perhaps, one could analyze how potential changes in medical technology would affect population by reducing death rates among certain cohorts. Lastly, one could assess how changes in *economic conditions* might affect a regional population

1.2.2 Methodology for Social Impacts

Two components make up the model. The first component projects populations for a given year based on the following six steps:

1) *Separate "special" populations from the "general" population of a region:* The general population of a region includes the portion subject to rates of survival, fertility, economic migration and non-economic migration. In other words, they live, die, have children and can move in and out of a region freely. "Special populations," on the other hand, include college students, prisoners and military personnel. Special populations are treated differently than the general population. For example, fertility rates are not applied to prisoners because in general inmates at correctional facilities do not have children, and they are incapable of freely migrating or out of a region. Projections for special populations were compiled by the TSDC using data from the Higher Education Coordinating Board, the Texas Department of Criminal Justice and the U.S. Department of Defense. Starting from the 2000 Census, general and special populations were broken down into the following cohorts:

- age cohorts ranging from age zero to 75 and older,
- race/ethnicity cohorts, including Anglo, Black, Hispanic and "other," and
- gender cohorts (male and female).

2) *Apply survival and fertility rates to the general population* : Survival and fertility rates were compiled by the TSDC with data from the Texas Department of Health (TDH). Natural decreases (i.e., deaths) are estimated by applying survival rates to each cohort and then subtracting estimated deaths from the total population. Birth rates were then applied to females in each age

and race cohort in general and special populations (college and military only) to arrive at a total figure for new births.

3) *Estimate economic migration based on labor supply and demand*: TSDC year 2000 labor supply estimates include all non-disabled and non-incarcerated civilians between the ages of 16 and 65. Thus, prisoners are not included. Labor supply for years beyond 2001 was calculated by converting year 2000 data to rates according to cohort and applying these rates to future years. Projected labor demand was estimated based on historical employment rates. Differences between total labor supply and labor demand determines the amount of in or out migration in a region. If supply is greater than demand, there is an out-migration of labor. Conversely, if demand is greater than supply, there is an in-migration of labor. The number of migrants does not necessarily reflect total population changes because some migrants have families. To estimate how many people might accompany workers, a migrant worker profile was developed based on the U.S. Census Bureau's Public Use Microdata Samples (PUMs) data. Migrant profiles estimate the number of additional family members, by age and gender that accompany migrating workers. Together, workers and their families constitute economic migration for a given year.

4) *Estimate non-economic migration*: As noted previously, migration patterns of individuals age 65 and older are generally independent of economic conditions. Retirees usually do not work, and when they relocate, it is primarily because of lifestyle preferences. Migratory patterns for people age 65 or older are based on historical PUMs data from the U.S. Census.

5) *Calculate ending population for a given year*: The total year-ending population is estimated by adding together: 1) surviving population from the previous year, 2) new births, 3) net economic migration, 4) net non-economic migration and 5) special populations. This figure serves as the baseline population for the next year and the process repeats itself.

The second component of the social impact model is identical to the first and includes the five steps listed above for each year where water shortages are reported (i.e., 2010, 2020, 2030, 2040, 2050 and 2060). The only difference is that labor demand changes in years with shortages. Shifts in labor demand stem from employment impacts estimated as part of the economic analysis component of this study with some slight modifications. IMPLAN employment data is based on the number of full and part-time jobs as opposed to the number of people working. To remedy discrepancies, employment impacts from IMPLAN were adjusted to reflect the number of people employed by using simple ratios (i.e., labor supply divided by number of jobs) at the county level. Declines in labor demand as measured using adjusted IMPLAN data are assumed to affect net economic migration in a given regional water planning area. Employment losses are adjusted to reflect the notion that some people would not relocate but would seek employment in the region and/or public assistance and wait for conditions to improve. Changes in school enrollment are simply the proportion of lost population between the ages of 5 and 17.

1.3 Clarifications, Assumptions and Limitations of Analysis

As with any attempt to measure and quantify human activities at a societal level, assumptions are necessary and every model has limitations. Assumptions are needed to maintain a level of generality and simplicity such that models can be applied on several geographic levels and across different economic sectors. In terms of the general approach used here several clarifications and cautions are warranted:

1) While useful for planning purposes, this study is not a benefit-cost analysis (BCA). BCA is a tool widely used to evaluate the economic feasibility of specific policies or projects as opposed to estimating economic impacts of unmet water needs. Nevertheless, one could include some impacts measured in this study as part of a BCA if done so properly.

2) Since this is not a BCA, future impacts are not weighted differently. In other words, estimates are not "discounted." If used as a measure of benefits in a BCA, one must consider the uncertainty of estimated monetary impacts.

3) All monetary figures are reported in constant year 2000 dollars.

4) Shortages reported by regional planning groups are the starting point for socioeconomic analyses. No adjustments or assumptions regarding the magnitude or distributions of unmet needs among different water use categories are incorporated in the analysis.

5) Estimated impacts are point estimates for years in which needs are reported (i.e., 2010, 2020, 2030, 2040, 2050 and 2060).They are independent and distinct "what if" scenarios for each particular year and water shortages are assumed to be temporary events resulting from severe drought conditions combined with infrastructure limitations. In other words, growth occurs and future shocks are imposed on an economy at 10-year intervals and resultant impacts are measured. Given, that reported figures are not cumulative in nature, it is inappropriate to sum impacts over the entire planning horizon. Doing so, would imply that the analysis predicts that drought of record conditions will occur every ten years in the future, which is not the case. Similarly, authors of this report recognize that in many communities needs are driven by population growth, and in the future total population will exceed the amount of water available due to infrastructure limitations, *regardless of whether or not there is a drought*. This implies that infrastructure limitations would constrain economic growth. However, since needs as defined by planning rules are based upon water supply and demand under the assumption of drought of record conditions, it improper to conduct economic analysis that focuses on growth related impacts over the planning horizon. Figures generated from such an analysis would presume a 50-year drought of record, which is unrealistic. Estimating lost economic activity related to constraints on population and commercial growth due to lack of water would require developing water supply and demand forecasts under "normal" or "most likely" future climatic conditions.

6) IO multipliers measure the strength of backward linkages to supporting industries (i.e., those who sell inputs to an affected sector). However, multipliers say nothing about forward linkages consisting of businesses that purchase goods from an affected sector for further processing. For example, ranchers in many areas sell most of their animals to local meat packers who process animals into a form that consumers ultimately see in grocery stores and restaurants. Multipliers do not capture forward linkages to meat packers, and since meat packers sell livestock purchased from ranchers as "final sales," multipliers for the ranching sector do fully account for all losses to a region's economy. Thus, as mentioned previously, in some cases closely linked sectors were moved from on water use category to another.

7) Cautions regarding interpretations of direct and secondary impacts are warranted. IO/SAM multipliers are based on "fixed-proportion production functions," which basically means that input use - including labor - moves in lockstep fashion with changes in levels of output. In a scenario where output (i.e., sales) declines, losses in the immediate sector or supporting sectors could be much less than predicted by an IO/SAM model for several reasons. For one, businesses will likely expect to continue operating so they might maintain spending on inputs for future use; or they may be under contractual obligations to purchase inputs for an extended period regardless of external conditions. Also, employers may not lay-off workers given that experienced labor is sometimes scarce and skilled personnel may not be readily available when water shortages subside. Lastly people who lose jobs might find other employment in the region. As a result, direct losses for employment and secondary losses in sales and employment should be considered an *upper bound*. Similarly, since population projections are based on reduced employment in the region, they should be considered an upper bound as well.

8) IO models are static in nature. Models and resultant multipliers are based upon the structure of the U.S. and regional economies in the year 2000. In contrast, unmet water needs are projected to occur well into the future (i.e., 2010 through 2060). Thus, the analysis assumes that the general structure of the economy remains the same over the planning horizon.

9) With respect to municipal needs, an important assumption is that people would eliminate all outdoor water use before indoor water uses were affected, and people would implement emergency indoor water conservation measures before commercial businesses had to curtail operations, and households had to seek alternative sources of water. Section 2.3.3 discusses this in greater detail.

10) Impacts are annual estimates. If one were to assume that conditions persisted for more than one year, figures should be adjusted to reflect the extended duration. The drought of record in Texas for many communities lasted several years.

2. Economic Impact Analysis

Part 2 of this report summarizes economic analysis for each water use category. Section 2.1 presents the year 2000 economic baseline for Region L. Section 2.2 presents results for agricultural water uses including livestock and irrigated crop production, while Section 2.3 reviews impacts to municipal and industrial water uses including manufacturing, mining, steam-electric and municipal demands.[7]

2.1 Economic Baseline

Table 2 summarizes baseline economic variables for Region L. In year 2000, the region produced $104,394 million in output that generated nearly $57,234 million worth of income for residents in the region. Economic activity supported an estimated 1,140,715 full and part-time jobs. Business and industry also generated slightly more $4,697 million in state and local taxes. Sections 2.2.and 2.3 discuss contributions of individual water use categories in greater detail.

[7] Attachment B of this report contains tables showing the distribution of impacts at the county level and city level (municipal uses only).

Table 2: Year 2000 Economic Baseline for Region L (monetary figures are reported in $millions)

	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Intermediate	Final			
Irrigation	$178.59	$40.08	$138.50	3,970	$91.12	$5.80
% of Total	<1%	<1%	<1%	<1%	<1%	<1%
Livestock	$676.15	$295.55	$380.59	13,020	$264.13	$16.08
% of Total	1%	1%	1%	1%	<1%	<1%
Manufacturing	$14,657.93	$3,008.57	$11,649.36	71,120	$4,529.78	$162.70
% of Total	14%	9%	17%	6%	8%	3%
Mining	$3,334.09	$1,571.74	$1,762.36	7,755	$1,532.27	173.39
% of Total	3%	5%	3%	1%	3%	4%
Steam Electric	$451.79	$106.78	$345.01	940	$323.09	$57.87
% of Total	<1%	<1%	<1%	<1%	1%	1%
Municipal *	$85,096.26	$28,990.83	$56,105.43	1,043,910	$50,494.32	$4,281.52
% of Total	82%	85%	80%	92%	88%	91%
Total	$104,394.80	$34,013.60	$70,381.30	1,140,715	$57,234.70	$4,697.40
% of Total	100%	100%	100%	100%	100%	100%

* Municipal includes all non-industrial commercial enterprises and institutional water uses such as the military, schools and other government organizations. Source: Generated by the Texas Water Development Board, Office of Water Planning using IMPLAN models and data from MIG, Inc.

2.2 Agriculture

Agriculture is a small but important component of the region's economy. In 2000, farmers using irrigation produced about $178.6 million dollars worth of crops that generated a total of almost $91.1 million in income – less than one percent of all income in the region. With $676.2 million in sales, the region's livestock industry is considerably larger. Collectively, irrigated farming and the livestock industry accounted for less than two percent of regional income and all jobs.

2.2.1 Irrigation

The first step in estimating impacts to irrigation required calculating gross sales for IMPLAN crop sectors. Default IMPLAN data do not distinguish irrigated production from dry-land production. Once gross sales were known other statistics such as employment and income were derived using IMPLAN direct multiplier coefficients. Gross sales for a given crop are based on two data sources:

1) county-level statistics collected and maintained by the TWDB and the USDA Natural Resources Conservation Service (NRCS) including the number of irrigated acres by crop type and water application per acre, and

2) regional-level data published by the Texas Agricultural Statistics Service (TASS) including prices received for crops (marketing year averages), crop yields and crop acreages.

Crop categories used by the TWDB differ from those used in IMPLAN datasets. To maintain consistency, sales and other statistics are reported using IMPLAN crop classifications. Table 3 shows the TWDB crops included in corresponding IMPLAN sectors. Table 4 summarizes acreage and estimated annual water use for each crop classification (year 2000).

Table 3: Crop Classifications Used in TWDB Water Use Survey and Corresponding IMPLAN Crop Sectors Applied in Socioeconomic Impact Analysis

IMPLAN Sector	TWDB Sector
Cotton	Cotton
Feed Grains	Corn, sorghum and “forage crops”
Food Grains	Rice, wheat and "other grains"
Fruits	Citrus
Hay and Pasture	Alfalfa and “other hay and pasture”
Oil Crops	Peanuts, soybeans and “other oil crops”
Sugar Crops	Sugarbeets and sugarcane
Tree Nuts	Pecans
Vegetables *	Deep-rooted vegetables, shallow-rooted vegetables and potatoes
Other Crops	"All other crops" "other orchards" and vineyards

* includes melons.

Table 4. Summary of Irrigated Crop Acreage and Water Demand for Region L (Year 2000)

Sector	Acres (1000s)	Distribution of Acres	Water Use (1000s of AF)	Distribution of Water Use
Feed Grains	103	37%	137	36%
Vegetables	49	18%	66	17%
Food Grains	42	15%	43	11%
Oil Bearing Crops	39	14%	76	20%
Hay and Pasture	22	8%	27	7%
Cotton	14	5%	20	5%
Other	9	3%	14	4%
Total	278	100%	383	100%

Source: Water demand figures are taken from the Texas Water Development Board 2006 Water Plan Projections data for year 2000. Statistics for irrigated crop acreage are based upon annual survey data collected by the TWDB and the National Resources Conservation Service (USDA).

Table 5 shows year 2000 economic data for irrigated crop production in the region. By far, vegetable production largest activity generating nearly $117.1 million in sales and providing jobs for 1,560 people.

Table 5: Year 2000 Baseline Economic Activity for Irrigated Crop Production in Region L
(monetary figures are reported in $millions)

	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Intermediate	Final			
Vegetables	$117.10	$20.40	$96.70	1,560	$51.10	$1.90
Oil Bearing Crops	$25.30	$14.30	$11.00	1,020	$16.90	$1.70
Feed Grains	$17.40	$1.70	$15.80	520	$12.20	$1.40
Food Grains	$6.40	$1.40	$5.00	330	$3.80	$0.40
Cotton	$5.60	$0.50	$5.00	70	$3.30	$0.30
Tree Nuts	$3.50	$1.50	$2.00	100	$1.90	$0.10
Hay and Pasture	$3.30	$0.30	$3.00	360	$1.80	$0.20
Total	$178.60	$40.10	$138.50	3,970	$91.10	$5.80

* Does not include dry-land crop production. Source: Generated by the Texas Water Development Board, Office of Water Planning using IMPLAN Pro™ software and data.

An important consideration when estimating impacts to irrigation was determining which crops are affected by water shortages. Several options are available. One approach is the so-called rationing model, which assumes that farmers respond to water supply cutbacks by fallowing the lowest value crops in the region first and the highest valued crops last until the amount of water saved equals the shortage.[8] For example, if farmer A grows vegetables (higher value) and farmer B grows wheat (lower value) and they both face a proportionate cutback in irrigation water, then farmer B will sell water to farmer A. Farmer B will fallow her irrigated acreage before farmer A fallows anything. Of course, this assumes that farmers can and do transfer enough water to allow this to happen. A different approach involves constructing farm-level profit maximization models that conform to widely-accepted economic theory that farmers make decisions based on marginal net returns. Such models have good predictive capability, but data requirements and complexity are high. Given that a detailed analysis for each region would require a *substantial* amount of farm-level data and analysis, the following investigation assumes that projected shortages are distributed equally across predominant crops in the region. "Predominant" in this case are crops that comprise at least one percent of total acreage in the region (see Table 4).

The following steps outline the overall method used to estimate direct impacts to irrigated agriculture:

[8] The rationing model was initially proposed by researchers at the University of California at Berkeley, and was then modified for use in a study conducted by the U.S. Environmental Protection Agency that evaluated how proposed water supply cutbacks recommended to protect water quality in the Bay/Delta complex in California would affect farmers in the Central Valley. See, Zilberman, D., Howitt, R. and Sunding, D. "*Economic Impacts of Water Quality Regulations in the San Francisco Bay and Delt*a." Western Consortium for Public Health. May 1993.

1. *Distribute shortages across predominant crop types in the region*. Again, unmet water needs were distributed equally across crop sectors that constitute one percent or more of irrigated acreage in 2000.

2. *Estimate associated reductions in output for affected crop sectors*. Output reductions are based on elasticities discussed in Section 1.2.1 and on estimated values per acre for different crops. Values per acre stem from the same data used to estimate output for the year 2000 baseline. Given that 2000 may have been an unusually poor or productive year for some crops and not necessarily representative of normal conditions, statistics regarding yield, price and acreage for crop sectors were averaged over a five-year period (1995-2000) if sufficient data were available.

3. *Offset reductions in output by revenues from dry-land production.* If TASS acreage data indicate that farmers grow a dry-land version of a given crop in the region (e.g., cotton or corn), estimated losses from irrigated acreage are offset by assumed revenues from dry-land harvests. Basically, the analysis assumes that farmers who use irrigation would have some output even if irrigation water were not available. Given that water shortages are expected to occur under drought conditions, values per acre for dry-land crops are based on 1998 and/or 1996 yields and prices. Both 1996 and 1998 were particularly bad drought years for much of Texas. Table 6 summarizes data used to estimate the value of lost output.

Table 6: Data Used to Estimate Impacts to Irrigated Crop Production in Region L.

Crop sector	Gross sales revenue per irrigated acre	Gross sales revenue per dry-land acre (drought conditions)	Data Sources for yield, prices and planted acreage used to estimate gross sales per acre
Feed Grains	$220	$75	Average weighted by acreage for corn, grain sorghum and forage crops. Price, yield and planted acreage data for corn and grain sorghum are TASS five year averages (1995-2000) for South Central Region. Forage crops estimate for gross revenues is from TAMU crop budgets for Coastal Bermuda hay. Dry-land calculated using same method but based on TASS South Central Region for 1998.
Vegetables	$2,800	$0	Average weighted by acreage for shallow-rooted vegetables, deep rooted vegetables and potatoes. Data source: gross revenues based on price, yield and planted acreage data from TASS (statewide five-year averages values for each crop). No dry-land output assumed.
Food Grains	$210	$50	Average weighted of winter wheat (Irrigated) and spring wheat (Irrigated). Data source: TAMU crop budgets. Dry-land value calculated based on TASS 1998 price, yield and planted acreage data for dry-land wheat.
Oil Bearing Crops	$630	$0	Gross revenues based on five-year average (1995-2000) price, yield and planted acreage estimates for peanuts. Data source: TASS South Texas Region.
Hay and Pasture	$150	$45	Gross revenues are from TAMU crop budgets for South Texas Coastal Bermuda hay. Dry-land value = $150 x 0.30
Cotton	$440	$160	Gross revenues for normal conditions based TASS five averages for cotton in South Texas. Dry-land is based on TASS yield, price and acreage data for dry-land cotton (1998).

*All values are rounded. TASS = Texas Agricultural Statistics Service. TAMU = Texas A&M University.

The South Central Texas 2006 Water Plan indicates that under drought of record conditions, shortages to irrigation would occur primarily in Zavala County. Table 7 summarizes estimated impacts. Attachment B of this report shows impacts by county, and Attachment C shows impacts by major river basin.

Table 7: Annual Economic Impacts of Unmet Water Needs for Irrigation in Region L (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)				
Year	Sales ($millions)	Regional Income ($millions)	Jobs	Business Taxes ($millions)
2010	$19.30	$10.61	470	$0.76
2020	$18.11	$9.98	445	$0.72
2030	$17.73	$9.76	440	$0.70
2040	$17.32	$9.54	430	$0.69
2050	$16.90	$9.31	420	$0.67
2060	$16.47	$9.07	410	$0.65

* Estimates are based on *projected* economic activity in the region. Source: Based on economic impact models developed by the Texas Water Development Board, Office of Water Planning.

2.2.2 Livestock

Livestock water shortages are projected to occur in Bexar, Comal and Kendall counties. Relative to other water use categories needs for livestock are small and range from 5 to 30 percent of demand. Thus, the analysis assumes that livestock farmers would haul water by truck to fill stock tanks. Table 8 shows estimated annual costs. Attachment B of this report shows impacts by county, and Attachment C shows impacts by major river basin.

Table 8: Annual Costs to Livestock Producers (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)	
Year	$millions
2010	$0.79
2020	$0.80
2030	$1.35
2040	$1.38
2050	$1.48
2060	$1.50

Source: Based on economic impact models developed by the Texas Water Development Board, Office of Water Planning.

2.3 Municipal and Industrial

2.3.1 Manufacturing

Table 9 summarizes baseline economic data for manufacturing sectors in the region. Chemicals, plastics and petroleum refining are the leader with total sales of $3,797 million. In 2000, these sectors supported an estimated 4,506 jobs that provided regional residents incomes worth slightly less than $845 million.

Table 9: Year 2000 Baseline Economic Activity for Manufacturing in Region L (monetary figures are reported in $millions)

Sector	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Intermediate	Final			
Industrial Organic Chemicals	$2,068.57	$624.52	$1,444.05	2,715	$505.99	36.52
Plastics Materials and Resins	$1,027.13	$151.50	$875.62	1,544	$236.17	9.03
Petroleum Refining	$701.39	$316.00	$385.39	247	$103.06	7.19
Bottled and Canned Drinks	$468.38	$2.60	$465.79	1,393	$95.13	3.48
Miscellaneous Plastics Products	$384.75	$5.67	$379.08	2,237	$106.33	2.50
Semiconductors and Related Devices	$381.75	$144.72	$237.04	1,797	$180.90	2.99
Refrigeration and Heating Equipment	$375.64	$141.35	$234.29	1,814	$94.04	3.29
Aircraft	$365.19	$10.77	$354.42	1,334	$99.41	3.95
All other manufacturing sectors	$8,885.12	$1,611.44	$7,273.69	58,047	$3,108.75	$93.75
Total	$14,657.93	$3,008.57	$11,649.36	71,128	$4,529.78	$162.70

Source: Generated by the Texas Water Development Board, Office of Water Planning using IMPLAN Pro™ software and data.

Direct impacts to manufacturing were estimated by distributing water shortages among industrial sectors at the county level. Care was taken to include only sectors recorded in the TWDB Water Uses database. Some sectors in IMPLAN databases are not part of the TWDB database given that they use relatively small amounts of water - primarily for on-site sanitation and potable uses. To maintain consistency between IMPLAN and TWDB databases, Standard Industrial Classification (SIC) codes in TWDB databases were matched to IMPLAN sector codes for each affected county. Non-matches were excluded when calculating direct impacts.

The distribution of water shortages among TWDB manufacturing sectors is weighted according to year 2000 water use. Accordingly, industries with the greatest use are affected the most. As a general observation, these sectors include petroleum and chemical refineries, plastic producers, paper mills, food processors and cement manufacturers. Other manufacturing sectors use considerably less water for productive processes and are less likely to suffer substantial negative effects due to water shortages. In other words, they would likely be able to haul in enough water by truck to keep their operations running.

The South Central Texas 2006 Water Plan indicates that under drought of record conditions, shortages to manufacturing would occur in Bexar, Comal, and Victoria counties. Table 10 summarizes estimated impacts. Attachment B of this report shows impacts by county, and Attachment C shows impacts by major river basin.

Table 10: Annual Economic Impacts of Unmet Water Needs for Manufacturing in Region L (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)				
Year	Sales ($millions)	Regional Income ($millions)	Jobs	Business Taxes ($millions)
2010	$300.61	$100.55	1,710	$5.72
2020	$1,257.80	$420.73	7,170	$23.92
2030	$3,729.51	$1,247.50	21,250	$70.93
2040	$4,955.18	$1,661.42	28,310	$94.32
2050	$6,101.83	$2,067.52	34,880	$115.85
2060	$7,338.60	$2,503.77	41,990	$139.13

* Estimates are based on *projected* economic activity in the region. Source: Generated by the Texas Water Development Board, Office of Water Planning.

2.3.2 Mining

Table 11 summarizes sales, employment and regional income for the mining industry in Region L. In 2000, mining sectors generated about $1,532 million worth of income and provided jobs for 7,756 workers in the region. Natural gas and petroleum extraction accounts for about 90 percent of mining activity. About 50 percent of output from the gas and crude extraction sector goes directly to other regional industries in the form of intermediate sales. Obviously, most of this goes to refineries, which are an important forward linkage for the gas and crude mining sector. Thus, reduced drilling activity resulting from water shortages might have an effect on regional oil refineries, but these impacts were not included to avoid double counting. Impacts to refineries were incorporated when estimating impacts to manufacturing sectors (see Section 2.3.1).

Table 11: Year 2000 Baseline Economic Activity for Mining in Region L (monetary figures are reported in $millions)						
Sector	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Intermediate	Final			
Natural Gas & Crude Petroleum	$2,972.61	$1,502.97	$1,469.64	6,335	$1,349.13	$158.27
All Other Mining Sectors	$361.48	$68.76	$292.72	1421	$183.14	$15.11
Total	$3,334.09	$1,571.74	$1,762.36	7,756	$1,532.27	$173.39

Source: Generated by the Texas Water Development Board, Office of Water Planning using IMPLAN Pro™ software and data.

Another consideration is that the petroleum and gas extraction industry only uses water in significant amounts for secondary recovery. Known in the industry as “enhanced” or “water flood” extraction, secondary recovery involves pumping water down injection wells to increase underground pressure thereby pushing oil or gas into other wells. IMPLAN output numbers do not distinguish between secondary and non-secondary recovery. To account for the discrepancy, county-level data from the Texas Railroad Commission (TRC) showing the proportion of barrels produced using secondary methods were used to adjust IMPLAN data to reflect only the portion of sales attributed to secondary recovery.

An additional problem with standard IMPLAN data matter relates to estimates of output at the county-level. In general, IMPLAN data for mining at the county level reflect sales and employment, but not necessarily physical output. For instance, a mining company and its employees may be based in Dallas County Texas, but most of its product comes from oil well leases in West Texas. However, company sales and employment figures are reported for Dallas County. Another good example includes coastal counties in the state (e.g., Harris County in Region H) where reported sales take account of off-shore gas and oil extraction in the Gulf of Mexico. To account for potential discrepancies, analysts used data from the TRC to check the accuracy of output in affected counties by comparing average well-head market prices for crude and gas to TRC production statistics in each county. If there were large discrepancies, estimates that reflect physical output based on TRC data were used instead of IMPLAN data.

Lastly, unlike output in other sectors including manufacturing and municipal output the crude and natural gas sectors is not assumed to grow over the planning horizon. Water use will increase as secondary recovery occurs in more fields, but the real volume of oil and gas produced on-shore in Texas is not likely to grow significantly. However, the analysis does presume that real prices of oil and gas will increase through time, and thus sales revenues will increase.

The South Central Texas 2006 Water Plan indicates that under drought of record conditions, shortages to mining would occur in Atascosa, Bexar and Comal counties. Table 12 summarizes estimated impacts. Attachment B of this report shows impacts by county, and Attachment C shows impacts by major river basin.

Table 12: Annual Economic Impacts of Unmet Water Needs for Mining in Region L
(years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)

Year	Sales ($millions)	Regional Income ($millions)	Jobs	Business Taxes ($millions)
2010	$112.83	$64.12	760	$3.88
2020	$119.77	$68.07	810	$4.12
2030	$132.39	$75.23	900	$4.55
2040	$137.74	$78.11	930	$4.78
2050	$150.94	$85.58	1,020	$5.24
2060	$152.36	$86.36	1,030	$5.30

* Estimates are based on *projected* economic activity in the region. Source: Generated by the Texas Water Development Board, Office of Water Planning.

2.3.3 Municipal

Table 13 summarizes economic activity for municipal uses. In 2000, businesses and institutions that make up the municipal category produced $85,096 million worth of goods and services. In return, they received $46,430 million in wages, salaries and profits. Municipal sectors generate the bulk of tax revenues in the region – nearly $4,281 billion (90 percent). Top commercial sectors in terms of income and output include communications, wholesale trade, real estate, banking, insurance and bars and restaurants. Federal facilities including military bases are also an important economic engine for the region. As shown, in year 2000 the federal government employed 75,674 people in the region.

Table 13: Year 2000 Baseline Economic Activity for Municipal Water Uses in Region L

Sector	Sales Activity			Jobs	Regional Income	Business Taxes
	Total	Intermediate	Final			
Federal Government	$6,095.01*	$0.00	$0.00	75,674	$4,153.68	$0.00
Communications	$4,461.85	$996.30	$3,465.55	12,288	$2,324.08	247.33
Wholesale Trade	$4,408.08	$2,038.09	$2,370.00	41,876	$2,420.62	629.63
Real Estate	$3,999.81	$1,569.04	$2,430.77	19,463	$2,372.00	473.19
Banking	$3,539.80	$900.45	$2,639.35	15,584	$2,286.90	57.22
Insurance Carriers	$3,398.32	$102.14	$3,296.18	24,720	$1,841.18	188.59
Eating & Drinking	$2,547.02	$119.19	$2,427.82	67,261	$1,212.09	169.12
All other municipal sectors	$56,646.38	$23,265.63	$39,475.76	862,720	$38,037.46	$2,516.73
Total	$85,096.26	$28,990.83	$56,105.43	968,237	$46,340.64	$4,281.52

"Sales" for the Federal Government sector is an monetary estimate of services provided. Source: Generated by the Texas Water Development Board, Office of Water Planning using IMPLAN Pro™ software and data.

Estimating direct economics impacts for the municipal category is complicated for a number of reasons. For one, municipal uses comprise a range of different consumers including commercial businesses, institutions (e.g., schools and government) and households. However, reported shortages do not specify how needs are distributed among different consumers. In other words, how much of a municipal need is commercial and how much is residential? The amount of commercial water use as a percentage of total municipal demand was estimated based on "GED" coefficients (gallons per employee per day) published in secondary sources (see Attachment A). For example, if year 2000 baseline data for a given economic sector (e.g., amusement and recreation services) shows employment at 30 jobs and the GED coefficient is 200, then average daily water use by that sector is (30 x 200 = 6,000 gallons) and thus annual use is 6.7 acre-feet. Water not attributed to commercial use is considered domestic, which includes single and multi-family residential consumption, institutional uses and all use designated as "county-other." The estimated proportion of water used for commercial purposes ranges from about 5 to 35 percent of total municipal demand at the county level. Less populated rural counties occupy the lower end of the spectrum, while larger metropolitan counties are at the higher end.

As mentioned earlier, a key study assumption is that people would eliminate outdoor water use before indoor water consumption was affected; and they would implement *voluntary* emergency indoor water conservation measures before people had to curtail business operations or seek emergency sources of water. This is logical because most water utilities have drought contingency plans. Plans usually specify curtailment or elimination of outdoor water use during periods of drought. In Texas, state law requires retail and wholesale water providers to prepare and submit plans to the Texas Commission on Environmental Quality (TCEQ). Plans must specify demand management measures for use during drought including curtailment of "non-essential water uses."[9] Thus, when assessing municipal needs there are several important considerations: 1) how much of a need would people reduce via eliminating outdoor uses and implementing emergency indoor conservation measures; and 2) what are the economic implications of such measures?

Determining how much water is used for outdoor purposes is key to answering these questions. The proportion used here is based on several secondary sources. The first is a major study sponsored by the American Water Works Association, which surveyed cities in states including Colorado, Oregon, Washington, California, Florida and Arizona. On average across all cities surveyed 58 percent of residential water use was for outdoor activities. In cities with climates comparable to large metropolitan areas of Texas, the average was 40 percent.[10]Earlier findings of the U.S. Water Resources Council showed a national average of 33 percent. Similarly, the United States Environmental Protection Agency (USEPA) estimated that landscape watering accounts for 32 percent of total residential and commercial water use on annual basis.[11] A study conducted for the California Urban Water Agencies (CUWA) calculated values ranging from 25 to 35 percent.[12] Unfortunately, there does not appear to be any comprehensive research that has estimated non-agricultural outdoor water use in Texas. As an approximation, an average annual value of 30 percent based on the above references was selected to serve as a rough estimate in this study. With respect to emergency indoor conservation measures, this analysis assumes that citizens in affected communities would reduce needs by an additional 20 percent. Thus, 50 percent of total needs could be eliminated before households and businesses had to implement emergency water procurement activities.

Eliminating outdoor watering would have a range of economic implications. For one, such a restriction would likely have adverse impacts on the landscaping and horticultural industry. If people are unable to water their lawns, they will likely purchase less lawn and garden materials such as plants and fertilizers. On the other hand, during a bad drought people may decide to invest in drought tolerant landscaping, or they might install more efficient landscape plumbing and other water saving devices. But in general, the horticultural industry would probably suffer considerable losses if outdoor water uses were restricted or eliminated. For example, many communities in Colorado, which is in the midst of a prolonged drought, have severely restricted lawn irrigation. In response, the turf industry in Colorado has laid off at least 50 percent of its 2,000 employees.[13] To capture impacts to the horticultural industry, regional sales net of exports for the greenhouse and nursery sectors and the landscaping services sector were reduced by proportion equal to reductions in outdoor water use. Note that these losses would not necessarily appear as losses to the regional or state economies because people would likely spend the money that they would have spent on landscaping on other goods in the economy. Thus, the net effect to state or regional accounts could be neutral.

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[9] Non-essential uses include, but are not limited to, landscape irrigation and water for swimming pools or fountains. For further information see the Texas Environmental Quality Code §288.20.

[10] See, Mayer, P.W., DeOreo, W.B., Opitz, E.M., Kiefer, J.C., Davis, W., Dziegielewski, D., Nelson, J.O. "*Residential End Uses of Water*." Research sponsored by the American Water Works Association and completed by Aquacraft, Inc. and Planning and Management Consultants, Ltd. (PMCL@CDM).

[11] U.S. Environmental Protection Agency. *"Cleaner Water through Conservation*." USEPA Report no. 841-B-95-002. April, 1995.

[12] Planning and Management Consultants, Ltd. "*Evaluating Urban Water Conservation Programs: A Procedures Manual*." Prepared for the California Urban Water Agencies. February 1992.

[13] Based on assessments of the Rocky Mountain Sod Growers. See, "*Drought Drying Up Business for Landscapers*." Associated Press. September, 17 2002.

Other considerations include the "welfare" losses to consumers who had to forgo outdoor and indoor water uses to reduce needs. In other words, the water that people would have to give up has an economic value. Estimating the economic value of this forgone water for each planning area would be a very time consuming and costly task, and thus secondary sources served as a proxy. Previous research funded by the TWDB, explored consumer "willingness to pay" for avoiding restrictions on water use.[14] Surveys revealed that residential water consumers in Texas would be willing to pay – on average across all income levels - $36 to avoid a 30 percent reduction in water availability lasting for at least 28 days. Assuming the average person in Texas uses 140 gallons per day and the typical household in the state has 2.7 persons (based on U.S. Census data), total monthly water use is 13,205 gallons per household. Therefore, the value of restoring 30 percent of average monthly water use during shortages to residential consumers is roughly one cent per gallon or $2,930 per acre-foot. This figure serves as a proxy to measure consumer welfare losses that would result from restricted outdoor uses and emergency indoor restrictions.

The above data help address the impacts of incurring water needs that are 50 percent or less of projected use. Any amount greater than 50 percent would result in municipal water consumers having to seek alternative sources. Costs to residential and non-water intensive commercial operations (i.e., those that use water only for sanitary purposes) are based on the most likely alternative source of water in the absence of water management strategies. In this case, the most likely alternative is assumed to be "hauled-in" water from other communities at annual cost of $6,530 per acre-foot for small rural communities and approximately and $10,995 per acre-foot for metropolitan areas.[15]

This is not an unreasonable assumption. It happened during the 1950s drought and more recently in Texas and elsewhere. For example, in 2000 at the heels of three consecutive drought years Electra - a small town in North Texas - was down to its last 45 days worth of reservoir water when rain replenished the lake, and the city was able to refurbish old wells to provide supplemental groundwater. At the time, residents were forced to limit water use to 1,000 gallons per person per month - less than half of what most people use - and many were having water hauled delivered to their homes by private contractors.[16] In 2003 citizens of Ballinger, Texas, were also faced with a dwindling water supply due to prolonged drought. After three years of drought, Lake Ballinger, which supplies water to more than 4,300 residents in Ballinger and to 600 residents in nearby Rowena, was almost dry. Each day, people lined up to get water from a well in nearby City Park. Trucks hauling trailers outfitted with large plastic and metal tanks hauled water to and from City Park to Ballinger.[17] In Australia, four cities have run out of water as a result of drought, and residents have been trucking in water since November 2002. One town has five trucks carting about one acre-foot eight times daily from a source 20 miles away. They had to build new roads and infrastructure to accommodate the trucks. Residents are currently restricted to indoor water use only.[18]

Direct impacts to commercial sectors were estimated in a fashion similar to other business sectors. Output was reduced among "water intensive" commercial sectors according to

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[14] See, Griffin, R.C., and Mjelde, W.M. "*Valuing and Managing Water Supply Reliability*. Final Research Report for the Texas Water Development Board: Contract no. 95-483-140." December 1997.

[15] For rural communities, figure assumes an average truck hauling distance of 50 miles at a cost of 8.4 cents per ton-mile (an acre foot of water weighs about 1,350 tons) with no rail shipment. For communities in metropolitan areas, figure assumes a 50 mile truck haul, and a rail haul of 300 miles at a cost of 1.2 cents per ton-mile. Cents per ton-mile are based on figures in: Forkenbrock, D.J., "*Comparison of External Costs of Rail and Truck Freight Transportation*." Transportation Research. Vol. 35 (2001).

[16] Zewe, C. "*Tap Threatens to Run Dry in Texas Town*." July 11, 2000. CNN Cable News Network.

[17] Associated Press, "*Ballinger Scrambles to Finish Pipeline before Lake Dries Up*." May 19, 2003.

[18] Healey, N. (2003) *Water on Wheels*, Water: Journal of the Australian Water Association, June 2003.

the severity of projected shortages. Water intensive is defined as non-medical related sectors that are heavily dependent upon water to provide their services. These include:

- car-washes,
- laundry and cleaning facilities,
- sports and recreation clubs and facilities including race tracks,
- amusement and recreation services,
- hotels and lodging places, and
- eating and drinking establishments.

For non-water intensive sectors, it is assumed that businesses would haul water by truck and/or rail.

An example will illustrate the breakdown of municipal water needs and the overall approach to estimating impacts of municipal needs. Assume City B has an unmet need of 50 acre feet in 2020 and projected demands of 200 acre-feet. In this case, residents of City B could eliminate needs via restricting all outdoor water use. City A, on the other hand, has an unmet need of 150 acre-feet in 2020 with a projected demand of 200 acre-feet. Thus, total shortages are 75 percent of total demand. Emergency outdoor and indoor conservation measures would eliminate 50 acre-feet of projected needs; however, 50 acre-feet would still remain. This remaining portion would result in costs to residential and commercial water users. Water intensive businesses such as car washes, restaurants, motels, race tracks would have to curtail operations (i.e., output would decline), and residents and non-water intensive businesses would have to have water hauled-in assuming it was available.

The last element of municipal water shortages considered focused on lost water utility revenues. Estimating these was straightforward. Analyst used annual data from the "*Water and Wastewater Rate Survey*" published annually by the Texas Municipal League to calculate an average value per acre-foot for water and sewer. For water revenues, averages rates multiplied by total water needs served as a proxy. For lost wastewater, total unmet needs were adjusted for return flow factor of 0.60 and multiplied by average sewer rates for the region. Needs reported as "county-other" were excluded under the presumption that these consist primarily of self-supplied water uses. In addition, 15 percent of water demand and needs are considered non-billed or "unaccountable" water that comprises things such leakages and water for municipal government functions (e.g., fire departments). Lost tax receipts are based on current rates for the "miscellaneous gross receipts tax, "which the state collects from utilities located in most incorporated cities or towns in Texas.

The South Central Texas 2006 Water Plan indicates that under drought of record conditions, shortages to municipal water uses would occur in Atascosa, Bexar, Caldwell, Comal, Medina, Uvalde and Wilson counties. Tables 14 through 17 summarize estimated impacts to residents, commercial businesses (water intensive and non-water intensive), water utilities and the horticultural industry. Attachment B of this report shows impacts by county, and Attachment C shows impacts by major river basin.

Table 14: Annual Economic Impacts of Unmet Water Needs for Water Intensive Commercial Businesses (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)				
Year	Sales ($millions)	Regional Income ($millions)	Jobs	Business Taxes ($millions)
2010	$250.94	$145.15	4870	$14.82
2020	$289.12	$166.86	5600	$17.06
2030	$348.03	$201.49	6770	$20.53
2040	$439.96	$258.53	8710	$25.93
2050	$1,709.90	$986.74	32,990	$101.08
2060	$2,427.45	$1,402.69	46,900	$143.50
* Estimates are based on *projected* economic activity in the region. Source: Source: Generated by the Texas Water Development Board, Office of Water Planning.				

Table 15: Annual Economic Impacts of Unmet Water Needs for the Horticultural Industry (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)				
Year	Sales ($millions)	Regional Income ($millions)	Jobs	Business Taxes ($millions)
2010	$90.64	$58.69	2,290	$1.93
2020	$133.74	$86.60	3,380	$2.84
2030	$175.00	$113.31	4,420	$3.72
2040	$207.28	$134.21	5,235	$4.41
2050	$234.11	$151.58	5,910	$4.98
2060	$259.70	$168.15	6,560	$5.52
Source: Generated by the Texas Water Development Board, Office of Water Planning.				

Table 16: Annual Costs to Domestic Water Users (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)	
Year	$millions
2010	$265.78
2020	$360.09
2030	$527.98
2040	$727.99
2050	$906.30
2060	$1,107.42
Source: Generated by the Texas Water Development Board, Office of Water Planning.	

Table 17: Annual Losses of Water Utility Revenues and Taxes due to Unmet Water Needs (years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)		
Year	$ millions	Utility Taxes
2010	$108.64	$1.91
2020	$156.06	$2.75
2030	$174.55	$3.07
2040	$242.13	$4.26
2050	$281.50	$4.95
2060	$322.26	$5.67

Figures do not include potential losses related to water shortages for manufacturing sectors that purchase utility water. Source: Generated by the Texas Water Development Board, Office of Water Planning.

2.3.4 Steam Electric

Without adequate cooling water, power plants cannot safely operate. As water availability falls below projected demands, water levels in lakes and rivers that provide cooling water would also decline, particularly during drought when surface flows are reduced. Low water levels could affect raw water intakes and water discharge outlets (i.e., outfalls) at power facilities in several ways. For one, power plants are regulated by thermal emission guidelines that specify the maximum amount of heat that can go back into a river or lake via discharged cooling water. Low lake or river levels could result in permit compliance issues due to reduced dilution and dispersion of heat and subsequent impacts on aquatic biota near outfalls.[19] But the primary concern would be a loss of head (i.e., pressure) over intake structures that would decrease flows through intake tunnels. This could affect safety related pumps, increase operating costs and/or result in sustained shut-downs. Assuming plants did shutdown, they would not be able to generate electricity, which implies that output (i.e., sales of electricity) would decline.

Among all water use categories, steam-electric is unique and cautions are necessary when applying methods used in this study. Measured changes to an economy using input-output models stem directly from changes in sales revenue. In the case of water shortages, one assumes that businesses will suffer lost output if process water is in short supply. For power generation facilities this is true as well. However, the electric services sector in IMPLAN represents a corporate entity that may own and operate several power plants in a given region. If one plant became inoperable due to water shortages, plants in other areas or generation facilities that do not rely heavily water (e.g., gas powered turbines or “peaking plants”) might be able to compensate for lost generating capacity. Utilities could also offset lost production via purchases on the spot market.[20] Thus, to presume that electricity would stop flowing may be unrealistic, but to maintain consistency, the model assumes that water shortages would result in lost sales of electricity.[21] Another related consideration is that IMPLAN output data report all sales transactions

[19] Section 316 (b) of the Clean Water Act requires that thermal wastewater discharges do not harm fish and other wildlife.

[20] Today, most utilities participate in large interstate “power pools” and can buy or sell electricity “on the grid” from other utilities or power marketers. Thus, assuming power was available to buy, and assuming that no contractual or physical limitations were in place (e.g., transmission constraints); utilities could offset lost power that resulted from waters shortages with purchases via the power grid.

[21] Losses offset through grid purchases or from peaking plants would likely result in higher production costs, which utilities would ultimately pass on to consumers in the form of higher utility bills. Determining the impacts of higher costs is not considered in this study.

for particular utility in a given county - including sales generated from stations outside a county. As a countermeasure, analysts estimated sales for affected counties using production and price data from the U.S. Energy Information Administration.

The South Central Texas 2006 Water Plan indicates that under drought of record conditions, shortages to steam-electric water uses would occur in Atascosa, Goliad and Guadalupe counties. Table 18 summarizes estimated impacts. Attachment B of this report shows impacts by county, and Attachment C shows impacts by major river basin.

Table 18: Annual Economic Impacts of Unmet Water Needs for Steam-electric Water Uses
(years 2010, 2020, 2030, 2040, 2050 and 2060, constant year 2000 dollars)

Year	Total Sales	Regional Income ($millions)	Jobs	Business Taxes
2010	$27.51	$18.53	100	$3.32
2020	$91.28	$61.47	345	$11.01
2030	$120.66	$81.26	450	$14.56
2040	$160.44	$108.02	600	$19.35
2050	$212.19	$142.81	785	$25.58
2060	$293.99	$197.67	1,050	$35.41

Source: Generated by the Texas Water Development Board, Office of Water Planning.

3. Results of Social Impact Analysis

As discussed previously in Section 1.2, estimated social impacts focus changes including population loss and subsequent related in school enrollment. As shown in Table 19, water shortages in 2010 could result in a population loss of 14,230 people with a corresponding reduction is school enrollment of 3,620. Models indicate that shortages in 2060 could cause population in the region to fall by 138,890 people and school enrollment by 35,280 students.

Table 19: Estimated Regional Social Impacts of Unmet Water Needs in Region L
(years 2010, 2020, 2030, 2040, 2050 and 2060)

Year	Population Losses	Declines in School Enrollment
2010	14,230	3,620
2020	25,080	6,370
2030	49,180	12,490
2040	62,970	15,990
2050	107,830	27,390
2060	138,890	35,280

Source: Generated by the Texas Water Development Board, Office of Water Planning.

Attachment A: Baseline Regional Economic Data

Tables A-1 through A-6 contain data from several sources that form a basis of analyses in this report. Economic statistics were extracted and processed via databases purchased from MIG, Inc. using IMPLAN Pro™ software. Values for gallons per employee (i.e. GED coefficients) for the municipal water use category are based on several secondary sources.[22] County-level data sets along with multipliers are not included given their large sizes (i.e., 528 sectors per county each with 12 different multiplier coefficients). Fields in Tables A-1 through A-6 contain the following variables:

- *GED -* average gallons of water use per employee per day (municipal use only);
- *total sales -* total industry production measured in millions of dollars (equal to shipments plus net additions to inventories);
- *intermediate sales -* sales to other industries in the region measured in millions of dollars;
- *final sales -* all sales to end-users including sales to households in the region and exports out of the region;
- *jobs -* number of full and part-time jobs (annual average) required by a given industry;
- *regional income* - total payroll costs (wages and salaries plus benefits), proprietor income, corporate income, rental income and interest payments;
- *business taxes –* sales taxes, excise taxes, fees, licenses and other taxes paid during normal business operations (includes all payments to federal, state and local government except income taxes).

[22] Sources for GED coefficients include: Gleick, P.H., Haasz, D., Henges-Jeck, C., Srinivasan, V., Wolff, G. Cushing, K.K., and Mann, A. "*Waste Not, Want Not*. *The Potential for Urban Water Conservation in California*." Pacific Institute. November 2003. U.S. Bureau of the Census. 1982 Census of Manufacturers: Water Use in Manufacturing. USGPO, Washington D.C. See also: "*U.S. Army Engineer Institute for Water Resources, IWR Report 88-R-6.*," Fort Belvoir, VA. See also, Joseph, E. S., 1982, "*Municipal and Industrial Water Demands of the Western United States*." Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, v. 108, no. WR2, p. 204-216. See also, Baumann, D. D., Boland, J. J., and Sims, J. H., 1981, "*Evaluation of Water Conservation for Municipal and Industrial Water Supply*." U.S. Army Corps of Engineers, Institute for Water Resources, Contract no. 82-C1.

Table A-1: Economic Data for Irrigated Agriculture in Region L (Year 2000, monetary figures reported in $millions)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Cotton	$5.58	$0.54	$5.03	74	$3.30	$0.28
Feed Grains	$17.43	$1.66	$15.77	521	$12.21	$1.37
Food Grains	$6.39	$1.42	$4.97	328	$3.81	$0.37
Hay and Pasture	$3.31	$0.32	$2.99	362	$1.81	$0.18
Oil Bearing Crops	$25.30	$14.28	$11.03	1020	$16.94	$1.65
Tree Nuts	$3.48	$1.46	$2.02	96	$1.93	$0.05
Vegetables	$117.09	$20.41	$96.68	1564	$51.11	$1.90
Total	$178.59	$40.08	$138.50	3,967	$91.12	$5.80

Data do not include non-irrigated acreage.

Table A-2: Economic Data for Livestock Sectors, Region L (Year 2000, monetary figures reported in $millions)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Cattle Feedlots	$152.52	$78.50	$74.02	1012	$108.58	8.56
Dairy Farm Products	$25.33	$5.86	$19.47	374	$17.23	0.13
Hogs, Pigs and Swine	$8.48	$8.35	$0.13	252	$3.20	0.37
Miscellaneous Livestock	$12.90	$2.94	$9.96	1205	$5.36	0.14
Other Meat Animal Products	$0.38	$0.21	$0.17	13	$0.08	0.01
Poultry and Eggs	$247.00	$92.81	$154.19	1755	$37.84	0.66
Ranch Fed Cattle	$105.98	$58.01	$47.98	3856	$42.04	3.01
Range Fed Cattle	$122.01	$47.45	$74.56	4329	$49.28	3.17
Sheep, Lambs and Goats	$1.54	$1.43	$0.11	224	$0.53	0.03
Total	$676.15	$295.55	$380.59	13,020	$264.13	$16.08

Table A-3: Economic Data for Municipal Sectors, Region L (Year 2000, monetary figures reported in $millions)

Sector	GED	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Accounting, Auditing and	120	$648.85	$577.11	$71.74	10635	$511.34	5.82
Advertising	117	$165.59	$133.27	$32.32	1386	$90.34	1.63
Agricultural, Forestry, Fishery	-	$62.13	$37.41	$24.72	3150	$34.84	1.54
Air Transportation	171	$690.66	$125.80	$564.85	7376	$344.04	49.20
Amusement and Recreation	427	$296.74	$5.87	$290.87	12517	$166.25	16.10
Apparel & Accessory Stores	68	$309.02	$19.73	$289.29	7777	$170.81	49.31
Arrangement Of Passenger	130	$314.82	$55.61	$259.21	2284	$217.40	9.41
Automobile Parking and Car Wash	681	$78.99	$13.05	$65.94	2086	$53.35	3.66
Automobile Rental and Leasing	147	$413.48	$187.18	$226.30	3882	$241.39	32.67
Automobile Repair and Services	55	$747.57	$148.14	$599.42	8974	$381.74	34.59
Automotive Dealers & Service	49	$1,660.32	$255.17	$1,405.15	19590	$990.16	256.78
Banking	59	$3,539.80	$900.45	$2,639.35	15584	$2,286.90	57.22
Beauty and Barber Shops	216	$196.59	$22.19	$174.39	6705	$120.83	2.37
Bowling Alleys and Pool Halls	86	$16.48	$0.03	$16.45	860	$8.71	1.42
Building Materials & Gardening	35	$303.84	$39.96	$263.88	5833	$216.79	49.98
Business Associations	160	$150.32	$42.89	$107.44	3588	$105.81	0.09
Child Day Care Services	120	$280.96	$0.00	$280.96	6723	$98.83	2.84
Colleges, Universities, Schools	75	$258.89	$2.80	$256.09	9024	$173.05	0.00
Commercial Sports Except Racing	391	$161.80	$72.17	$89.64	758	$111.90	9.17
Communications, Except Radio and	47	$4,461.85	$996.30	$3,465.55	12288	$2,324.08	247.33
Computer and Data Processing	40	$702.50	$445.80	$256.70	9938	$568.37	10.68
Credit Agencies	156	$935.38	$423.16	$512.23	23653	$510.97	32.94
Detective and Protective Services	84	$183.87	$88.63	$95.23	5916	$139.25	2.54
Doctors and Dentists	203	$2,342.94	$0.00	$2,342.94	22877	$1,577.37	30.28
Domestic Services	-	$118.15	$118.15	$0.00	13237	$118.21	0.00
Eating & Drinking	157	$2,547.02	$119.19	$2,427.82	67261	$1,212.09	169.12
Electrical Repair Service	37	$123.25	$47.13	$76.12	1583	$49.82	4.30
Elementary and Secondary Schools	169	$96.20	$0.00	$96.20	3519	$63.07	0.00
Engineering, Architectural Services	87	$910.59	$679.10	$231.48	9970	$396.79	5.85
Equipment Rental and Leasing	29	$361.34	$182.46	$178.88	2741	$167.12	11.61

Table A-3: Economic Data for Municipal Sectors, Region L (Year 2000, monetary figures reported in $millions)

Federal Government - Military	-	$3,887.83	$3,887.83	$0.00	37644	$3,887.83	0.00
Federal Government - Non-Military	-	$2,207.18	$2,207.18	$0.00	38030	$2,207.18	0.00
Food Stores	98	$1,261.27	$30.97	$1,230.30	29543	$945.58	201.53
Funeral Service and Crematories	111	$70.63	$0.00	$70.63	1810	$46.78	2.01
Furniture & Home Furnishings	42	$346.76	$35.86	$310.90	7579	$225.02	54.39
Gas Production and Distribution	51	$2,594.06	$644.44	$1,949.62	2167	$762.29	210.84
General Merchandise Stores	47	$822.02	$28.03	$793.99	20597	$516.93	131.17
Greenhouse and Nursery Products	-	$77.18	$31.90	$45.28	2376	$62.37	0.86
Hospitals	76	$1,497.48	$0.85	$1,496.63	21943	$942.71	5.29
Hotels and Lodging Places	230	$850.11	$252.52	$597.59	14380	$468.22	60.26
Insurance Agents and Brokers	89	$628.33	$624.80	$3.53	11141	$487.62	6.70
Insurance Carriers	136	$3,398.32	$102.14	$3,296.18	24720	$1,841.18	188.59
Job Trainings & Related Services	141	$68.48	$15.66	$52.82	1716	$36.67	0.16
Labor and Civic Organizations	122	$173.12	$0.82	$172.31	11126	$131.37	0.02
Landscape and Horticultural	-	$195.10	$120.80	$74.30	5831	$115.84	4.98
Laundry, Cleaning and Shoe Repair	517	$228.62	$43.73	$184.90	9070	$168.26	5.84
Legal Services	76	$812.26	$337.39	$474.87	7775	$625.23	7.28
Local Government Passenger	-	$41.32	$5.82	$35.50	901	-$85.57	0.00
Local, Interurban Passenger Transit	68	$128.51	$18.68	$109.82	2877	$77.45	2.77
Maintenance and Repair Oil and	25	$246.31	$169.77	$76.54	2144	$142.14	9.70
Maintenance and Repair Other	25	$1,331.65	$649.59	$682.06	22056	$909.78	6.08
Maintenance and Repair,	25	$937.32	$244.85	$692.47	6989	$267.16	3.62
Management and Consulting	87	$789.30	$552.49	$236.81	9706	$391.58	5.18
Membership Sports and Recreation	427	$116.26	$3.18	$113.08	4266	$58.61	4.15
Miscellaneous Personal Services	129	$180.21	$16.58	$163.63	2581	$51.79	3.93
Miscellaneous Repair Shops	124	$149.81	$97.79	$52.03	2375	$66.42	4.15
Miscellaneous Retail	132	$1,470.70	$105.04	$1,365.67	35608	$922.48	224.68
Motion Pictures	113	$219.67	$124.88	$94.78	2664	$76.95	2.69
Motor Freight Transport and	85	$1,245.12	$804.43	$440.69	12564	$473.71	14.89
New Government Facilities	63	$1,608.74	$0.00	$1,608.74	10518	$616.68	9.69
New Highways and Streets	45	$394.16	$0.00	$394.16	3584	$151.43	2.48
New Industrial and Commercial	63	$1,550.48	$0.00	$1,550.48	13193	$547.89	11.35
New Mineral Extraction Facilities	63	$1,042.74	$11.14	$1,031.60	15581	$644.63	52.01
New Residential Structures	35	$2,933.33	$0.00	$2,933.33	18829	$558.92	18.87
New Utility Structures	63	$674.75	$0.00	$674.75	6449	$277.54	3.62
Nursing and Protective Care	197	$404.46	$0.00	$404.46	12014	$295.23	10.00
Other Business Services	84	$1,522.65	$870.43	$652.22	16729	$572.51	20.82
Other Educational Services	116	$254.31	$20.56	$233.75	4865	$104.55	7.83
Other Federal Government	-	$275.77	$38.86	$236.91	2077	$40.65	0.00
Other Medical and Health Services	168	$1,030.79	$47.56	$983.23	22017	$536.93	16.76
Other Nonprofit Organizations	122	$92.36	$5.99	$86.37	3422	$51.28	0.63
Other State and Local Govt	-	$738.48	$204.63	$533.86	3730	$267.64	0.00
Owner-occupied Dwellings	89	$4,340.98	$0.00	$4,340.98	0	$2,725.32	562.89
Personnel Supply Services	484	$591.46	$511.28	$80.18	31411	$569.59	11.25
Photofinishing, Commercial	112	$150.50	$102.84	$47.66	1217	$65.77	4.05
Pipe Lines, Except Natural Gas	49	$19.01	$12.15	$6.86	25	$13.20	1.56
Portrait and Photographic Studios	184	$41.75	$3.84	$37.91	1036	$19.85	1.00
Racing and Track Operation	391	$42.20	$6.00	$36.19	820	$16.75	7.84
Radio and TV Broadcasting	64	$416.56	$310.89	$105.67	2096	$187.88	6.90
Railroads and Related Services	68	$903.00	$113.81	$789.19	837	$681.08	36.10
Real Estate	89	$3,999.81	$1,569.04	$2,430.77	19463	$2,372.00	473.19
Religious Organizations	328	$129.83	$0.00	$129.83	1045	$15.36	0.00
Research, Development & Testing	123	$554.63	$182.77	$371.86	8214	$322.08	5.86
Residential Care	111	$155.71	$0.00	$155.71	5039	$102.77	1.44
Sanitary Services and Steam Supply	51	$496.66	$212.40	$284.26	2061	$207.58	90.96
Security and Commodity Brokers	59	$560.26	$408.59	$151.67	3595	$157.25	15.35
Services To Buildings	67	$315.34	$205.74	$109.60	7869	$146.82	5.83
Social Services, N.E.C.	42	$255.33	$26.34	$229.00	4771	$101.62	0.31
State & Local Government -	na	$2,611.02	$2,611.02	$0.00	73975	$2,611.02	0.00
State & Local Government - Non-	na	$2,031.27	$2,031.27	$0.00	42847	$2,031.27	0.00
State and Local Electric Utilities	na	$756.72	$178.45	$578.28	1466	$307.01	0.00
Theatrical Producers, Bands Etc.	36	$91.71	$58.91	$32.80	933	$42.29	3.74
Transportation Services	40	$117.71	$50.67	$67.04	962	$87.91	1.02
U.S. Postal Service	na	$368.05	$219.05	$149.00	4482	$274.43	0.00
Watch, Clock, Jewelry and Furniture	50	$24.36	$0.22	$24.14	397	$9.39	1.29
Water Supply and Sewerage	51	$66.84	$21.38	$45.46	351	$36.42	4.53
Water Transportation	353	$69.59	$20.19	$49.40	225	$27.97	2.49
Wholesale Trade	43	$4,408.08	$2,038.09	$2,370.00	41876	$2,420.62	629.63
Total	na	$85,096.26	$28,990.83	$56,105.43	1043911	$50,494.32	4281.52

NEC = not elsewhere classified. “na” = not available.

Table A-4: Economic Data for Manufacturing Sectors, Region L (Year 2000, monetary figures reported in $millions)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Adhesives and Sealants	$0.47	$0.38	$0.09	2	$0.11	0.00
Agricultural Chemicals, N.E.C	$25.15	$2.63	$22.53	108	$14.70	0.30
Aircraft	$365.19	$10.77	$354.42	1334	$99.41	3.95
Aircraft and Missile Engines and Parts	$261.71	$24.01	$237.69	1272	$78.51	2.01
Aircraft and Missile Equipment,	$70.57	$0.64	$69.94	607	$27.47	0.54
Alkalies & Chlorine	$0.44	$0.13	$0.31	3	$0.16	0.01
Aluminum Foundries	$0.45	$0.06	$0.38	4	$0.14	0.00
Analytical Instruments	$4.17	$0.69	$3.48	20	$1.31	0.04
Animal and Marine Fats and Oils	$5.21	$3.80	$1.40	19	$1.58	0.04
Apparel Made From Purchased Materials	$283.02	$5.04	$277.98	2598	$73.87	1.21
Architectural Metal Work	$40.52	$1.27	$39.25	352	$23.52	0.40
Asphalt Felts and Coatings	$2.22	$2.14	$0.08	6	$1.49	0.02
Automatic Merchandising Machine	$7.12	$0.73	$6.39	54	$1.68	0.05
Automatic Temperature Controls	$0.13	$0.11	$0.01	2	$0.06	0.00
Automotive and Apparel Trimmings	$25.34	$10.09	$15.26	167	$6.20	0.18
Bags, Plastic	$119.64	$0.86	$118.77	628	$33.82	1.11
Blankbooks and Looseleaf Binder	$167.70	$11.21	$156.49	1089	$75.63	2.59
Blast Furnaces and Steel Mills	$270.12	$15.65	$254.48	774	$64.10	3.03
Blinds, Shades, and Drapery Hardware	$5.02	$0.02	$5.01	58	$2.24	0.03
Blowers and Fans	$0.98	$0.02	$0.96	12	$0.28	0.01
Boat Building and Repairing	$5.47	$0.02	$5.45	55	$1.45	0.03
Book Printing	$1.29	$0.39	$0.90	7	$0.56	0.02
Book Publishing	$40.06	$2.99	$37.07	185	$10.93	0.38
Bookbinding & Related	$9.71	$2.57	$7.14	153	$4.81	0.11
Bottled and Canned Soft Drinks & Water	$468.38	$2.60	$465.79	1393	$95.13	3.48
Brass, Bronze, and Copper Foundries	$0.69	$0.09	$0.60	17	$0.42	0.01
Bread, Cake, and Related Products	$243.56	$64.15	$179.41	1418	$87.03	1.48
Brick and Structural Clay Tile	$6.77	$0.02	$6.75	61	$2.72	0.08
Broadwoven Fabric Mills and Finishing	$200.76	$26.95	$173.81	1593	$67.81	1.79
Brooms and Brushes	$1.72	$0.15	$1.57	26	$0.59	0.02
Burial Caskets and Vaults	$0.33	$0.05	$0.28	5	$0.26	0.00
Calculating and Accounting Machines	$6.90	$1.17	$5.72	47	$3.26	0.05
Canned and Cured Sea Foods	$0.32	$0.00	$0.32	3	$0.06	0.00
Canned Fruits and Vegetables	$56.18	$0.49	$55.69	303	$12.22	0.28
Canned Specialties	$5.08	$0.05	$5.04	16	$0.52	0.01
Canvas Products	$3.52	$2.06	$1.46	44	$1.77	0.03
Carbon Paper and Inked Ribbons	$0.21	$0.01	$0.20	2	$0.11	0.00
Carburetors, Pistons, Rings, Valves	$0.93	$0.09	$0.85	7	$0.35	0.01
Cement, Hydraulic	$91.26	$0.26	$91.00	241	$34.30	1.46
Ceramic Wall and Floor Tile	$1.30	$0.00	$1.30	16	$0.54	0.02
Chemical Preparations, N.E.C	$7.09	$5.24	$1.85	22	$2.02	0.06
Cigars	$1.41	$0.07	$1.34	3	$0.08	0.29
Clay Refractories	$0.31	$0.00	$0.31	3	$0.11	0.00
Coated Fabrics, Not Rubberized	$3.77	$0.11	$3.65	23	$0.66	0.02
Commercial Fishing	$23.20	$2.71	$20.49	863	$21.05	0.72
Commercial Laundry Equipment	$2.37	$1.08	$1.28	18	$1.01	0.02
Commercial Printing	$325.93	$150.06	$175.88	2860	$111.61	3.34
Communications Equipment N.E.C.	$6.62	$2.45	$4.17	65	$4.17	0.06
Computer Peripheral Equipment,	$1.55	$0.59	$0.95	5	$0.34	0.01
Concrete Block and Brick	$36.24	$0.35	$35.89	209	$13.45	0.60
Concrete Products, N.E.C	$167.76	$1.60	$166.16	1394	$59.41	2.20
Condensed and Evaporated Milk	$7.72	$1.64	$6.08	15	$1.84	0.05
Confectionery Products	$113.69	$0.84	$112.84	429	$32.35	0.74
Construction Machinery and Equipment	$21.83	$0.86	$20.96	84	$4.53	0.18
Converted Paper Products, N.E.C	$0.56	$0.01	$0.55	4	$0.06	0.00
Conveyors and Conveying Equipment	$42.96	$9.61	$33.35	260	$15.54	0.38
Cookies and Crackers	$0.57	$0.02	$0.55	3	$0.28	0.00
Cordage and Twine	$1.57	$0.02	$1.56	16	$0.40	0.01
Costume Jewelery	$0.10	$0.00	$0.10	3	$0.06	0.00
Curtains and Draperies	$116.08	$15.72	$100.36	1349	$26.77	0.60
Cut Stone and Stone Products	$3.48	$0.02	$3.46	54	$1.56	0.03
Cyclic Crudes, Interm. & Indus. Organic Chem.	$2,068.57	$624.52	$1,444.05	2715	$505.99	36.52
Dental Equipment and Supplies	$0.53	$0.36	$0.17	3	$0.07	0.00
Die-cut Paper and Board	$0.29	$0.00	$0.28	3	$0.03	0.00
Drugs	$264.17	$72.93	$191.23	1090	$144.15	3.02
Electric Lamps	$0.18	$0.00	$0.18	2	$0.10	0.00
Electrical Equipment, N.E.C.	$5.34	$0.61	$4.73	24	$1.22	0.03
Electromedical Apparatus	$1.80	$0.84	$0.95	5	$0.88	0.03
Electronic Components, N.E.C.	$110.81	$63.73	$47.09	410	$27.47	0.97
Electronic Computers	$10.55	$1.38	$9.17	37	$3.87	0.08
Engine Electrical Equipment	$357.01	$49.80	$307.22	1541	$177.02	4.35
Envelopes	$14.54	$0.23	$14.31	119	$2.05	0.06
Fabricated Metal Products, N.E.C.	$33.41	$4.30	$29.11	260	$9.71	0.23
Fabricated Plate Work (Boiler Shops)	$86.79	$1.43	$85.36	915	$47.89	0.83
Fabricated Rubber Products, N.E.C.	$1.68	$0.03	$1.66	15	$0.22	0.01

Table A-4: Economic Data for Manufacturing Sectors, Region L (Year 2000, monetary figures reported in $millions)

Fabricated Structural Metal	$91.68	$2.70	$88.98	563	$34.34	0.89
Fabricated Textile Products, N.E.C.	$88.42	$10.88	$77.54	601	$26.60	0.59
Farm Machinery and Equipment	$72.57	$15.69	$56.88	413	$19.87	0.52
Fertilizers, Mixing Only	$1.98	$0.20	$1.78	7	$0.25	0.01
Flavoring Extracts and Syrups, N.E.C.	$1.09	$0.25	$0.84	9	$0.72	0.01
Flour and Other Grain Mill Products	$140.26	$1.86	$138.40	400	$31.95	1.06
Fluid Milk	$78.43	$5.37	$73.06	226	$9.53	0.43
Fluid Power Cylinders & Actuators	$0.83	$0.04	$0.79	5	$0.14	0.00
Fluid Power Pumps & Motors	$16.91	$0.75	$16.16	158	$7.75	0.12
Food Preparations, N.E.C	$87.41	$0.59	$86.82	515	$21.90	0.47
Food Products Machinery	$20.16	$3.61	$16.55	190	$10.03	0.18
Forest Products	$2.14	$0.08	$2.05	70	$1.19	0.05
Forestry Products	$1.87	$0.00	$1.87	16	$1.41	0.30
Frozen Fruits, Juices and Vegetables	$37.73	$0.69	$37.04	186	$7.64	0.25
Frozen Specialties	$0.34	$0.00	$0.34	3	$0.04	0.00
Furniture and Fixtures, N.E.C	$59.46	$10.05	$49.41	271	$18.35	0.36
Games, Toys, and Childrens Vehicles	$0.36	$0.00	$0.36	4	$0.21	0.00
Glass and Glass Products, Exc Containers	$7.65	$5.10	$2.55	61	$3.41	0.09
Gum and Wood Chemicals	$5.90	$1.16	$4.74	11	$2.97	0.07
Gypsum Products	$3.33	$0.03	$3.30	11	$0.67	0.05
Hand and Edge Tools, N.E.C.	$2.40	$1.14	$1.26	26	$1.40	0.03
Hardware, N.E.C.	$8.81	$3.48	$5.33	55	$3.52	0.08
Hardwood Dimension and Flooring Mills	$0.35	$0.33	$0.02	4	$0.16	0.00
Heating Equipment, Except Electric	$0.28	$0.01	$0.27	2	$0.13	0.00
Housefurnishings, N.E.C	$5.20	$0.82	$4.38	40	$1.47	0.04
Household Cooking Equipment	$80.75	$0.74	$80.01	469	$19.59	0.80
Household Furniture, N.E.C	$0.14	$0.02	$0.12	2	$0.05	0.00
Ice Cream and Frozen Desserts	$19.65	$6.77	$12.88	95	$4.21	0.12
Industrial and Fluid Valves	$3.50	$1.36	$2.14	15	$0.84	0.02
Industrial Gases	$26.05	$7.86	$18.19	187	$20.07	0.60
Industrial Machines N.E.C.	$112.67	$1.24	$111.44	1041	$50.25	0.99
Industrial Trucks and Tractors	$1.43	$0.40	$1.03	8	$0.32	0.01
Inorganic Chemicals Nec.	$0.99	$0.30	$0.69	6	$0.34	0.02
Instruments To Measure Electricity	$10.52	$0.40	$10.11	60	$2.75	0.07
Internal Combustion Engines, N.E.C.	$14.43	$6.66	$7.78	41	$2.71	0.13
Iron and Steel Forgings	$0.34	$0.04	$0.30	3	$0.14	0.00
Iron and Steel Foundries	$41.56	$0.27	$41.29	327	$13.60	0.37
Jewelers Materials and Lapidary Work	$0.38	$0.00	$0.38	3	$0.14	0.00
Jewelry, Precious Metal	$53.72	$0.39	$53.33	374	$23.75	0.59
Knit Outerwear Mills	$3.38	$0.23	$3.16	46	$1.09	0.02
Laboratory Apparatus & Furniture	$17.28	$4.14	$13.14	76	$3.44	0.16
Lead Pencils and Art Goods	$0.43	$0.03	$0.40	16	$0.29	0.01
Leather Goods, N.E.C	$18.71	$0.85	$17.85	422	$14.17	0.12
Leather Tanning and Finishing	$23.41	$12.72	$10.69	91	$4.09	0.15
Lighting Fixtures and Equipment	$19.29	$0.36	$18.93	137	$5.80	0.18
Lime	$58.36	$0.57	$57.78	202	$24.56	1.03
Logging Camps and Logging Contractors	$1.27	$0.75	$0.51	9	$0.51	0.01
Lubricating Oils and Greases	$0.94	$0.54	$0.40	2	$0.14	0.01
Luggage	$6.72	$1.04	$5.67	70	$2.70	0.05
Machine Tools, Metal Cutting Types	$0.07	$0.03	$0.04	1	$0.02	0.00
Machine Tools, Metal Forming Types	$0.13	$0.08	$0.05	2	$0.03	0.00
Malt Beverages	$60.37	$1.38	$58.99	190	$19.75	11.10
Manifold Business Forms	$3.46	$1.30	$2.16	24	$1.18	0.04
Manufactured Ice	$4.49	$0.11	$4.37	112	$2.56	0.02
Manufacturing Industries, N.E.C.	$45.88	$1.68	$44.20	480	$18.31	0.45
Marking Devices	$4.76	$0.35	$4.41	80	$3.89	0.04
Mattresses and Bedsprings	$20.18	$1.34	$18.85	169	$6.10	0.08
Meat Packing Plants	$236.98	$53.58	$183.40	625	$20.05	1.44
Mechanical Measuring Devices	$7.73	$1.70	$6.03	58	$2.75	0.08
Metal Cans	$9.78	$6.64	$3.14	28	$1.32	0.07
Metal Coating and Allied Services	$11.31	$2.43	$8.89	70	$4.49	0.10
Metal Doors, Sash, and Trim	$25.45	$1.30	$24.15	224	$11.06	0.24
Metal Household Furniture	$8.86	$0.80	$8.07	77	$1.93	0.04
Metal Office Furniture	$0.90	$0.17	$0.73	5	$0.21	0.00
Metal Partitions and Fixtures	$10.13	$4.99	$5.15	81	$3.14	0.05
Metal Sanitary Ware	$1.47	$0.04	$1.42	18	$1.07	0.02
Metal Stampings, N.E.C.	$18.22	$4.94	$13.29	107	$7.06	0.16
Millwork	$62.22	$59.63	$2.60	664	$20.44	0.50
Mineral Wool	$9.46	$0.13	$9.34	75	$3.56	0.09
Minerals, Ground Or Treated	$25.80	$0.15	$25.66	137	$12.73	0.35
Mining Machinery, Except Oil Field	$0.73	$0.11	$0.62	6	$0.20	0.01
Miscellaneous Fabricated Wire Products	$9.01	$3.77	$5.25	90	$3.78	0.07
Miscellaneous Metal Work	$2.80	$0.14	$2.65	7	$0.28	0.02
Miscellaneous Plastics Products	$384.75	$5.67	$379.08	2237	$106.33	2.50
Miscellaneous Publishing	$59.44	$33.85	$25.59	378	$32.32	0.72
Mobile Homes	$28.08	$0.03	$28.04	259	$10.49	0.34
Motor Homes	$0.66	$0.00	$0.66	3	$0.35	0.00

Table A-4: Economic Data for Manufacturing Sectors, Region L (Year 2000, monetary figures reported in $millions)

Motor Vehicle Parts and Accessories	$29.67	$14.83	$14.84	138	$6.55	0.09
Motor Vehicles	$5.13	$0.08	$5.05	9	$0.73	0.02
Musical Instruments	$0.19	$0.01	$0.19	4	$0.10	0.00
Newspapers	$215.03	$125.99	$89.05	2241	$112.38	2.59
Nonferrous Wire Drawing and Insulating	$1.52	$0.40	$1.12	6	$0.30	0.01
Nonmetallic Mineral Products, N.E.C.	$15.88	$0.24	$15.64	174	$6.60	0.16
Oil Field Machinery	$53.02	$8.37	$44.65	447	$22.58	0.47
Ophthalmic Goods	$25.60	$0.86	$24.73	244	$7.82	0.20
Packaging Machinery	$16.31	$4.84	$11.48	97	$5.04	0.14
Paints and Allied Products	$4.53	$0.09	$4.45	14	$1.45	0.04
Paper Coated & Laminated Packaging	$16.93	$0.77	$16.16	71	$4.23	0.13
Paperboard Containers and Boxes	$138.02	$124.72	$13.31	653	$33.95	1.28
Paperboard Mills	$2.02	$0.01	$2.01	5	$0.26	0.01
Paving Mixtures and Blocks	$0.83	$0.79	$0.04	3	$0.29	0.01
Pens and Mechanical Pencils	$34.31	$2.14	$32.17	350	$15.66	0.35
Periodicals	$23.60	$12.05	$11.55	177	$6.23	0.16
Petroleum and Coal Products, N.E.C.	$83.14	$15.96	$67.18	124	$63.28	0.85
Petroleum Refining	$701.39	$316.00	$385.39	247	$103.06	7.19
Phonograph Records and Tape	$1.52	$0.43	$1.09	28	$0.65	0.01
Photographic Equipment and Supplies	$2.65	$0.42	$2.24	11	$0.34	0.02
Pickles, Sauces, and Salad Dressings	$53.10	$1.22	$51.88	184	$17.53	0.32
Pipe, Valves, and Pipe Fittings	$22.34	$8.65	$13.69	179	$9.36	0.18
Plastics Materials and Resins	$1,027.13	$151.50	$875.62	1544	$236.17	9.03
Plate Making	$0.55	$0.05	$0.50	11	$0.44	0.01
Plating and Polishing	$10.34	$1.52	$8.82	138	$8.30	0.10
Pleating and Stitching	$3.55	$1.10	$2.46	62	$2.34	0.03
Polishes and Sanitation Goods	$27.65	$3.18	$24.47	100	$17.37	0.29
Potato Chips & Similar Snacks	$80.18	$1.75	$78.43	251	$27.05	0.65
Pottery Products, N.E.C	$3.01	$0.02	$3.00	48	$0.91	0.03
Poultry Processing	$175.25	$32.51	$142.74	1363	$36.23	1.17
Power Transmission Equipment	$0.37	$0.00	$0.36	3	$0.08	0.00
Prefabricated Metal Buildings	$15.57	$0.45	$15.12	114	$7.11	0.14
Prefabricated Wood Buildings	$7.63	$0.05	$7.58	55	$2.88	0.08
Prepared Feeds, N.E.C	$118.12	$4.87	$113.25	310	$14.17	0.91
Prepared Fresh Or Frozen Fish Or Seafood	$7.06	$0.48	$6.58	49	$0.69	0.03
Primary Aluminum	$7.28	$0.07	$7.21	25	$1.80	0.09
Printed Circuit Boards	$10.31	$5.93	$4.38	127	$6.23	0.08
Printing Ink	$0.56	$0.50	$0.06	3	$0.12	0.00
Public Building Furniture	$7.38	$3.17	$4.20	45	$1.51	0.03
Pumps and Compressors	$0.75	$0.01	$0.74	3	$0.13	0.00
Radio and Tv Communication Equipment	$3.80	$1.40	$2.39	14	$0.69	0.02
Railroad Equipment	$3.52	$0.13	$3.39	14	$0.58	0.02
Ready-mixed Concrete	$123.53	$0.85	$122.69	792	$43.64	1.76
Refrigeration and Heating Equipment	$375.64	$141.35	$234.29	1814	$94.04	3.29
Relays & Industrial Controls	$8.12	$3.22	$4.90	42	$3.25	0.08
Roasted Coffee	$9.23	$2.64	$6.59	16	$1.56	0.05
Rubber and Plastics Hose and Belting	$0.24	$0.00	$0.24	2	$0.06	0.00
Salted and Roasted Nuts & Seeds	$10.61	$0.17	$10.44	27	$1.37	0.07
Sausages and Other Prepared Meats	$222.04	$32.69	$189.35	1043	$34.89	1.33
Schiffi Machine Embroideries	$0.81	$0.49	$0.32	7	$0.18	0.00
Screw Machine Products and Bolts, Etc.	$15.28	$3.97	$11.31	115	$6.59	0.14
Secondary Nonferrous Metals	$4.98	$0.06	$4.92	14	$0.64	0.04
Semiconductors and Related Devices	$381.75	$144.72	$237.04	1797	$180.90	2.99
Service Industry Machines, N.E.C.	$14.68	$5.19	$9.49	84	$4.65	0.13
Sheet Metal Work	$193.48	$4.98	$188.49	1460	$77.85	1.64
Shoes, Except Rubber	$121.17	$0.50	$120.66	1595	$54.92	0.92
Signs and Advertising Displays	$139.82	$48.04	$91.78	1398	$67.21	1.54
Small Arms	$0.01	$0.00	$0.01	1	$0.01	0.00
Small Arms Ammunition	$0.40	$0.00	$0.40	4	$0.31	0.04
Soap and Other Detergents	$38.55	$5.68	$32.87	252	$20.61	0.42
Special Dies and Tools and Accessories	$22.14	$12.49	$9.64	281	$10.74	0.18
Special Industry Machinery N.E.C.	$28.95	$7.33	$21.62	76	$4.77	0.14
Sporting and Athletic Goods, N.E.C.	$101.08	$0.85	$100.23	738	$43.25	3.67
Steam Engines and Turbines	$0.71	$0.13	$0.58	3	$0.12	0.00
Steel Pipe and Tubes	$1.38	$0.08	$1.31	7	$0.20	0.01
Storage Batteries	$11.37	$3.44	$7.93	57	$4.21	0.11
Structural Clay Products, N.E.C	$4.19	$0.03	$4.17	77	$3.43	0.09
Structural Wood Members, N.E.C	$36.85	$30.88	$5.98	314	$13.44	0.36
Surface Active Agents	$0.88	$0.43	$0.45	2	$0.21	0.01
Surgical and Medical Instrument	$12.60	$4.83	$7.77	64	$4.42	0.15
Surgical Appliances and Supplies	$30.92	$5.16	$25.76	155	$8.82	0.36
Switchgear and Switchboard Apparatus	$1.07	$0.79	$0.28	6	$0.48	0.01
Synthetic Rubber	$0.60	$0.13	$0.46	2	$0.18	0.00
Telephone and Telegraph Apparatus	$141.76	$77.00	$64.76	322	$33.61	0.77
Textile Bags	$15.95	$2.95	$12.99	213	$4.19	0.11
Toilet Preparations	$157.43	$5.25	$152.18	453	$69.16	1.46
Transportation Equipment, N.E.C	$20.64	$0.28	$20.36	91	$3.94	0.13

Table A-4: Economic Data for Manufacturing Sectors, Region L (Year 2000, monetary figures reported in $millions)

Truck and Bus Bodies	$71.05	$2.72	$68.33	332	$32.18	0.33
Truck Trailers	$2.33	$0.04	$2.29	16	$0.78	0.01
Typesetting	$5.26	$1.81	$3.45	47	$2.65	0.06
Upholstered Household Furniture	$18.53	$0.30	$18.23	215	$6.32	0.12
Vegetable Oil Mills, N.E.C	$44.78	$3.45	$41.33	71	$0.60	0.16
Vitreous Plumbing Fixtures	$31.45	$0.55	$30.90	345	$17.18	0.34
Wiring Devices	$37.32	$1.74	$35.59	332	$14.35	0.29
Womens Handbags and Purses	$1.29	$0.01	$1.28	29	$0.36	0.00
Wood Containers	$0.22	$0.19	$0.03	4	$0.09	0.00
Wood Household Furniture	$3.90	$0.08	$3.82	47	$1.28	0.02
Wood Kitchen Cabinets	$203.25	$61.17	$142.08	2491	$94.87	1.91
Wood Office Furniture	$27.47	$6.37	$21.10	261	$8.88	0.12
Wood Pallets and Skids	$22.08	$12.49	$9.59	280	$9.67	0.20
Wood Partitions and Fixtures	$13.41	$8.03	$5.37	132	$4.45	0.07
Wood Preserving	$0.91	$0.88	$0.03	3	$0.13	0.01
Wood Products, N.E.C	$24.17	$8.15	$16.02	228	$9.16	0.24
Wood Tv and Radio Cabinets	$0.15	$0.00	$0.14	2	$0.06	0.00
Total	$14,657.93	$3,008.57	$11,649.36	71128	$4,529.78	$162.70

NEC = not elsewhere classified. “na” = not available.

Table A-5: Economic Data for Mining Sectors, Region L (Year 2000, monetary figures reported in $millions)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Chemical, Fertilizer Mineral Mining	$0.51	$0.08	$0.44	7	$0.33	0.02
Clay, Ceramic, Refractory Minerals,	$43.30	$0.48	$42.81	107	$25.80	1.44
Coal Mining	$19.21	$6.48	$12.74	60	$6.43	2.48
Dimension Stone	$156.20	$5.87	$150.33	869	$95.12	4.77
Iron Ores	$0.27	$0.02	$0.26	4	$0.00	0.00
Natural Gas & Crude Petroleum	$2,972.61	$1,502.97	$1,469.64	6335	$1,349.13	158.27
Natural Gas Liquids	$106.42	$53.80	$52.61	71	$33.61	5.29
Sand and Gravel	$34.82	$1.29	$33.54	277	$21.70	1.09
Uranium-radium-vanadium Ores	$0.75	$0.75	$0.00	25	$0.15	0.03
Total	$3,334.09	$1,571.74	$1,762.36	7756	$1,532.27	173.39

na = “not available”

Table A-6: Economic Data for the Steam Electric Sector, Region L (Year 2000, monetary figures reported in $millions)

Sector	Total Sales	Intermediate Sales	Final Sales	Jobs	Regional Income	Business Taxes
Electric Services	$451.79	$106.78	$345.01	941	$323.09	57.87

na = “not available”

Attachment B: Distribution of Economic Impacts by County and Water User Group

Tables B-1 through B-6 show economic impacts by county and water user group; however, caution is warranted. Figures shown for specific counties are *direct* impacts only. For the most part, figures reported in the main text for all water use categories uses include *direct and secondary* impacts. Secondary effects were estimated using regional level multipliers that treat each regional water planning area as an aggregate and autonomous economy. Multipliers do not specify where secondary impacts will occur at a sub-regional level (i.e., in which counties or cities). All economic impacts that would accrue to a region as a whole due to secondary economic effects are reported in Tables B-1 through B-6 as "secondary regional level impacts."

For example, assume that in a given county (or city) water shortages caused significant reductions in output for a manufacturing plant. Reduced output resulted in lay-offs and lost income for workers and owners of the plant. This is a *direct* impact. Direct impacts were estimated at a county level; and thus one can say with certainty that direct impacts occurred in that county. However, secondary impacts accrue to businesses and households throughout the region where the business operates, and it is impossible using input-output models to determine where these businesses are located spatially.

The same logic applies to changes in population and school enrollment. Since employment losses and subsequent out-migration from a region were estimated using *direct* and *secondary* multipliers, it is impossible to say with any degree of certainty how many people a given county would lose regardless of whether the economic impact was direct or secondary. For example, assume the manufacturing plant referred to above is in County A. If the firm eliminated 50 jobs, one could state with certainty that water shortages in County A resulted in a loss of 50 jobs in that county. However, one could not unequivocally say whether 100 percent of the population loss due to lay-offs at the manufacturing would accrue to County A because many affected workers might commute from adjacent counties. This is particularly true in large metropolitan areas that overlay one or counties. Thus, population and school enrollment impacts cannot be reported at a county level.

Manufacturing

Table B-1: Distribution of Economic Impacts by County and Water User Groups: Manufacturing

Lost Sales ($millions)

County	2010	2020	2030	2040	2050	2060
Bexar						
Direct Impacts	$192.14	$803.94	$2,383.76	$3,163.20	$3,848.90	$4,593.78
Secondary Regional Level Impacts	$108.47	$453.86	$1,345.75	$1,785.78	$2,172.89	$2,593.41
Comal						
Direct Impacts	$0.00	$0.00	$0.00	$3.73	$6.69	$10.86
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$2.47	$4.44	$7.20
Victoria						
Direct Impacts	$0.00	$0.00	$0.00	$0.00	$35.73	$69.14
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$33.18	$64.20
Total	$300.61	$1,257.80	$3,729.51	$4,955.18	$6,101.83	$7,338.59

Job Losses (numbers may not sum to figures in text due to rounding)

County	2010	2020	2030	2040	2050	2060
Bexar						
Direct Impacts	575	2,406	7,135	9,468	11,521	13,750
Secondary Regional Level Impacts	1,138	4,760	14,115	18,730	22,790	27,201
Comal						
Direct Impacts	0	0	0	77	138	224
Secondary Regional Level Impacts	0	0	0	44	79	128
Victoria						
Direct Impacts	0	0	0	0	73	142
Secondary Regional Level Impacts	0	0	0	0	283	548
Total	1,713	7,166	21,250	28,319	34,884	41,993

Income Losses ($millions)

County	2010	2020	2030	2040	2050	2060
Bexar						
Direct Impacts	$43.03	$180.04	$533.85	$708.41	$861.97	$1,028.79
Secondary Regional Level Impacts	$57.52	$240.68	$713.65	$947.00	$1,152.29	$1,375.30
Comal						
Direct Impacts	$0.00	$0.00	$0.00	$3.61	$6.48	$10.51
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$2.40	$4.30	$6.98
Victoria						
Direct Impacts	$0.00	$0.00	$0.00	$0.00	$9.30	$17.99
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$33.18	$64.20
Total	$100.55	$420.72	$1,247.50	$1,661.42	$2,067.52	$2,503.77

Business Taxes ($millions)

County	2010	2020	2030	2040	2050	2060
Bexar						
Direct Impacts	$2.54	$10.61	$31.47	$41.76	$50.82	$60.65
Secondary Regional Level Impacts	$3.18	$13.31	$39.46	$52.36	$63.71	$76.04
Comal						
Direct Impacts	$0.00	$0.00	$0.00	$0.12	$0.21	$0.34
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.08	$0.14	$0.22
Victoria						
Direct Impacts	$0.00	$0.00	$0.00	$0.00	$0.34	$0.65
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$0.63	$1.22
Total	$5.72	$23.92	$70.93	$94.32	$115.85	$139.12

Municipal

Impacts to the horticultural industry were estimated at the regional level only, and are not include here.

Table B-2: Distribution of Economic Impacts by County: Water Intensive Commercial Uses (Municipal)						
Lost Sales ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.14	$0.29	$0.48	$0.63	$0.78	$0.89
Secondary Regional Level Impacts	$0.08	$0.17	$0.27	$0.36	$0.44	$0.50
Bexar						
Direct	$145.09	$168.56	$194.87	$210.05	$1,038.70	$1,461.36
Secondary Regional Level Impacts	$64.72	$75.19	$86.92	$93.69	$463.32	$651.85
Caldwell						
Direct	$0.51	$0.68	$0.88	$1.21	$2.26	$3.53
Secondary Regional Level Impacts	$0.28	$0.37	$0.48	$0.66	$1.23	$1.91
Comal						
Direct	$23.92	$25.51	$37.90	$82.95	$128.27	$196.38
Secondary Regional Level Impacts	$11.75	$12.53	$18.61	$40.73	$62.99	$96.44
Medina						
Direct	$0.54	$0.81	$1.18	$1.54	$1.92	$2.39
Secondary Regional Level Impacts	$1.50	$2.24	$3.26	$4.27	$5.32	$6.64
Uvalde						
Direct	$1.40	$1.57	$1.71	$1.80	$1.87	$1.95
Secondary Regional Level Impacts	$0.77	$0.86	$0.94	$0.99	$1.03	$1.07
Wilson						
Direct	$0.16	$0.21	$0.34	$0.69	$1.13	$1.62
Secondary Regional Level Impacts	$0.09	$0.12	$0.19	$0.39	$0.63	$0.91
Total	$250.95	$289.11	$348.03	$439.96	$1,709.89	$2,427.44
Lost Income ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.07	$0.15	$0.24	$0.32	$0.39	$0.45
Secondary Regional Level Impacts	$0.04	$0.09	$0.14	$0.19	$0.24	$0.27
Bexar						
Direct	$84.38	$98.03	$113.33	$122.15	$604.07	$849.87
Secondary Regional Level Impacts	$35.15	$40.84	$47.22	$50.89	$251.67	$354.07
Caldwell						
Direct	$0.30	$0.40	$0.52	$0.71	$1.33	$2.07
Secondary Regional Level Impacts	$0.16	$0.21	$0.28	$0.38	$0.71	$1.10
Comal						
Direct	$16.56	$17.66	$26.23	$57.40	$88.77	$135.90
Secondary Regional Level Impacts	$6.41	$6.83	$10.15	$22.22	$34.36	$52.60
Medina						
Direct	$0.48	$0.71	$1.04	$1.36	$1.69	$2.11
Secondary Regional Level Impacts	$0.29	$0.43	$0.62	$0.81	$1.01	$1.27
Uvalde						
Direct	$0.77	$0.86	$0.94	$0.99	$1.03	$1.07
Secondary Regional Level Impacts	$0.42	$0.47	$0.51	$0.54	$0.56	$0.58
Wilson						
Direct	$0.08	$0.11	$0.17	$0.35	$0.57	$0.82
Secondary Regional Level Impacts	$0.05	$0.06	$0.10	$0.21	$0.34	$0.49
Total	$145.16	$166.85	$201.49	$258.52	$986.74	$1,402.67
Job Losses (numbers may not sum to figures in text due to rounding)						

County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	4	8	13	18	22	25
Secondary Regional Level Impacts	1	2	3	4	5	6
Bexar						
Direct	3,193	3,710	4,289	4,622	22,858	32,160
Secondary Regional Level Impacts	784	911	1,053	1,135	5,614	7,898
Caldwell						
Direct	19	25	33	45	84	131
Secondary Regional Level Impacts	4	5	6	9	16	25
Comal						
Direct	635	677	1,006	2,202	3,405	5,213
Secondary Regional Level Impacts	144	154	228	500	772	1,183
Medina						
Direct	26	39	57	75	93	116
Secondary Regional Level Impacts	6	9	14	18	22	28
Uvalde						
Direct	39	44	48	50	52	54
Secondary Regional Level Impacts	9	11	11	12	13	13
Wilson						
Direct	4	6	10	20	32	46
Secondary Regional Level Impacts	1	1	2	5	8	11
Total	4,869	5,602	6,773	8,715	32,996	46,909

Lost Business Taxes ($millions)

County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.01	$0.02	$0.03	$0.04	$0.05	$0.05
Secondary Regional Level Impacts	$0.00	$0.01	$0.02	$0.02	$0.03	$0.03
Bexar						
Direct	$8.23	$9.56	$11.05	$11.91	$58.92	$82.89
Secondary Regional Level Impacts	$4.19	$4.87	$5.63	$6.07	$30.03	$42.25
Caldwell						
Direct	$0.02	$0.03	$0.04	$0.06	$0.11	$0.17
Secondary Regional Level Impacts	$0.01	$0.02	$0.02	$0.03	$0.06	$0.09
Comal						
Direct	$1.38	$1.47	$2.18	$4.77	$7.38	$11.29
Secondary Regional Level Impacts	$0.73	$0.77	$1.15	$2.52	$3.89	$5.96
Medina						
Direct	$0.06	$0.09	$0.13	$0.17	$0.22	$0.27
Secondary Regional Level Impacts	$0.04	$0.06	$0.08	$0.11	$0.13	$0.17
Uvalde						
Direct	$0.08	$0.09	$0.10	$0.10	$0.11	$0.11
Secondary Regional Level Impacts	$0.05	$0.05	$0.06	$0.06	$0.06	$0.06
Wilson						
Direct	$0.01	$0.01	$0.02	$0.04	$0.07	$0.10
Secondary Regional Level Impacts	$0.01	$0.01	$0.01	$0.02	$0.04	$0.06
Total	$14.82	$17.06	$20.52	$25.92	$101.10	$143.50

Table B-3: Lost Water Utility Revenues (Municipal)						
County	2010	2020	2030	2040	2050	2060
Atascosa	$1.12	$1.76	$2.42	$2.91	$3.37	$3.72
Bexar	$87.93	$126.01	$158.37	$180.39	$201.94	$223.52
Caldwell	$0.56	$1.72	$2.90	$4.36	$5.86	$7.38
Calhoun	$0.05	$0.17	$0.37	$0.57	$0.56	$0.56
Comal	$3.78	$7.11	$14.23	$21.75	$29.74	$38.36
Gonzales	$0.00	$0.00	$0.05	$0.19	$0.22	$0.21
Guadalupe	$0.42	$0.72	$2.07	$4.61	$7.56	$11.50
Karnes	$0.21	$0.29	$0.34	$0.38	$0.44	$0.48
Kendall	$0.30	$1.04	$1.93	$3.59	$5.19	$6.60
Medina	$2.47	$3.45	$4.45	$5.40	$6.38	$7.31
Uvalde	$4.49	$4.52	$4.54	$4.54	$4.54	$4.57
Wilson	$7.31	$9.26	$11.38	$13.46	$15.70	$18.06
Total	$108.64	$156.06	$203.06	$242.13	$281.50	$322.26

Table B-4: Costs to Non-Water Intensive Commercial Businesses and Households						
County	2010	2020	2030	2040	2050	2060
Atascosa	$1.53	$3.20	$5.31	$7.51	$9.19	$10.76
Bexar	$180.39	$254.59	$362.45	$456.21	$517.85	$597.61
Caldwell	$0.00	$1.53	$4.71	$7.97	$12.06	$16.69
Calhoun	$0.00	$0.14	$0.45	$1.16	$1.96	$1.91
Comal	$29.92	$38.46	$74.74	$151.88	$231.60	$312.79
Gonzales	$0.00	$0.00	$0.00	$0.14	$0.51	$0.61
Guadalupe	$0.29	$1.19	$2.09	$6.18	$13.67	$22.42
Karnes	$0.73	$0.85	$1.10	$1.31	$1.48	$1.67
Kendall	$2.44	$0.96	$3.02	$5.47	$10.01	$14.41
Medina	$14.67	$20.94	$29.22	$37.77	$45.80	$54.16
Uvalde	$35.77	$35.88	$36.17	$36.31	$36.31	$36.30
Wilson	$0.04	$2.36	$8.71	$16.08	$25.86	$38.09
Total	$265.78	$360.10	$527.97	$727.99	$906.30	$1,107.42

Steam Electric

Table B-5: Distribution of Economic Impacts by County and Water User Groups: (Steam Electric)						
Lost Sales ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.00	$0.00	$0.00	$5.24	$11.66	$20.17
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$4.89	$10.88	$18.82
Goliad						
Direct	$0.00	$0.00	$0.00	$0.00	$10.60	$24.71
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$9.89	$23.05
Guadalupe						
Direct	$14.23	$47.22	$62.42	$77.76	$87.51	$107.21
Secondary Regional Level Impacts	$13.28	$44.06	$58.24	$72.55	$81.64	$100.03

Total	$27.51	$91.28	$120.66	$160.44	$212.19	$293.99
Lost Income ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.00	$0.00	$0.00	$4.66	$10.36	$17.90
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$2.16	$4.81	$8.31
Goliad						
Direct	$0.00	$0.00	$0.00	$0.00	$9.42	$21.93
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$4.37	$10.19
Guadalupe						
Direct	$12.65	$41.97	$55.49	$69.10	$77.74	$95.15
Secondary Regional Level Impacts	$5.88	$19.50	$25.77	$32.10	$36.11	$44.20
Total	$18.53	$61.47	$81.26	$108.02	$142.81	$197.67
Lost Jobs (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	0	0	0	13	28	46
Secondary Regional Level Impacts	0	0	0	25	56	93
Goliad						
Direct	0	0	0	0	25	57
Secondary Regional Level Impacts	0	0	0	0	51	114
Guadalupe						
Direct	33	115	150	187	209	247
Secondary Regional Level Impacts	67	230	300	375	417	493
Total	33	115	150	225	368	557
Lost Business Taxes ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.00	$0.00	$0.00	$0.83	$1.86	$3.21
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.39	$0.86	$1.49
Goliad						
Direct	$0.00	$0.00	$0.00	$0.00	$1.69	$3.93
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.00	$0.78	$1.82
Guadalupe						
Direct	$2.27	$7.52	$9.94	$12.38	$13.92	$17.04
Secondary Regional Level Impacts	$1.05	$3.49	$4.62	$5.75	$6.47	$7.92
Total	$3.32	$11.01	$14.56	$19.35	$25.58	$35.41

Mining

Table B-6: Distribution of Economic Impacts by County and Water User Groups: (Mining)						
Lost Sales ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.00	$0.00	$0.00	$0.62	$0.77	$0.85
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.62	$0.77	$0.85
Bear						
Direct	$0.00	$0.00	$5.60	$5.59	$5.96	$6.29
Secondary Regional Level Impacts	$0.00	$0.00	$2.78	$2.77	$2.95	$3.12

Comal						
Direct	$75.94	$80.61	$83.47	$86.24	$94.57	$95.07
Secondary Regional Level Impacts	$36.89	$39.16	$40.54	$41.89	$45.93	$46.18
Total	$112.83	$119.77	$132.39	$137.74	$150.94	$152.36
Lost Income ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.00	$0.00	$0.00	$0.27	$0.34	$0.37
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.27	$0.34	$0.37
Bear						
Direct	$0.00	$0.00	$3.23	$3.23	$3.44	$3.63
Secondary Regional Level Impacts	$0.00	$0.00	$1.52	$1.52	$1.62	$1.71
Comal						
Direct	$43.89	$46.59	$48.24	$49.85	$54.66	$54.95
Secondary Regional Level Impacts	$20.23	$21.48	$22.24	$22.98	$25.19	$25.33
Total	$64.12	$68.07	$75.23	$78.11	$85.58	$86.36
Lost Jobs (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	0	0	0	2	2	3
Secondary Regional Level Impacts	0	0	0	2	2	3
Bear						
Direct	0	0	30	30	32	33
Secondary Regional Level Impacts	0	0	29	29	31	33
Comal						
Direct	386	410	425	439	481	484
Secondary Regional Level Impacts	381	405	419	433	475	477
Total	768	815	903	934	1,023	1,032
Lost Business Taxes ($millions)						
County	2010	2020	2030	2040	2050	2060
Atascosa						
Direct	$0.00	$0.00	$0.00	$0.04	$0.05	$0.06
Secondary Regional Level Impacts	$0.00	$0.00	$0.00	$0.04	$0.05	$0.06
Bear						
Direct	$0.00	$0.00	$0.19	$0.19	$0.20	$0.21
Secondary Regional Level Impacts	$0.00	$0.00	$0.09	$0.09	$0.10	$0.10
Comal						
Direct	$2.67	$2.84	$2.94	$3.03	$3.33	$3.34
Secondary Regional Level Impacts	$1.21	$1.28	$1.33	$1.37	$1.50	$1.51
Total	$3.88	$4.12	$4.55	$4.78	$5.24	$5.30

Irrigation

Table B-7: Distribution of Economic Impacts by County and Water User Groups: (Irrigation)						
Lost Sales ($millions)						
County	2010	2020	2030	2040	2050	2060
Medina						
Direct	$0.47	$0.00	$0.00	$0.00	$0.00	$0.00
Secondary Regional Level Impacts	$0.25	$0.00	$0.00	$0.00	$0.00	$0.00
Zavala						

	2010	2020	2030	2040	2050	2060
Direct	$12.07	$11.78	$11.53	$11.27	$10.99	$10.71
Secondary Regional Level Impacts	$6.51	$6.33	$6.20	$6.06	$5.91	$5.76
Total	$19.30	$18.11	$17.73	$17.33	$16.90	$16.47
Lost Income ($millions)						
County	2010	2020	2030	2040	2050	2060
Medina						
Direct	$0.25	$0.00	$0.00	$0.00	$0.00	$0.00
Secondary Regional Level Impacts	$0.15	$0.00	$0.00	$0.00	$0.00	$0.00
Zavala						
Direct	$6.42	$6.29	$6.16	$6.02	$5.87	$5.72
Secondary Regional Level Impacts	$3.79	$3.68	$3.61	$3.52	$3.44	$3.35
Total	$10.61	$9.97	$9.77	$9.54	$9.31	$9.07
Lost Jobs						
	2010	2020	2030	2040	2050	2060
Medina						
Direct	14	0	0	0	0	0
Secondary Regional Level Impacts	4	0	0	0	0	0
Zavala						
Direct	355	353	346	338	329	321
Secondary Regional Level Impacts	97	94	92	90	88	85
Total	470	447	438	428	417	406
Lost Business Taxes ($millions)						
County	2010	2020	2030	2040	2050	2060
Medina						
Direct	$0.02	$0.00	$0.00	$0.00	$0.00	$0.00
Secondary Regional Level Impacts	$0.01	$0.00	$0.00	$0.00	$0.00	$0.00
Zavala						
Direct	$0.49	$0.48	$0.47	$0.46	$0.45	$0.44
Secondary Regional Level Impacts	$0.24	$0.24	$0.23	$0.23	$0.22	$0.22
Total	$0.76	$0.72	$0.70	$0.69	$0.67	$0.66

Livestock

Given the relatively small amount of unmet needs for livestock water uses, this study assumed that ranchers would haul water in by truck to fill stock tanks. Costs primarily consist of transportation costs.

Table B-8: Projected Costs to Livestock Producers

County	2010	2020	2030	2040	2050	2060
Bexar	$0.00	$0.00	$0.54	$0.57	$0.60	$0.62
Comal	$0.62	$0.63	$0.63	$0.64	$0.69	$0.69
Kendall	$0.17	$0.17	$0.17	$0.17	$0.19	$0.19
Total	$0.79	$0.80	$1.35	$1.38	$1.48	$1.50

Attachment C: Allocation of Economic Impacts by River Basin

Tables C-1 through C-6 distribute regional economic and social impacts by major river basin. Impacts were allocated based on distribution of water shortages among counties. For instance, if 50 percent of water shortages in River Basin A and 50 percent occur in River Basin then impacts were split equally among the two basins.

Manufacturing

Table C-1: Distribution of Impacts among Major River Basins (Manufacturing Uses)						
Lost Sales ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio	$300.61	$1,257.80	$3,729.51	$4,955.18	$5,848.80	$5,781.90
Guadalupe	$0.00	$0.00	$0.00	$0.00	$253.03	$1,556.70
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$300.61	$1,257.80	$3,729.51	$4,955.18	$6,101.83	$7,338.60
Lost Income ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio	$100.55	$420.73	$1,247.50	$1,661.42	$1,981.78	$1,972.66
Guadalupe	$0.00	$0.00	$0.00	$0.00	$85.74	$531.11
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$100.55	$420.73	$1,247.50	$1,661.42	$2,067.52	$2,503.77
Job Losses (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Basin						
Nueces	0	0	0	0	0	0
San Antonio	1,710	7,170	21,250	28,310	33,434	33,083
Guadalupe	0	0	0	0	1,446	8,907
Lower-Colorado	0	0	0	0	0	0
Colorado-Lavaca	0	0	0	0	0	0
Lavaca	0	0	0	0	0	0
Lower-Guadalupe	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0
Rio Grande	0	0	0	0	0	0
Total	1,710	7,170	21,250	28,310	34,880	41,990
Lost Business Taxes ($millions)						
	2010	2020	2030	2040	2050	2060

Nueces	$5.72	$23.92	$70.93	$94.32	$115.85	$139.13
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$5.72	$23.92	$70.93	$94.32	$111.05	$109.62
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$4.80	$29.51
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$5.72	$23.92	$70.93	$94.32	$115.85	$139.13

Municipal

Table C-2: Distribution of Regional Impacts among Major River Basins
(Municipal Uses including Water Intensive Commercial Businesses, Horticultural Industry and Water Utilities)

Lost Sales ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$1.85	$20.49	$40.77
San Antonio	$450.21	$578.65	$696.50	$884.97	$2,198.13	$2,958.60
Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Colorado	$0.00	$0.00	$0.00	$0.46	$2.63	$5.07
Colorado-Lavaca	$0.00	$0.27	$1.09	$2.09	$4.27	$4.97
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$450.21	$578.92	$697.58	$889.37	$2,225.51	$3,009.40

Lost Income ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$2.33	$18.82	$36.28
San Antonio	$469.61	$613.26	$841.47	$1,115.20	$2,019.47	$2,633.05
Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Colorado	$0.00	$0.00	$0.00	$0.58	$2.41	$4.51
Colorado-Lavaca	$0.00	$0.28	$1.31	$2.64	$3.92	$4.42
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$469.61	$613.55	$842.78	$1,120.74	$2,044.63	$2,678.26

Job Losses (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Basin						
Nueces	0	0	0	29	358	724
San Antonio	7,159	8,974	11,173	13,876	38,425	52,557
Guadalupe	0	0	0	0	0	0
Lower-Colorado	0	0	0	7	46	90
Colorado-Lavaca	0	4	17	33	75	88
Lavaca	0	0	0	0	0	0
Lower-Guadalupe	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0
Rio Grande	0	0	0	0	0	0
Total	7,159	8,978	11,190	13,945	38,903	53,459

Lost Business Taxes ($millions)						
	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$0.07	$1.02	$2.10
San Antonio	$18.66	$22.64	$27.28	$34.43	$109.65	$152.09
Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Colorado	$0.00	$0.00	$0.00	$0.02	$0.13	$0.26
Colorado-Lavaca	$0.00	$0.01	$0.04	$0.08	$0.21	$0.26
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$18.66	$22.65	$27.32	$34.60	$111.02	$154.70

Mining

Table C-3: Distribution of Impacts among Major River Basins (Mining Uses)						
Lost Sales ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.85	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio	$0.00	$0.00	$36.46	$39.33	$42.60	$44.24
Guadalupe	$111.98	$119.77	$95.94	$98.41	$108.35	$108.13
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$112.83	$119.77	$132.39	$137.74	$150.94	$152.36
Lost Income ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.48	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio	$0.00	$0.00	$20.72	$22.30	$24.15	$25.08
Guadalupe	$63.64	$68.07	$54.52	$55.81	$61.43	$61.29
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$64.12	$68.07	$75.23	$78.11	$85.58	$86.36
Job Losses (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Basin						
Nueces	6	0	0	0	0	0
San Antonio	0	0	248	266	288	299
Guadalupe	754	810	652	664	732	731
Lower-Colorado	0	0	0	0	0	0
Colorado-Lavaca	0	0	0	0	0	0

Lavaca	0	0	0	0	0	0
Lower-Guadalupe	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0
Rio Grande	0	0	0	0	0	0
Total	760	810	900	930	1,020	1,030
Lost Business Taxes ($millions)						
	2010	2020	2030	2040	2050	2060
Nueces	$0.03	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio	$0.00	$0.00	$1.25	$1.36	$1.48	$1.54
Guadalupe	$3.85	$4.12	$3.30	$3.41	$3.76	$3.76
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$3.88	$4.12	$4.55	$4.78	$5.24	$5.30

Steam-Electric

Table C-4: Distribution of Impacts among Major River Basins (Steam-Electric Uses)						
Lost Sales ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$8.08	$17.81	$30.64
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$27.51	$91.28	$120.66	$152.36	$194.38	$263.35
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$27.51	$91.28	$120.66	$160.44	$212.19	$293.99
Lost Income ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$5.44	$11.99	$20.60
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$18.53	$61.47	$81.26	$102.58	$130.82	$177.07
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$18.53	$61.47	$81.26	$108.02	$142.81	$197.67
Job Losses (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Basin						
Nueces	0	0	0	30	65	109
San Antonio	0	0	0	0	0	0
Guadalupe	100	340	450	570	715	941

Lower-Colorado	0	0	0	0	0	0
Colorado-Lavaca	0	0	0	0	0	0
Lavaca	0	0	0	0	0	0
Lower-Guadalupe	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0
Rio Grande	0	0	0	0	0	0
Total	100	340	450	600	780	1,050
Lost Business Taxes ($millions)						
	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$0.97	$2.15	$3.69
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$3.32	$11.01	$14.56	$18.38	$23.43	$31.72
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$3.32	$11.01	$14.56	$19.35	$25.58	$35.41

Irrigation

Table C-5: Distribution of Impacts among Major River Basins (Irrigation)						
Lost Sales ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$19.30	$18.11	$17.73	$17.32	$16.90	$16.47
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$19.30	$18.11	$17.73	$17.32	$16.90	$16.47
Lost Income ($millions)						
Basin	2010	2020	2030	2040	2050	2060
Nueces	$10.61	$9.98	$9.76	$9.54	$9.31	$9.07
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$10.61	$9.98	$9.76	$9.54	$9.31	$9.07
Job Losses (numbers may not sum to figures in text due to rounding)						
	2010	2020	2030	2040	2050	2060
Basin						
Nueces	470	445	440	430	420	410

	2010	2020	2030	2040	2050	2060
San Antonio	0	0	0	0	0	0
Guadalupe	0	0	0	0	0	0
Lower-Colorado	0	0	0	0	0	0
Colorado-Lavaca	0	0	0	0	0	0
Lavaca	0	0	0	0	0	0
Lower-Guadalupe	0	0	0	0	0	0
San Antonio-Nueces	0	0	0	0	0	0
Rio Grande	0	0	0	0	0	0
Total	470	445	440	430	420	410
Lost Business Taxes ($millions)						
	2010	2020	2030	2040	2050	2060
Nueces	$0.76	$0.72	$0.70	$0.69	$0.67	$0.65
San Antonio	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$0.76	$0.72	$0.70	$0.69	$0.67	$0.65

Livestock

Table C-6: Distribution of Impacts Among Major River Basins (Livestock)

Basin	2010	2020	2030	2040	2050	2060
Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio	$0.16	$0.16	$0.56	$0.58	$0.63	$0.64
Guadalupe	$0.63	$0.64	$0.79	$0.80	$0.85	$0.86
Lower-Colorado	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Colorado-Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lavaca	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Lower-Guadalupe	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
San Antonio-Nueces	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Rio Grande	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$0.79	$0.80	$1.35	$1.38	$1.48	$1.50

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Appendix F

Texas Commission on Environmental Quality

Model
Municipal Water Conservation Plan

Utility Profile and Water Conservation Plan Requirements for Municipal Water Use by Public Water Suppliers

(See following pages of Appendix F)

Web Sites for Information:
www.tceq.state.tx.us/waterconservation/waterconservationplanforms
www.twdb.state.tx.us/assistance/conservation/Municipal/Plans/CPlans.asp
www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf

Texas Commission on Environmental Quality

UTILITY PROFILE & WATER CONSERVATION PLAN REQUIREMENTS FOR MUNICIPAL WATER USE BY PUBLIC WATER SUPPLIERS

This form is provided to assist entities in water conservation plan development for municipal water use by a retail public water supplier. Information from this form should be included within a water conservation plan for municipal use. If you need assistance in completing this form or in developing your plan, please contact the conservation staff of the Resource Protection Team in the Water Supply Division at (512) 239-4691.

Name of Entity: ____

Address & Zip: ____

Telephone Number: ______________________________ **Fax:** ____________________

Form Completed By:____

Title: ____

Signature: ______________________________ **Date:** ___________________

Name and Phone Number of Person/Department responsible for implementing a water conservation program: ____

UTILITY PROFILE

I. POPULATION AND CUSTOMER DATA

A. Population and Service Area Data

1. Attach a copy of your service-area map and, if applicable, a copy of your Certificate of Convenience and Necessity (CCN).

2. Service area size (square miles): ________________________________

3. Current population of service area: ______________________________

4. Current population served:

a. water ______________________
b. wastewater ______________________

5. Population served by water utility for the previous five years:

Year	Population
________	_________
________	_________
________	_________
________	_________
________	_________

6. Projected population for service area in the following decades:

Year	Population
2010	_________
2020	_________
2030	_________
2040	_________
2050	_________

7. List source/method for the calculation of current and projected population:

____
____
____
____

B. Active Connections

1. Current number of active connections. Check whether multi-family service is counted as Residential _____ or Commercial _____

Treated water users:	Metered	Not-metered	Total
Residential	________	__________	______
Commercial	________	__________	______
Industrial	________	__________	______
Other	________	__________	______

2. List the net number of new connections per year for most recent three years:

Year	________	________	________
Residential	________	________	________
Commercial	________	________	________
Industrial	________	________	________
Other	________	________	________

C. High Volume Customers

List annual water use for the five highest volume customers
(indicate if treated or raw water delivery)

	Customer	Use (1,000gal./yr.)	Treated/Raw Water
(1)	________	________	________
(2)	________	________	________
(3)	________	________	________
(4)	________	________	________
(5)	________	________	________

II. WATER USE DATA FOR SERVICE AREA

A. Water Accounting Data

1. Amount of water use for previous five years (in 1,000 gal.):
Please indicate : Diverted Water ________________
Treated Water ________________

Year	________	________	________	________	________
January	________	________	________	________	________
February	________	________	________	________	________
March	________	________	________	________	________

April					
May					
June					
July					
August					
September					
October					
November					
December					
Total					

Indicate how the above figures were determined (e.g., from a master meter located at the point of a diversion from the source or located at a point where raw water enters the treatment plant, or from water sales).

____

____

____

2. Amount of water (in 1,000 gallons) delivered (sold) as recorded by the following account types for the past five years.

Year	Residential	Commercial	Industrial	Wholesale	Other	Total Sold

3. List previous five years records for water loss (the difference between water diverted (or treated) and water delivered (or sold))

Year	Amount (gal.)	%

4. Municipal water use for previous five years:

Year	Population	Total Water Diverted or Pumped for Treatment (1,000 gal.)
	_______________	__________________
	_______________	__________________
	_______________	__________________
	_______________	__________________
	_______________	__________________

B. Projected Water Demands

If applicable, attach projected water supply demands for the next ten years using information such as population trends, historical water use, and economic growth in the service area over the next ten years and any additional water supply requirement from such growth.

III. WATER SUPPLY SYSTEM DATA

A. Water Supply Sources

List all current water supply sources and the amounts authorized with each:

	Source	Amount Authorized
Surface Water:	_________________________________	______________ acre-feet
Groundwater:	_________________________________	______________ acre-feet
Contracts:	_________________________________	______________ acre-feet
Other:	_________________________________	______________ acre-feet

B. Treatment and Distribution System

1. Design daily capacity of system: ________________ MGD

2. Storage Capacity: Elevated ________ MGD, Ground _______ MGD

3. If surface water, do you recycle filter backwash to the head of the plant? Yes ______ No ______. If yes, approximately ________ MGD.

4. Please attach a description of the water system. Include the number of

treatment plants, wells, and storage tanks. If possible, include a sketch of the system layout.

IV. WASTEWATER SYSTEM DATA

A. Wastewater System Data

1. Design capacity of wastewater treatment plant(s): ___________ MGD

2. Is treated effluent used for irrigation on-site _____, off-site _____, plant washdown _____, or chlorination/dechlorination ______?
If yes, approximately ________ gallons per month.

3. Briefly describe the wastewater system(s) of the area serviced by the water utility. Describe how treated wastewater is disposed of. Where applicable, identify treatment plant(s) with the TCEQ name and number, the operator, owner, and, if wastewater is discharged, the receiving stream. If possible, attach a sketch or map which locates the plant(s) and discharge points or disposal sites.

B. Wastewater Data for Service Area

1. Percent of water service area served by wastewater system: ______%

2. Monthly volume treated for previous three years (in 1,000 gallons):

Year	________	________	________
January	________	________	________
February	________	________	________
March	________	________	________
April	________	________	________
May	________	________	________
June	________	________	________
July	________	________	________
August	________	________	________
September	________	________	________
October	________	________	________
November	________	________	________
December	________	________	________
Total	________	________	________

REQUIREMENTS FOR WATER CONSERVATION PLANS FOR MUNICIPAL WATER USE BY PUBLIC WATER SUPPLIERS

In addition to the utility profile, a water conservation plan for municipal use by a public water supplier must include, at a minimum, additional information as required by Title 30, Texas Administrative Code, §288.2. <u>Note: If the water conservation plan does not provide information for each requirement, an explanation must be included as to why the requirement is not applicable.</u>

Specific, Quantified 5 & 10-Year Targets

The water conservation plan must include specific, quantified five-year and ten-year targets for water savings to include goals for water loss programs and goals for ***municipal use in gallons per capita per day*** (see Appendix A). Note that the goals established by a public water supplier under this subparagraph are not enforceable.

Metering Devices

The water conservation plan must include a statement about the water supplier's metering device(s), within an accuracy of plus or minus 5.0% in order to measure and account for the amount of water diverted from the source of supply.

Universal Metering

The water conservation plan must include and a program for universal metering of both customer and public uses of water, for meter testing and repair, and for periodic meter replacement.

Unaccounted-For Water Use

The water conservation plan must include measures to determine and control unaccounted-for uses of water (for example, periodic visual inspections along distribution lines; annual or monthly audit of the water system to determine illegal connections; abandoned services; etc.).

Continuing Public Education & Information

The water conservation plan must include a description of the program of continuing public education and information regarding water conservation by the water supplier.

Non-Promotional Water Rate Structure

The water supplier must have a water rate structure which is not "promotional," i.e., a rate structure which is cost-based and which does not encourage the excessive use of water. This rate structure must be listed in the water conservation plan.

Reservoir Systems Operations Plan

The water conservation plan must include a reservoir systems operations plan, if applicable, providing for the coordinated operation of reservoirs owned by the applicant within a common watershed or river basin in order to optimize available water supplies.

Enforcement Procedure & Plan Adoption

The water conservation plan must include a means of implementation and enforcement which shall be evidenced by 1) a copy of the ordinance, resolution, or tariff indicating **official adoption** of the water conservation plan by the water supplier; and 2) a description of the authority by which the water supplier will implement and enforce the conservation plan.

Coordination with the Regional Water Planning Group(s)

The water conservation plan must include documentation of coordination with the regional water planning group(s) for the service area of the public water supplier in order to ensure consistency with the appropriate approved regional water plans.

Example statement to be included within the water conservation plan:

The service area of the _____________ (name of water supplier) is located within the ___________ (name of regional water planning area or areas) and ___________ (name of water supplier) has provided a copy of this water conservation plan to the ____________ (name of regional water planning group or groups).

Additional Requirements:

required of suppliers serving population of 5,000 or more or a projected population of 5,000 or more within ten years)

1. Program for Leak Detection, Repair, and Water Loss Accounting

The plan must include a description of the program of leak detection, repair, and water loss accounting for the water transmission, delivery, and distribution system in order to control unaccounted-for uses of water.

2. Record Management System

The plan must include a record management system to record water pumped, water deliveries, water sales, and water losses which allows for the desegregation of water sales and uses into the following user classes (residential; commercial; public and institutional; and industrial.

Plan Review and Update

Beginning May 1, 2005, a public water supplier for municipal use shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The public water supplier for municipal use shall review and update the next revision of its water conservation plan not later than May 1, 2009, and every five years after that date to coincide with the regional water planning group. The revised plan must also include an implementation report.

Best Management Practices Guide

On November 2004, the Texas Water Development Board's (TWDB) Report 362 was completed by the Water Conservation Implementation Task Force. Report 362 is the Water Conservation Best Management Practices (BMP) Guide. The BMP Guide is a voluntary list of management practices that water users may implement in addition to the required components of Title 30, Texas Administrative Code, Chapter 288. The BMP Guide is available on the TWDB's website at the link below or by calling (512) 463-7847.

http://www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf

Appendix A

Definitions of Commonly Used Terms

Conservation – Those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.

Industrial use – The use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, commercial fish production, and the development of power by means other than hydroelectric, but does not include agricultural use.

Irrigation – The agricultural use of water for the irrigation of crops, trees, and pastureland, including, but not limited to, golf courses and parks which do not receive water through a municipal distribution system.

Municipal per capita water use – The sum total of water diverted into a water supply system for residential, commercial, and public and institutional uses divided by actual population served.

Municipal use – The use of potable water within or outside a municipality and its environs whether supplied by a person, privately owned utility, political subdivision, or other entity as well as the use of sewage effluent for certain purposes, including the use of treated water for domestic purposes, fighting fires, sprinkling streets, flushing sewers and drains, watering parks and parkways, and recreational purposes, including public and private swimming pools, the use of potable water in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands, and for the watering of lawns and family gardens.

Municipal use in gallons per capita per day – The total average daily amount of water diverted or pumped for treatment for potable use by a public water supply system. The calculation is made by dividing the water diverted or pumped for treatment for potable use by population served. Indirect reuse volumes shall be credited against total diversion volumes for the purpose of calculating gallons per capita per day for targets and goals.

Pollution – The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Public water supplier – An individual or entity that supplies water to the public for human consumption.

Regional water planning group – A group established by the Texas Water Development Board to prepare a regional water plan under Texas Water Code, §16.053.

Retail public water supplier – An individual or entity that for compensation supplies water to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants when that water is not resold to or used by others.

Reuse – The authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake, or other body of state-owned water.

Water conservation plan – A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s).

Water loss - The difference between water diverted or treated and water delivered (sold). Water loss can result from:

1. inaccurate or incomplete record keeping;
2. meter error;
3. unmetered uses such as firefighting, line flushing, and water for public buildings and water treatment plants;
4. leaks; and
5. water theft and unauthorized use.

Wholesale public water supplier – An individual or entity that for compensation supplies water to another for resale to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants as an incident of that employee service or tenancy when that water is not resold to or used by others, or an individual or entity that conveys water to another individual or entity, but does not own the right to the water which is conveyed, whether or not for a delivery fee.

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Appendix G

Texas Commission on Environmental Quality

Model
Municipal Drought Contingency Plan

Drought Contingency Plan Requirements for
Municipal Retail Public Water Suppliers

Web Site for Information:
www.tnrcc.state.tx.us/permitting/waterperm/wrpa/contingency.html

DROUGHT CONTINGENCY PLAN
FOR THE
(name of retail public water supplier)
(date)

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the ___________________ (name of water supplier) hereby adopts the following regulations and restrictions on the delivery and consumption of water through an ordinance/or resolution (see Appendix C for an example).

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the ______________ (name of water supplier) by means of ________________ (describe methods used to inform the public about the preparation of the plan and provide opportunities for input; for example, scheduling and providing public notice of a public meeting to accept input on the Plan).

Section III: Public Education

The _________ (name of water supplier) will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of __________________ (describe methods to be used to provide information to the public about the Plan; for example, public events, press releases or utility bill inserts).

Section IV: Coordination with Regional Water Planning Groups

The service area of the _____________ (name of water supplier) is located within the ____________ (name of regional water planning area or areas) and ___________ (name of water supplier) has provided a copy of this Plan to the ____________ (name of regional water planning group or groups).

Section V: Authorization

The ___________________ (designated official; for example, the mayor, city manager, utility director, general manager, etc.), or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _______________, (designated official) or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the __________________ (name of supplier). The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by _________________ (name of water supplier).

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;

(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The ____________ (designated official) or his/her designee shall monitor water supply and/or demand conditions on a _____ (*e.g., daily, weekly, monthly*) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on ____________________________________
____
(*provide a brief description of the rationale for the triggering criteria; for example, triggering criteria / trigger levels based on a statistical analysis of the vulnerability of the water source under drought of record conditions, or based on known system capacity limits*).

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation
Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII–Definitions, when
____
(*describe triggering criteria / trigger levels; see examples below*).

Following are examples of the types of triggering criteria that might be used in one or more successive stages of a drought contingency plan. One or a combination of such criteria must be defined for each drought response stage, but usually not all will apply. Select those appropriate to your system:

Example 1: Annually, beginning on May 1 through September 30.

Example 2: When the water supply available to the ____________ (name of water supplier) is equal to or less than _______ (acre-feet, percentage of storage, etc.).

Example 3: *When, pursuant to requirements specified in the _____________(name of water supplier) wholesale water purchase contract with ____________ (name of wholesale water supplier), notification is received requesting initiation of Stage 1 of the Drought Contingency Plan.*

Example 4: *When flows in the _______ (name of stream or river) are equal to or less than ____cubic feet per second.*

Example 5: *When the static water level in the ____________(name of water supplier) well(s) is equal to or less than _____feet above/below mean sea level.*

Example 6: *When the specific capacity of the __________________(name of water supplier) well(s) is equal to or less than _____ percent of the well's original specific capacity.*

Example 7: *When total daily water demand equals or exceeds ______ million gallons for ___consecutive days of ____ million gallons on a single day (e.g., based on the "safe" operating capacity of water supply facilities).*

Example 8: *Continually falling treated water reservoir levels which do not refill above __ percent overnight (e.g., based on an evaluation of minimum treated water storage required to avoid system outage).*

The public water supplier may devise other triggering criteria which are tailored to its system.

Requirements for termination
Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g. 3) consecutive days.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when ____________ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 3) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Triggers – SEVERE Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when ____________ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 3) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when ____________ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 3) consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

Stage 5 Triggers -- EMERGENCY Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when ____________ (designated official), or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; **or**

2. Natural or man-made contamination of the water supply source(s).

Requirements for termination
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 3) consecutive days.

Stage 6 Triggers -- WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section IX of this Plan and comply with the requirements and restrictions for Stage 5 of this Plan when ________________________ (*describe triggering criteria, see examples in Stage 1*).

Requirements for termination – Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 3) consecutive days.

> *Note: The inclusion of WATER ALLOCATION as part of a drought contingency plan may not be required in all cases. For example, for a given water supplier, an analysis of water supply availability under drought of record conditions may indicate that there is essentially no risk of water supply shortage. Hence, a drought contingency plan for such a water supplier might only address facility capacity limitations and emergency conditions (e.g., supply source contamination and system capacity limitations).*

Section IX: Drought Response Stages

The _________ (designated official), or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification

Notification of the Public:
The ____________ (designated official) or his/ here designee shall notify the public by means of:

Examples:
publication in a newspaper of general circulation,
direct mail to each customer,
public service announcements,
signs posted in public places
take-home fliers at schools.

Additional Notification:
The ___________ (designated official) or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / Chairman and members of the City Council / Utility Board
Fire Chief(s)
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TCEQ *(required when* mandatory *restrictions are imposed)*
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers

Note: The plan should specify direct notice only as appropriate to respective drought stages.

Stage 1 Response -- MILD Water Shortage Conditions

Target: Achieve a voluntary ___ percent reduction in __________ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe measures, if any, to be implemented directly by (name of water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, activation and use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Voluntary Water Use Restrictions for Reducing Demand :

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m to midnight on designated watering days.

(b) All operations of the ______________ (name of water supplier) shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response -- MODERATE Water Shortage Conditions

Target: Achieve a ___ percent reduction in __________ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe measures, if any, to be implemented directly by ____________ (name of water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Demand Reduction:
Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the ____________________ (name of water supplier).

(f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the ________________ (name of water supplier), the facility shall not be subject to these regulations.

(g) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response -- SEVERE Water Shortage Conditions

<u>Target</u>: Achieve a ___ percent reduction in _________ (e.g., total water use, daily water demand, etc.).

<u>Best Management Practices for Supply Management</u>:

Describe measures, if any, to be implemented directly by ____________ (name of water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

<u>Water Use Restrictions for Demand Reduction</u>:
All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the ____________________ (name of water supplier).

(c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response -- CRITICAL Water Shortage Conditions

<u>Target</u>: Achieve a ___ percent reduction in _________ (e.g., total water use, daily water demand, etc.).

<u>Best Management Practices for Supply Management</u>:

Describe measures, if any, to be implemented directly by ____________ (name of water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

<u>Water Use Restrictions for Reducing Demand:</u>. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response -- EMERGENCY Water Shortage Conditions

Target: Achieve a ___ percent reduction in __________ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe measures, if any, to be implemented directly by ____________ (name of water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand. All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Stage 6 Response -- WATER ALLOCATION

In the event that water shortage conditions threaten public health, safety, and welfare, the ____________ (designated official) is hereby authorized to allocate water according to the following water allocation plan:

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	6,000
3 or 4	7,000
5 or 6	8,000
7 or 8	9,000
9 or 10	10,000
11 or more	12,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the ____________ (name of water supplier) of a greater number of persons per household on a form prescribed by the _________ (designated official). The _________ (designated official) shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every residential customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the ____________ (name of water supplier) offices to complete and sign the form claiming more than two (2) persons per household. New customers may claim more persons per household at the time of applying for water service on the form prescribed by the __________ (designated official). When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the _________ (name of water supplier) on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the _________(name of water supplier) in writing within two (2) days. In prescribing the method for claiming more than two (2) persons per household, the _________ (designated official) shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the ____________ (name of water supplier) of a reduction in the number of person in a household shall be fined not less than $________.

Residential water customers shall pay the following surcharges:

$____ for the first 1,000 gallons over allocation.
$____ for the second 1,000 gallons over allocation.
$____ for the third 1,000 gallons over allocation.

$____ for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Master-Metered Multi-Family Residential Customers

The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. It shall be assumed that such a customer's meter serves two dwelling units unless the customer notifies the ____________ (name of water supplier) of a greater number on a form prescribed by the __________ (designated official). The _________ (designated official) shall give his/her best effort to see that such forms are mailed, otherwise provided, or made available to every such customer. If, however, a customer does not receive such a form, it shall be the customer's responsibility to go to the ____________ (name of water supplier) offices to complete and sign the form claiming more than two (2) dwellings. A dwelling unit may be claimed under this provision whether it is occupied or not. New customers may claim more dwelling units at the time of applying for water service on the form prescribed by the __________ (designated official). If the number of dwelling units served by a master meter is reduced, the customer shall notify the _________(name of water supplier) in writing within two (2) days. In prescribing the method for claiming more than two (2) dwelling units, the _________ (designated official) shall adopt methods to insure the accuracy of the claim. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter or fails to timely notify the ____________ (name of water supplier) of a reduction in the number of person in a household shall be fined not less than $________. Customers billed from a master meter under this provision shall pay the following monthly surcharges:

$____ for 1,000 gallons over allocation up through 1,000 gallons for each dwelling unit.
$____, thereafter, for each additional 1,000 gallons over allocation up through a second 1,000 gallons for each dwelling unit.
$____, thereafter, for each additional 1,000 gallons over allocation up through a third 1,000 gallons for each dwelling unit.
$____, thereafter for each additional 1,000 gallons over allocation.

Surcharges shall be cumulative.

Commercial Customers

A monthly water allocation shall be established by the __________ (designated official), or his/her designee, for each nonresidential commercial customer other than an industrial customer who uses water for processing purposes. The non-residential customer's allocation shall be approximately __ (e.g. 75%) percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, __ percent of whose monthly usage is less than ____ gallons, shall be allocated ____ gallons. The _________ (designated official) shall give his/her best effort to see that notice of each non-residential customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the ____________ (name of water supplier) to determine the allocation. Upon request of the customer or at the initiative of the ___________ (designated official), the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage, (2) one nonresidential customer agrees to transfer part of its allocation to another nonresidential customer, or (3) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the ___________ (designated official or alternatively, a special water allocation review committee). Nonresidential commercial customers shall pay the following surcharges:

Customers whose allocation is _____ gallons through ______ gallons per month:

$____ per thousand gallons for the first 1,000 gallons over allocation.
$____ per thousand gallons for the second 1,000 gallons over allocation.
$____ per thousand gallons for the third 1,000 gallons over allocation.
$____ per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is ______ gallons per month or more:

___ times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
___ times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.
___ times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
___ times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Industrial Customers

A monthly water allocation shall be established by the __________ (designated official), or his/her designee, for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be approximately __ (e.g., 90%) percent of the customer's water usage baseline. Ninety (90) days after the initial imposition of the allocation for industrial customers, the industrial customer's allocation shall be further reduced to __ (e.g., 85%) percent of the customer's water usage baseline. The industrial customer's water use baseline will be computed on the average water use for the ______ month period ending prior to the date of implementation of Stage 2 of the Plan. If the industrial water customer's billing history is shorter than ___ months, the monthly average for the period for which there is a record shall be used for any monthly period for which no billing history exists. The _________ (designated official) shall give his/her best effort to see that notice of each industrial customer's allocation is mailed to such customer. If, however, a customer does not receive such notice, it shall be the customer's responsibility to contact the ____________ (name of water supplier) to determine the allocation, and the allocation shall be fully effective notwithstanding the lack of receipt of written notice. Upon request of the customer or at the initiative of the ___________ (designated official), the allocation may be reduced or increased, (1) if the designated period does not accurately reflect the customer's normal water use because the customer had shutdown a major processing unit for repair or overhaul during the period, (2) the customer has added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce water use is limited, (5) the customer agrees to transfer part of its allocation to another industrial customer, or (6) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the ___________ (designated official or alternatively, a special water allocation review committee). Industrial customers shall pay the following surcharges:

Customers whose allocation is _____ gallons through _______ gallons per month:

$____ per thousand gallons for the first 1,000 gallons over allocation.
$____ per thousand gallons for the second 1,000 gallons over allocation.
$____ per thousand gallons for the third 1,000 gallons over allocation.
$____ per thousand gallons for each additional 1,000 gallons over allocation.

Customers whose allocation is ______ gallons per month or more:

___ times the block rate for each 1,000 gallons in excess of the allocation up through 5 percent above allocation.
___ times the block rate for each 1,000 gallons from 5 percent through 10 percent above allocation.

___ times the block rate for each 1,000 gallons from 10 percent through 15 percent above allocation.
___ times the block rate for each 1,000 gallons more than 15 percent above allocation.

The surcharges shall be cumulative. As used herein, "block rate" means the charge to the customer per 1,000 gallons at the regular water rate schedule at the level of the customer's allocation.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the __________________ (name of water supplier) for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by _____________(designated official), or his/her designee, in accordance with provisions of this

Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than _______ dollars ($__) and not more than ______ dollars ($__). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the _____________ (designated official) shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $______, and any other costs incurred by the __________________ (name of water supplier) in discontinuing service. In addition, suitable assurance must be given to the ________________ (designated official) that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the ______________ (name of water supplier), in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the _______________ (name of water supplier), police officer, or other _____ employee designated by the ___________ (designated official), may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the _____________ (e.g., municipal court) on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in _________ (e.g., municipal court) to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in __________ (e.g., municipal court), a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in __________ (e.g., municipal court) before all other cases.

Section XI: Variances

The ________________ (designated official), or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the _________________ (name of water supplier) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the __________ (designated official), or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the ___________________ (name of water supplier) shall be subject to the following conditions, unless waived or modified by the ____________ (designated official) or his/her designee:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

EXAMPLE ORDINANCE FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN

ORDINANCE NO. __________

AN ORDINANCE OF THE CITY OF ____________________, TEXAS, ADOPTING A DROUGHT CONTINGENCY PLAN; ESTABLISHING CRITERIA FOR THE INITIATION AND TERMINATION OF DROUGHT RESPONSE STAGES; ESTABLISHING RESTRICTIONS ON CERTAIN WATER USES; ESTABLISHING PENALTIES FOR THE VIOLATION OF AND PROVISIONS FOR ENFORCEMENT OF THESE RESTRICTIONS; ESTABLISHING PROCEDURES FOR GRANTING VARIANCES; AND PROVIDING SEVERABILITY AND AN EFFECTIVE DATE.

WHEREAS, the City of _________________, Texas recognizes that the amount of water available to the City and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the City recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the citizens of _____________, Texas, the ________________ (governing body) deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT ORDAINED BY THE CITY OF ____________, TEXAS:

SECTION 1.

That the City of ____________, Texas Drought Contingency Plan attached hereto as Exhibit "A" and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the City.

SECTION 2.

That all ordinances that are in conflict with the provisions of this ordinance be, and the same are hereby, repealed and all other ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3.

Should any paragraph, sentence, subdivision, clause, phrase, or section of this ordinance be adjudged or held to be unconstitutional, illegal or invalid, the same shall not affect the validity of this ordinance as a whole or any part or provision thereof, other than the part so declared to be invalid, illegal or unconstitutional.

SECTION 4.

This ordinance shall take effect immediately from and after its passage and the publication of the caption, as the law in such cases provides.

DULY PASSED BY THE CITY OF _______________, TEXAS, on the ___________ day of ______________, 20__.

APPROVED:

____
MAYOR

ATTESTED TO:

____
CITY SECRETARY

APPROVED AS TO FORM:

____
CITY ATTORNEY

EXAMPLE RESOLUTION FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN

RESOLUTION NO. __________

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE ___________________ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN.

WHEREAS, the Board recognizes that the amount of water available to the ____________ (name of water supplier) and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the customers of the _________________(name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE _________________ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit ÀA@ and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the ________________ (name of water supplier).

SECTION 2. That the _______________ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE ______________, ON THIS __ day of ______________, 20__.

____
President, Board of Directors

ATTESTED TO:

____
Secretary, Board of Directors

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Appendix H
Threatened, Endangered, and Rare Species by County

Table H-1.
Threatened, Endangered, and Rare Species of Atascosa County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Petrochelidon pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Elmendorf's onion	*Allium elmendorfii*	endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		T
Jaguarundi	*Herpailurus jaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Mountain Plover	*Charadrius montanus*	breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous		
Nueces Crayfish	*Procambarus nueces*	known only from one small sluggish stream tributary to the Nueces River; slightly sinuous channel, with natural debris impeding flow; substrate of sand and gravel, also silt covered in deeper pooled areas; riparian edges of grass, sedges, and herbaceous plants in mostly unshaded area		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E

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Table H-1 (continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
Park's jointweed	*Polygonella parksii*	endemic; deep loose sands of Carrizo and similar Eocene formations, including disturbed areas; flowering spring-summer		
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		
Sandhill woolywhite	*Hymenopappus carrizoanus*	endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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 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
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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				

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Table H-2.
Threatened, Endangered, and Rare Species of
Bastrop County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	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	LT-PDL	T
Blue Sucker	*Cycleptus elongatus*	usually inhabits channels and flowing pools with a moderate current; bottom type usually consists 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
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Petrochelidon pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle 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		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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		
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
Mountain Plover	*Charadrius montanus*	breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous		
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		

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Table H-2 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Sandhill woolywhite	*Hymenopappus carrizoanus*	endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-3.
Threatened, Endangered, and Rare Species of Bexar County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
A Ground Beetle	*Rhadine exilis*	small, essentially eyeless ground beetle; karst features in northern Bexar County and northeastern Medina County	LE	
A Ground Beetle	*Rhadine infernalis*	small, essentially eyeless ground beetle; karst features in northern and western Bexar County and northeastern Medina County	LE	
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
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		
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	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, & required structure; nests mid April-late summer	LE	E
Black-spotted Newt	*Notophthalmus meridionalis*	can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River		T
Bracted twistflower	*Streptanthus bracteatus*	endemic; shallow clay soils over limestone, mostly on rocky slopes, in openings in juniper-oak woodlands; flowering April-May		
Braken Bat Cave Meshweaver (=Veni's Cave Spider)	*Cicurina venii*	small, eyeless, or essentially eyeless spider; karst features in western Bexar County and eastern Medina County	LE	
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	C1	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		

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Table H-3 (continued)

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
Cokendolpher Cave Harvestman (=Robber Baron Cave Harvestman)	*Texella cokendolpheri*	small, eyeless harvestman; karst features in north-central Bexar County		
Comal Blind Salamander	*Eurycea tridentifera*	endemic; semi-troglobitic; found in springs and waters of caves in Bexar and Comal counties		T
Correll's false dragon-head	*Physostegia correllii*	wet soils including roadside ditches and irrigation channels; flowering June-July		
Edwards Plateau Spring Salamanders	*Eurycea sp. 7*	endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County		
Elmendorf's onion	*Allium elmendorfii*	endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May		
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 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 & shrubs; nests late March-early summer	LE	E
Government Canyon Bat Cave Meshweaver (=Vesper Cave Spider)	*Cicurina vespera*	small, eyeless, or essentially eyeless spider; karst features in northwestern Bexar County and northeastern Medina County	LE	
Government Canyon Bat Cave Spider (=Government Canyon Cave Spider)	*Neoleptoneta microps*	small, eyeless, or essentially eyeless spider; karst features in northwestern Bexar County and northeastern Medina County	LE	
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Helotes Mold Beetle	*Batrisodes venyivi*	small, eyeless mold beetle; karst features in northwestern Bexar County and northeastern Medina County	LE	
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		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		T
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Madla Cave Meshweaver (=Madla's Cave Spider)	*Cicurina madla*	small, eyeless, or essentially eyeless spider; karst features in northern Bexar County and northeastern Medina County	LE	
Manfreda Giant-skipper	*Stallingsia maculosus*	most skippers are small and stout-bodied; name derives from fast, erratic flight; at rest most skippers hold front and hind wings at different angles; skipper larvae are smooth, with the head and neck constricted; skipper larvae usually feed inside a leaf shelter and pupate in a cocoon made of leaves fastened together with silk		

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Table H-3 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Mimic Cavesnail	*Phreatodrobia imitata*	subaquatic; only known from two wells penetrating the Edwards Aquifer		
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		
Park's jointweed	*Polygonella parksii*	endemic; deep loose sands of Carrizo and similar Eocene formations, including disturbed areas; flowering spring-summer		
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		
Robber Baron Cave Meshweaver (=Robber Baron Cave Spider)	*Cicurina baronia*	small, eyeless, or essentially eyeless spider; karst features in north-central Bexar County	LE	
Sandhill woolywhite	*Hymenopappus carrizoanus*	endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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 Salamander	*Eurycea neotenes*	endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; restricted to Helotes and Leon Creek drainages in Bexar County		
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
Toothless Blindcat	*Trogloglanis pattersoni*	troglobitic, blind catfish endemic to the San Antonio Pool of the Edwards Aquifer		T
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
Widemouth Blindcat	*Satan eurystomus*	troglobitic, blind catfish endemic to the San Antonio Pool of the Edwards Aquifer		T

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Table H-3 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
Zone-tailed Hawk	*Buteo albonotatus*	arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, 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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-4.
Threatened, Endangered, and Rare Species of
Caldwell County, Texas

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	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	LT-PDL	T
Blue Sucker	*Cycleptus elongatus*	usually inhabits channels and flowing pools with a moderate current; bottom type usually consists 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
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
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		
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		
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		
Sandhill woolywhite	*Hymenopappus carrizoanus*	endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T

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Table H-4 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-5.
Threatened, Endangered, and Rare Species of Calhoun County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata*	Gulf and bay system	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	LT-PDL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Brown Pelican	*Pelecanus occidentalis*	largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Eskimo Curlew	*Numenius borealis*	non-breeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats	LE	E
Gulf Saltmarsh Snake	*Nerodia clarkii*	saline flats, coastal bays, & brackish river mouths		
Green Sea Turtle	*Chelonia mydas*	Gulf and bay system	LT	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*	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
Jaguarundi	*Herpailurus jaguarondi*	thick brushlands, near water favored; 6 month gestation, young born twice per year in March and August	LE	E
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Gulf and bay system	LE	E
Leatherback Sea Turtle	*Dermochelys coriacea*	Gulf and bay system	LE	E
Loggerhead Sea Turtle	*Caretta caretta*	Gulf and bay system	LT	T
Louisiana Black Bear	*Ursus americanus luteolus*	within historical range in eastern Texas; inhabits bottomland hardwoods and large tracts of undeveloped forested areas; dens in tree hollows, rock piles, or under brush piles	LT	T
Mountain Plover	*Charadrius montanus*	breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: short-grass plains and bare, dirt (plowed) fields; primarily insectivorous		

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Table H-5 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Opossum Pipefish	*Microphis brachyurus*	brooding adults found in fresh or low salinity waters and young move or are carried into more saline waters after birth		T
Piping Plover	*Charadrius melodus*	wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	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		
Red Wolf	*Canis rufus*	(extirpated) – formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies	LE	E
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*	wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
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
Southern Yellow Bat	*Lasiurus ega*	associated with trees, such as palm trees (Sabal mexicana) in Brownsville, which provide them with daytime roosts; insectivorous; breeding in late winter		T
Texas Diamondback 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
Threeflower broomweed	*Thurovia triflora*	endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November		
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
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 it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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.				

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Table H-6.
Threatened, Endangered, and Rare Species of Comal County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	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, & required structure; nests mid April-late summer	LE	E
Bracted twistflower	*Streptanthus bracteatus*	endemic; shallow clay soils over limestone, mostly on rocky slopes, in openings in juniper-oak woodlands; flowering April-May		
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	C1	T
Canyon mock-orange	*Philadelphus ernestii*	solution-pitted outcrops of Cretaceous limestone on caprock along mesic canyons, usually in shade of mixed evergreen-deciduous canyon woodland; flowering April-May, fruit maturing in September		
Cascade Caverns Salamander	*Eurycea latitans*	endemic; subaquatic; springs and caves in Comal, Kendall, and Kerr counties;		T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Comal Blind Salamander	*Eurycea tridentifera*	endemic; semi-troglobitic; found in springs and waters of caves in Bexar and Comal counties		T
Comal Springs Diving Beetle	*Comaldessus stygius*	known only from the outflows at Comal Springs; aquatic; diving beetles generally inhabit the water column		
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 live in soil or decaying wood	LE	
Comal Springs Riffle Beetle	*Heterelmis comalensis*	Comal and San Marcos Springs	LE	
Comal Springs Salamander	*Eurycea sp. 8*	endemic; Comal Springs		
Edwards Aquifer Diving Beetle	*Haideoporus texanus*	habitat poorly known; known from an artesian well in Hays County		
Edwards Plateau Spring Salamanders	*Eurycea sp. 7*	endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County		

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Table H-6 (continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
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 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 & shrubs; nests late March-early summer	LE	E
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
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		
Hill Country wild-mercury	*Argythamnia aphoroides*	shallow to moderately deep clays and clay loams over limestone, in grasslands associated with plateau live oak woodlands, mostly on rolling uplands; flowering April-May; fruit persisting until midsummer		
Horseshoe Liptooth	*Daedalochila hippocrepis*	terrestrial snail known only from the steep, wooded hillsides of Landa Park in New Braunfels		
Mountain Plover	*Charadrius montanus*	breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous		
Peck's Cave Amphipod	*Stygobromus pecki*	small, aquatic crustacean; lives underground in the Edwards Aquifer; collected at Comal and Hueco springs	LE	E
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		
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		T
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 mock-orange	*Philadelphus texensis*	endemic; limestone cliffs and boulders in mesic stream bottoms and canyons, usually in shade of mostly deciduous sloped forest; flowering April-May		
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-7. Threatened, Endangered, and Rare Species of Dewitt County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	this county within historic range; endemic; open prairies of mostly thick grass 1 to 3 feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks on booming grounds during late winter-early spring; breed 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	LT-PDL	T
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	C1	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
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*	this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; inland lake beaches; also known to nest on man-made structures (wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Mountain Plover	*Charadrius montanus*	breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous		

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Table H-7 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
Texas Asaphomyian Tabanid Fly	*Asaphomyia texanus*	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		
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		T
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 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
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 it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-8.
Threatened, Endangered, and Rare Species of Dimmit County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Audubon's Oriole	*Icterus graduacauda audubonii*	scrub, mesquite; nests in dense trees, or thickets, usually along water courses		
Big Free-tailed Bat	*Nyctinomops macrotis*	habitat data sparse but records indicate that species prefers to roost in crevices and cracks in high canyon walls, but will use buildings, as well; reproduction data sparse, but gives birth to single offspring late June-early July; females gather in nursery colonies; winter habits undetermined, but may hibernate in the Trans-Pecos; opportunistic insectivore		
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Carrizo Springs Pocket Gopher	*Geomys streckeri*	underground burrows of deep, sandy soils; feed mostly on vegetation; reproductive data not well known, but likely breed year round, with no more than two litters per year		
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Dimmit sunflower	*Helianthus praecox ssp. hirtus*	well-drained sandy soils in open shrublands; flowering late summer-fall		
Ghost-faced Bat	*Mormoops megalophylla*	colonially roosts in caves, crevices, abandoned mines, and buildings; insectivorous; breeds late winter-early spring; single offspring born per year		
Gray Wolf	*Canis lupus (extirpated)*	formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands	LE	E
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		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; inland lake beaches; also known to nest on man-made structures (wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony	LE	E
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E

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Table H-8 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Mexican mud-plantain	*Heteranthera mexicana*	aquatic; ditches and ponds; flowering June-August		
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Reticulate Collared Lizard	*Crotaphytus reticulatus*	requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite		T
Sennett's Hooded Oriole	*Icterus cucullatus sennetti*	often builds nests in and of Spanish moss (Tillandsia unioides); feeds on invertebrates, fruit, and nectar; breeds March-August		
South Texas Siren – large form	*Siren sp. 1*	wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods, but does require some moisture to remain; southern Texas south of Balcones Escarpment; breeds February-June		T
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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 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
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 and man-made structures, such as culverts		
White-nosed Coati	*Nasua narica*	woodlands, riparian corridors and canyons; most individuals in Texas probably transients from Mexico; diurnal and crepuscular; very sociable; forages on ground and in trees; omnivorous; may be susceptible to hunting, trapping, and pet trade		T
Yuma Myotis Bat	*Myotis yumanensis*	desert regions; most commonly found in lowland habitats near open water, where forages; roosts in caves, abandoned mine tunnels, and buildings; single offspring born May-early July		
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-9.
Threatened, Endangered, and Rare Species of Fayette County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	Most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	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.	LT-PDL	T
Cave Myotis Bat	*Myotis velifer*	Roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Petrochelidon pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
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		
Guadalupe Bass	*Micropterus treculi*	Introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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*	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		
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
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		
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
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		

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Table H-9 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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 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 meadow-rue	Thalictrum texanum	Endemic; mesic woodlands or forests, including wet ditches on partially shaded roadsides; flowering March-May		
Texas Pimpleback	*Quadrula petrina*	Mud, gravel and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe river basins		
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
Whooping Crane	*Grus americana*	Potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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

Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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.

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Table H-10.
Threatened, Endangered, and Rare Species of
Frio County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Frio Pocket Gopher	*Geomys texensis bakeri*	associated with nearly level Atco soil, which is well-drained and consists of sandy surface layers with loam extending to as deep as two meters		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		T
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
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		

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Table H-10 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Reticulate Collared Lizard	*Crotaphytus reticulatus*	requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite		T
Sandhill woolywhite	*Hymenopappus carrizoanus*	endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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 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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-11.
Threatened, Endangered, and Rare Species of
Goliad County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	this county within historic range; endemic; open prairies of mostly thick grass 1 to 3 feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks on booming grounds during late winter-early spring; breed 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	LT-PDL	T
Black-spotted Newt	*Notophthalmus meridionalis*	can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River		T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Corkwood	*Leitneria floridana*	small, sparingly-branched, dioecious, deciduous shrub or small tree; forms thickets of stick-like erect stems, the diameter of each at base rarely to 12 or 13 cm; found in narrow zone between brackish marsh and contiguous coastal pine-hardwood; brackish or freshwater swamps or thickets; flowers in spring		
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*	this subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; inland lake beaches; also known to nest on man-made structures (wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony	LE	E
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
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		

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Table H-11 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
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
Runyon's water willow	*Justicia runyonii*	calcareous silt loam, silty clay, or clay in openings in subtropical woodlands on active or former floodplains; flowering (July-) September-November		
Sheep Frog	*Hypopachus variolosus*	predominantly grassland and savanna; moist sites in arid areas		T
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
Texas Asaphomyian Tabanid Fly	*Asaphomyia texanus*	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		
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		T
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 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
Welder machaeranthera	*Psilactis heterocarpa*	endemic; grasslands and adjacent scrub flats on clay; flowering October-November		
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 it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-12.
Threatened, Endangered, and Rare Species of Gonzales County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	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	LT-PDL	T
Blue Sucker	*Cycleptus elongatus*	usually inhabits channels and flowing pools with a moderate current; bottom type usually consists 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
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	C1	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Elmendorf's onion	*Allium elmendorfii*	endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
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		
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
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		
Palmetto Pill Snail	*Euchemotrema leai cheatumi*	terrestrial snail with only one known population, from moist palmetto woodlands of Palmetto State Park; ¼ – 3/8 inches long; distinguishable by a small ridge seen in the opening of the shell		
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		

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Table H-12 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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		T
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
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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-13.
Threatened, Endangered, and Rare Species of Guadalupe County, Texas

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
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		
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	C1	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Elmendorf's onion	*Allium elmendorfii*	endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
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*	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
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
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		
Park's jointweed	*Polygonella parksii*	endemic; deep loose sands of Carrizo and similar Eocene formations, including disturbed areas; flowering spring-summer		
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		

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Table H-13 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Red Wolf	*Canis rufus*	extirpated: formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies	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		
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
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		T
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 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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-14.
Threatened, Endangered, and Rare Species of
Hays County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Balcones Cave Amphipod	*Stygobromus balconis*	A small subterranean amphipod. Found in cave pools		
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, & required structure; nests mid April-late summer	LE	E
Blanco Blind Salamander	*Eurycea robusta*	troglobitic; water-filled subterranean caverns of the Edwards Aquifer; 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 in Blanco, Hays, and Kendall counties		
Blue Sucker	*Cycleptus elongatus*	usually inhabits channels and flowing pools with a moderate current; bottom type usually consists 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
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	C1	T
Canyon mock-orange	*Philadelphus ernestii*	solution-pitted outcrops of Cretaceous limestone on caprock along mesic canyons, usually in shade of mixed evergreen-deciduous canyon woodland; flowering April-May, fruit maturing in September		
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Comal Springs Diving Beetle	*Comaldessus stygius*	known only from the outflows at Comal Springs; aquatic; diving beetles generally inhabit the water column		

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Table H-14 (continued)

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
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 live in soil or decaying wood		
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		
Edwards Plateau Spring Salamanders	*Eurycea sp. 7*	troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County		
Ezell's Cave Amphipod	*Stygobromus flagellatus*	known only from artesian wells		
Flint's Net-spinning Caddisfly	*Cheumatopsyche flinti*	very poorly known species with habitat description limited to "a spring"		
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
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 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 & shrubs; nests late March-early summer	LE	E
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
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		
Hill Country wild-mercury	*Argythamnia aphoroides*	shallow to moderately deep clays and clay loams over limestone, in grasslands associated with plateau live oak woodlands, mostly on rolling uplands; flowering April-May; fruit persisting until midsummer		
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
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		

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Table H-14 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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		
San Marcos Gambusia	*Gambusia georgei*	extinct: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
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		
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
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		
Texas Cave Shrimp	*Palaemonetes antrorum*	subterranean sluggish streams and pools		
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		T
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 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
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
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		
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E

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Table H-14 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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.				

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Table H-15.
Threatened, Endangered, and Rare Species of Jackson County, Texas

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
American Eel	*Anguilla rostrata*	Most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	This county within historic range; endemic; open prairies of mostly thick grass 1 to 3 feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks on booming grounds during late winter-early spring; breed 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	LT-PDL	T
Black Bear	*Ursus americanus*	Within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, and brush piles	T/SA;NL	T
Brown Pelican	*Pelecanus occidentalis*	Largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Gulf Saltmarsh Snake	*Nerodia clarkii*	Saline flats, coastal bays, & brackish river mouths		
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*	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
Louisiana Black Bear	*Ursus americanus luteolus*	Within historical range in eastern Texas; inhabits bottomland hardwoods and large tracts of undeveloped forested areas; dens in tree hollows, rock piles, or under brush piles	LT	T
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		
Piping Plover	*Charadrius melodus*	Wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
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		

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Table H-15 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
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
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		
Snowy Plover	*Charadrius alexandrinus*	Wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
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
Texas Diamondback 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 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 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
Threeflower broomweed	*Thurovia triflora*	Endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November		
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
Welder machaeranthera	Psilactis heterocarpa	Endemic; grasslands and adjacent scrub flats on clay; flowering October-November		
West Indian Manatee	*Trichechus manatus*	Gulf and bay system; opportunistic, aquatic herbivore	LE	E
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

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Table H-15 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
White-tailed Hawk	*Buteo albicaudatus*	Near coast it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
Whooping Crane	*Grus americana*	Potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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.				

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Table H-16. Threatened, Endangered, and Rare Species of Karnes County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Black Spotted Newt	*Notophthalmus meridionalis*	can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River		T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		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
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Manfreda Giant-skipper	*Stallingsia maculosus*	most skippers are small and stout-bodied; name derives from fast, erratic flight; at rest most skippers hold front and hind wings at different angles; skipper larvae are smooth, with the head and neck constricted; skipper larvae usually feed inside a leaf shelter and pupate in a cocoon made of leaves fastened together with silk		
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
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		

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Table H-16 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Red Wolf	*Canis rufus*	extirpated: formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies	LE	E
Sheep Frog	*Hypopachus variolosus*	predominantly grassland and savanna; moist sites in arid areas		T
South Texas Siren – large form	*Siren sp. 1*	wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods, but does require some moisture to remain; southern Texas south of Balcones Escarpment; breeds February-June		T
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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 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
Welder machaeranthera	*Psilactis heterocarpa*	endemic; grasslands and adjacent scrub flats on clay; flowering October-November		
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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.				

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Table H-17.
Threatened, Endangered, and Rare Species of Kendall County, Texas

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Basin bellflower	*Campanula reverchonii*	endemic; dry gravels and very shallow sandy soils derived from Precambrian igneous and metamorphic rocks, on open slopes and rock outcrops; flowering May-July, Sept.-Oct.		
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		
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	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, & required structure; nests mid April-late summer	LE	E
Blanco River Springs Salamander	*Eurycea pterophila*	subaquatic; springs and caves in the Blanco River drainage in Blanco, Hays, and Kendall counties		
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	C1	T
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		
Cascade Caverns Salamander	*Eurycea latitans*	endemic; subaquatic; springs and caves in Comal, Kendall, and Kerr counties		T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (*Petrochelidon pyrrhonota*) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Comal Blind Salamander	*Eurycea tridentifera*	endemic; semi-troglobitic; found in springs and waters of caves in Bexar and Comal counties		T
Edwards Plateau Spring Salamanders	*Eurycea sp. 7*	troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County		
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 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 & shrubs; nests late March-early summer	LE	E
Gray Wolf	*Canis lupus*	extirpated – formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands	LE	E
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		

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Table H-17 (continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
Guadalupe Darter	*Percina sciera apristis*	spawns January to June; typically over gravel or gravel and sand raceways of medium streams and rivers, and pools; feeds mainly on larval insects in riffles		
Headwater Catfish	*Ictalurus lupus*	springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers; originally distributed throughout streams of the Edwards Plateau and the Rio Grande basin; currently limited to Rio Grande drainage, including the Pecos River system		
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		
Hill Country wild-mercury	*Argythamnia aphoroides*	shallow to moderately deep clays and clay loams over limestone, in grasslands associated with plateau live oak woodlands, mostly on rolling uplands; flowering April-May; fruit persisting until midsummer		
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
Long-legged Cave Amphipod	*Stygobromus longipes*	subaquatic crustacean; subterranean obligate; found in subterranean streams		
Mountain Plover	*Charadrius montanus*	breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; non-breeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous		
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
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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 mock-orange	*Philadelphus texensis*	endemic; limestone cliffs and boulders in mesic stream bottoms and canyons, usually in shade of mostly deciduous sloped forest; flowering April-May		
Texas Salamander	*Eurycea neotenes*	endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; restricted to Helotes and Leon Creek drainages in Bexar County		
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
Zone-tailed Hawk	*Buteo albonotatus*	arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, 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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-18.
Threatened, Endangered, and Rare Species of
LaSalle County, Texas

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Audubon's Oriole	*Icterus graduacauda audubonii*	scrub, mesquite; nests in dense trees, or thickets, usually along water courses		
Big Free-tailed Bat	*Nyctinomops macrotis*	habitat data sparse but records indicate that species prefers to roost in crevices and cracks in high canyon walls, but will use buildings, as well; reproduction data sparse, but gives birth to single offspring late June-early July; females gather in nursery colonies; winter habits		
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Black-spotted Newt	*Notophthalmus meridionalis*	can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River		T
Cactus Ferruginous Pygmy-owl	*Glaucidium brasilianum cactorum)*	riparian trees, brush, palm, and mesquite thickets; during day also roosts in small caves and recesses on slopes of low hills; breeding April to June		T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Ghost-faced Bat	*Mormoops megalophylla*	colonially roosts in caves, crevices, abandoned mines, and buildings; insectivorous; breeds late winter-early spring; single offspring born per year		
Gray Wolf	*Canis lupus*	extirpated – formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands	LE	E
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Indigo Snake	*Drymarchon corais*	thornbrush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		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
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		

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Table H-18 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Kleberg saltbush	*Atriplex klebergorum*	endemic; sandy to clayey loams, usually saline; often with other halophytes; maturation usually occurs in fall but may vary with rainfall		
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
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		
Reticulate Collared Lizard	*Crotaphytus reticulatus*	requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite		T
Sennett’s Hooded Oriole	*Icterus cucullatus sennetti*	often builds nests in and of Spanish moss (Tillandsia unioides); feeds on invertebrates, fruit, and nectar; breeds March-August		
Sheep Frog	*Hypopachus variolosus*	predominantly grassland and savanna; moist sites in arid areas		T
Silvery wild-mercury	*Argythamnia argyraea*	among shortgrass on whitish clay soils in shrub-invaded grasslands, particularly over the Yegua Formation; flowering April-June; fruiting until fall		
South Texas Siren – large form	*Siren sp. 1*	wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods, but does require some moisture to remain; southern Texas south of Balcones Escarpment; breeds February-June		T
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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 Tortoise	*Gopherus berlandieri*	open scrub woods, arid brush, lomas, grass-cactus association; open brush with grass understory preferred; uses shallow depressions at base of bush or cactus or underground burrow or hides under surface cover		T
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 and man-made structures, such as culverts		
White-tailed Hawk	*Buteo albicaudatus*	near coast it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "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.				

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Table H-19. Threatened, Endangered, and Rare Species of Lee County, Texas

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Branched gayfeather	*Liatris cymosa*	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
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
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		
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
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; inland lake beaches; also known to nest on man-made structures (wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony	LE	E
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
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		T
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E

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Table H-19 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
Zone-tailed Hawk	*Buteo albonotatus*	arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites		T

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Table H-20.
Threatened, Endangered, and Rare Species of Matagorda County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	Most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata*	Gulf and bay system	LE	E
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	This county within historic range; endemic; open prairies of mostly thick grass 1 to 3 feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks on booming grounds during late winter-early spring; breed 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	LT-PDL	T
Black Bear	*Ursus americanus*	Within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Brown Pelican	*Pelecanus occidentalis*	Largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Coastal gay-feather	*Liatris bracteata*	Endemic; black clay soils of prairie remnants; flowering in fall		
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		
Gulf Saltmarsh Snake	*Nerodia clarkii*	Saline flats, coastal bays, & brackish river mouths		
Green Sea Turtle	*Chelonia mydas*	Gulf and bay system	LT	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*	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
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Gulf and bay system	LE	E
Leatherback Sea Turtle	*Dermochelys coriacea*	Gulf and bay system	LE	E
Loggerhead Sea Turtle	*Caretta caretta*	Gulf and bay system	LT	T

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Table H-20 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Louisiana Black Bear	*Ursus americanus luteolus*	Within historical range in eastern Texas; inhabits bottomland hardwoods and large tracts of undeveloped forested areas; dens in tree hollows, rock piles, or under brush piles	LT	T
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		
Ocelot	*Leopardus pardalis*	Dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Piping Plover	*Charadrius melodus*	Wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
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		
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
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
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 Green Snake	*Liochlorophis vernalis*	Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation		T
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		
Snowy Plover	*Charadrius alexandrinus*	Wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
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
Texas Diamondback 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 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		

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Table H-20 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
Threeflower broomweed	*Thurovia triflora*	Endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November		
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
West Indian Manatee	*Trichechus manatus*	Gulf and bay system; opportunistic, aquatic herbivore	LE	E
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 it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
Whooping Crane	*Grus americana*	Potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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

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Table H-21.
Threatened, Endangered, and Rare Species of
Medina County, Texas

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
A Ground Beetle	*Rhadine exilis*	Small, essentially eyeless ground beetle; karst features in northern Bexar County and northeastern Medina County	LE	
A Ground Beetle	*Rhadine infernalis*	Small, essentially eyeless ground beetle; karst features in northern and western Bexar County and northeastern Medina County	LE	
American Peregrine Falcon	*Falco peregrinus anatum*	Potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Black Bear	*Ursus americanus*	Within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	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, & required structure; nests mid April-late summer	LE	E
Bracted twistflower	*Streptanthus bracteatus*	Endemic; shallow clay soils over limestone, mostly on rocky slopes, in openings in juniper-oak woodlands; flowering April-May		
Braken Bat Cave Meshweaver	***Cicurina venii***	Small, eyeless, or essentially eyeless spider; karst features in western Bexar County and eastern Medina County		LE
Edwards Plateau Shiner	*Cyprinella lepida*	Edwards Plateau portion of Nueces basin, mainstream and tributaries of Nueces, Frio, and Sabinal rivers; clear, cool, spring-fed headwater creeks; usually over gravel.		T
Edwards Plateau Spring Salamanders	*Eurycea sp. 7*	Endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County		
Frio Pocket Gopher	*Geomys texensis bakeri*	Associated with nearly level Atco soil, which is well-drained and consists of sandy surface layers with loam extending to as deep as two meters		

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Table H-21 (Continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
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 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 & shrubs; nests late March-early summer	LE	E
Government Canyon Bat Cave Spider	*Neoleptoneta microps*	Small, eyeless, or essentially eyeless spider; karst features in northwestern Bexar County and northeastern Medina County		LE
Guadalupe Bass	*Micropterus treculi*	Introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Helotes Mold Beetle	*Batrisodes venyivi*	Small, eyeless mold beetle; karst features in northwestern Bexar County and northeastern Medina County	LE	
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		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		T
Keeled Earless Lizard	*Holbrookia propinqua*	Coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Madla Cave Meshweaver	*Cicurina madla*	Small, eyeless, or essentially eyeless spider; karst features in northern Bexar County and northeastern Medina County		LE
Manfreda Giant-skipper	*Stallingsia maculosus*	Most skippers are small and stout-bodied; name derives from fast, erratic flight; at rest most skippers hold front and hind wings at different angles; skipper larvae are smooth, with the head and neck constricted; skipper larvae usually feed inside a leaf shelter and pupate in a cocoon made of leaves fastened together with silk		
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		
Nueces Roundnose Minnow	*Dionda serena*	Edwards Plateau portion of Nueces basin, mainstream and tributaries of Nueces, Frio and Sabinal rivers		

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Table H-21 (Continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Sandhill woolywhite	*Hymenopappus carrizoanus*	Endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	Central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
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		T
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 mock-orange	*Philadelphus texensis*	Endemic; limestone cliffs and boulders in mesic stream bottoms and canyons, usually in shade of mostly deciduous sloped forest; flowering April-May		
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
Valdina Farms Sinkhole Salamander	*Eurycea troglodytes complex*	Isolated, intermittent pools of a subterranean stream; sinkhole located in Medina County		
Zone-tailed Hawk	*Buteo albonotatus*	Arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, 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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-22.
Threatened, Endangered, and Rare Species of
Milam County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	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	LT-PDL	T
Blue Sucker	*Cycleptus elongatus*	usually inhabits channels and flowing pools with a moderate current; bottom type usually consists 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
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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		
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
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; inland lake beaches; also known to nest on man-made structures (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		
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
Parks' jointweed	*Polygonella parksii*	endemic; deep loose sands of Carrizo and similar Eocene formations, including disturbed areas; flowering spring-summer		
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

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Table H-22 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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	C1	
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	C1	
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		T
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Zone-tailed Hawk	*Buteo albonotatus*	arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, 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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-23.
Threatened, Endangered, and Rare Species of Refugio County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Eel	*Anguilla rostrata*	most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata*	Gulf and bay system	LE	E
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	this county within historic range; endemic; open prairies of mostly thick grass 1 to 3 feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks on booming grounds during late winter-early spring; breed 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	LT-PDL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Black lace cactus	*Echinocereus reichenbachii var. albertii*	grasslands, thorn shrublands, mesquite woodlands on sandy, possibly somewhat saline soils on coastal prairie; possibly more frequent in natural open areas sparsely covered with low brush; sometimes at the ecotone between this upland type and lower areas dominated by halophytic grasses and forbs; flowering April-June	LE	E
Black Spotted Newt	*Notophthalmus meridionalis*	can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River		T
Brown Pelican	*Pelecanus occidentalis*	largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Coastal gay-feather	*Liatris bracteata*	endemic; black clay soils of prairie remnants; flowering in fall		
Elmendorf's onion	*Allium elmendorfii*	endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May		

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Table H-23 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Gulf Saltmarsh Snake	*Nerodia clarkii*	saline flats, coastal bays, & brackish river mouths		
Green Sea Turtle	*Chelonia mydas*	Gulf and bay system	LT	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		
Indigo Snake	*Drymarchon corais*	thornbrush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		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
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Gulf and bay system	LE	E
Leatherback Sea Turtle	*Dermochelys coriacea*	Gulf and bay system	LE	E
Loggerhead Sea Turtle	*Caretta caretta*	Gulf and bay system	LT	T
Louisiana Black Bear	*Ursus americanus luteolus*	within historical range in eastern Texas; inhabits bottomland hardwoods and large tracts of undeveloped forested areas; dens in tree hollows, rock piles, or under brush piles	LT	T
Mexican Treefrog	*Smilisca baudinii*	subtropical region of extreme southern Texas; breeds May-October coinciding with rainfall, eggs laid in temporary rain pools		T
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Opossum Pipefish	*Microphis brachyurus*	brooding adults found in fresh or low salinity waters and young move or are carried into more saline waters after birth		T
Piping Plover	*Charadrius melodus*	wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats	LT	T
Plains gumweed	*Grindelia oolepis*	endemic; prairies and grasslands on black clay soils of the Gulf Coastal Bend; may occur along railroad rights-of-way and in urban areas; flowering May-December		

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Table H-23 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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
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
Scarlet Snake	*Cemophora coccinea*	mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September		T
Sennett's Hooded Oriole	*Icterus cucullatus sennetti*	often builds nests in and of Spanish moss (Tillandsia usnioides); feeds on invertebrates, fruit, and nectar; breeds March-August		
Sheep Frog	*Hypopachus variolosus*	predominantly grassland and savanna; moist sites in arid areas		T
Snowy Plover	*Charadrius alexandrinus*	wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats		
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
South Texas Siren – large form	*Siren sp. 1*	wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods, but does require some moisture to remain; southern Texas south of Balcones Escarpment; breeds February-June		T
Southern Yellow Bat	*Lasiurus ega*	associated with trees, such as palm trees (Sabal mexicana) in Brownsville, which provide them with daytime roosts; insectivorous; breeding in late winter		T
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
Texas Botteri's Sparrow	*Aimophila botterii texana*	coastal lowlands & prairies; brush or open grassy land; nests on or near ground, in tall grass or at base of tuft of grass		T
Texas Diamondback 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 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

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Table H-23 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
Tharp's rhododon	*Rhododon angulatus*	deep, sandy soils among and upon stabilized dunes; found in fairly open areas with sparse vegetation		
Threeflower broomweed	*Thurovia triflora*	endemic; black clay soils of remnant grasslands, also tidal flats; flowering July-November		
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
Welder machaeranthera	*Psilactis heterocarpa*	endemic; grasslands and adjacent scrub flats on clay; flowering October-November		
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
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 it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-24.
Threatened, Endangered, and Rare Species of Uvalde County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	Potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Big Free-tailed Bat	*Nyctinomops macrotis*	Habitat data sparse but records indicate that species prefers to roost in crevices and cracks in high canyon walls, but will use buildings, as well; reproduction data sparse, but gives birth to single offspring late June-early July; females gather in nursery colonies; winter habits undetermined, but may hibernate in the Trans-Pecos; opportunistic insectivore		
Black Bear	*Ursus americanus*	Within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	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, & required structure; nests mid April-late summer	LE	E
Blue Sucker	*Cycleptus elongatus*	Usually inhabits channels and flowing pools with a moderate current; bottom type usually consists 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
Bracted twistflower	*Streptanthus bracteatus*	Endemic; shallow clay soils over limestone, mostly on rocky slopes, in openings in juniper-oak woodlands; flowering April-May		
Cave Myotis Bat	*Myotis velifer*	Roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Edwards Plateau Shiner	*Cyprinella lepida*	Edwards Plateau portion of Nueces basin, mainstream and tributaries of Nueces, Frio, and Sabinal rivers; clear, cool, spring-fed headwater creeks; usually over gravel		T
Edwards Plateau Spring Salamanders	*Eurycea sp. 7*	Endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County		

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Table H-24 (Continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
Flint's Net-spinning Caddisfly	*Cheumatopsyche flinti*	Very poorly known species with habitat description limited to "a spring"		
Frio Pocket Gopher	*Geomys texensis bakeri*	Associated with nearly level Atco soil, which is well-drained and consists of sandy surface layers with loam extending to as deep as two meters		
Ghost-faced Bat	*Mormoops megalophylla*	Colonially roosts in caves, crevices, abandoned mines, and buildings; insectivorous; breeds late winter-early spring; single offspring born per year		
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 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 & shrubs; nests late March-early summer	LE	E
Gray Wolf	*Canis lupus*	Extirpated – formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands	LE	E
Guadalupe Bass	*Micropterus treculi*	Introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Headwater Catfish	*Ictalurus lupus*	Springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers; originally distributed throughout streams of the Edwards Plateau and the Rio Grande basin; currently limited to Rio Grande drainage, including the Pecos River system		
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		
Hill country wild-mercury	*Argythamnia aphoroides*	Shallow to moderately deep clays and clay loams over limestone, in grasslands associated with plateau live oak woodlands, mostly on rolling uplands; flowering April-May; fruit persisting until midsummer		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		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; inland lake beaches; also known to nest on man-made structures (wastewater treatment plants, gravel mines, etc); eats small fish & crustaceans, when breeding forages within a few hundred feet of colony	LE	E
Jaguarundi	*Herpailurus yaguarondi*	Thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	Coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		

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Table H-24 (Continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
Mexican Hooded Oriole	*Icterus cucullatus cucullatus*	Scrub, mesquite; nests in dense trees, or thickets, usually along water courses		
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		
Nueces River Shiner	*Cyprinella sp. 2*	Edwards Plateau portion of Nueces basin; Clear, cool, spring-fed headwater creeks		
Nueces Roundnose Minnow	*Dionda serena*	Edwards Plateau portion of Nueces basin, mainstream and tributaries of Nueces, Frio and Sabinal rivers		
Ocelot	*Leopardus pardalis*	Dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
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
Reticulate Collared Lizard	*Crotaphytus reticulatus*	Requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite		T
Sabinal prairie-clover	*Dalea sabinalis*	Information sketchy, but probably in rocky soils or on limestone outcrops in sparse grassland openings in juniper-oak woodlands		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	Central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		
Springrun whitehead	*Trichocoronis rivularis*	Known only from two locations; aquatic; abandoned river channel fed by a strong perennial stream, rooted in fine-textured sediments, in slowly flowing water up to ca. 1 foot (0.3-0.4 m) in depth but appeared to be absent from deeper water, most of the channel was shaded for most of the day; also found in water 1.5 – 3 feet (0.5-1 m) deep, rooted in a muck bottom		
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		T
Texas grease bush	*Glossopetalon texense*	Dry limestone ledges and chalk bluffs; flowering in fall		
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

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Table H-24 (Continued)

Texas largeseed bittercress	*Cardamine macrocarpa var. texana*	Seasonally (vernally) moist loamy soils in pine-oak woodlands, at high elevations in the Chisos Mountains but at moderate elevations in pinyon-oak juniper woodlands in Kinney and Uvalde counties; flowering in early spring and withering by beginning of summer; it is unknown whether this species, like many other annual crucifers, blooms occasionally in early winter (December)		
Texas mock-orange	*Philadelphus texensis*	Endemic; limestone cliffs and boulders in mesic stream bottoms and canyons, usually in shade of mostly deciduous sloped forest; flowering April-May		
Texas snowbells	*Styrax platanifolius ssp. Texanus*	Limestone bluffs, boulder slopes, and cliff faces, usually along perennial streams in canyon bottoms, in full sun or in partial shade of diverse evergreen-deciduous woodlands; flowering April-May	LE	E
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
Tobusch fishhook cactus	*Sclerocactus brevihamatus var. tobuschii*	Endemic; very shallow gravelly soil in shortgrass grasslands among live oak-juniper woodlands on limestone uplands; occasionally in gravels along creek bottoms; flowering (January) February-March (April)	LE	E
Valdina Farms Sinkhole Salamander	*Eurycea troglodytes complex*	Isolated, intermittent pools of a subterranean stream; sinkhole located in Medina County		
White-nosed Coati	*Nasua narica*	Woodlands, riparian corridors and canyons; most individuals in Texas probably transients from Mexico; diurnal and crepuscular; very sociable; forages on ground and in trees; omnivorous; may be susceptible to hunting, trapping, and pet trade		T
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
Yuma Myotis Bat	*Myotis yumanensis*	Desert regions; most commonly found in lowland habitats near open water, where forages; roosts in caves, abandoned mine tunnels, and buildings; single offspring born May-early July		
Zone-tailed Hawk	*Buteo albonotatus*	Arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, 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

Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status

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Table H-25. Threatened, Endangered, and Rare Species of Victoria County, Texas

Common Name	*Scientific Name*	*Habitat Preference*	*Federal Status*	*State Status*
American Eel	*Anguilla rostrata*	most aquatic habitats with access to ocean; spawns January-February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries		
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Attwater's Greater Prairie-chicken	*Tympanuchus cupido attwateri*	this county within historic range; endemic; open prairies of mostly thick grass 1 to 3 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 Feb.-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	LT-PDL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Black Spotted Newt	*Notophthalmus meridionalis*	can be found in wet or sometimes wet areas, such as arroyos, canals, ditches, or even shallow depressions; aestivates in the ground during dry periods; Gulf Coastal Plain south of the San Antonio River		T
Brown Pelican	*Pelecanus occidentalis*	largely coastal and near shore areas, where it roosts on islands and spoil banks	LE	E
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	C1	T
Eskimo Curlew	*Numenius borealis*	nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats	LE	E
Gulf Saltmarsh Snake	*Nerodia clarkii*	saline flats, coastal bays, & brackish river mouths		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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*	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
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Louisiana Black Bear	*Ursus americanus luteolus*	within historical range in eastern Texas; inhabits bottomland hardwoods and large tracts of undeveloped forested areas; dens in tree hollows, rock piles, or under brush piles	LT	T

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Table H-25 (continued)

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
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		
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
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
Texas Asaphomyian Tabanid Fly	*Asaphomyia texanus*	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		
Texas Diamondback 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 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		T
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 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
Welder machaeranthera	*Psilactis heterocarpa*	endemic; grasslands and adjacent scrub flats on clay; flowering October-November		
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	LE	E
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 it is found on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March to May		T
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

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Table H-26.
Threatened, Endangered, and Rare Species of Wilson County, Texas

Common Name	Scientific Name	Habitat Preference	Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
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		
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Elmendorf's onion	*Allium elmendorfii*	endemic; deep sands derived from Queen City and similar Eocene formations; flowering April-May		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
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		
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
Manfreda Giant-skipper	*Stallingsia maculosus*	most skippers are small and stout-bodied; name derives from fast, erratic flight; at rest most skippers hold front and hind wings at different angles; skipper larvae are smooth, with the head and neck constricted; skipper larvae usually feed inside a leaf shelter and pupate in a cocoon made of leaves fastened together with silk		
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Park's jointweed	*Polygonella parksii*	endemic; deep loose sands of Carrizo and similar Eocene formations, including disturbed areas; flowering spring-summer		
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		

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Table H-26 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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 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
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
Whooping Crane	*Grus americana*	potential migrant; winters in and around Aransas National Wildlife Refuge and migrates to Canada for breeding; only remaining natural breeding population of this species	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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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Table H-27. Threatened, Endangered, and Rare Species of Zavala County, Texas

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
American Peregrine Falcon	*Falco peregrinus anatum*	potential migrant; nests in west Texas	DL	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	due to similar field characteristics, treat all Peregrine falcons as federal listed Endangered; potential migrant	DL	T
Black Bear	*Ursus americanus*	within historical range of Louisiana Black Bear in eastern Texas, Black Bear is federally listed threatened and inhabits bottomland hardwoods and large tracts of undeveloped forested areas; in remainder of Texas, Black Bear is not federally listed and inhabits desert lowlands and high elevation forests and woodlands; dens in tree hollows, rock piles, cliff overhangs, caves, or under brush piles	T/SA;NL	T
Cave Myotis Bat	*Myotis velifer*	roosts colonially in caves, rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Petrochelidon pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum caves of Panhandle during winter; opportunistic insectivore		
Frio Pocket Gopher	*Geomys texensis bakeri*	associated with nearly level Atco soil, which is well-drained and consists of sandy surface layers with loam extending to as deep as two meters		
Guadalupe Bass	*Micropterus treculi*	introduced in Nueces River system; endemic to perennial streams of the Edwards Plateau region		
Indigo Snake	*Drymarchon corais*	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter		T
Jaguarundi	*Herpailurus yaguarondi*	thick brushlands, near water favored; six month gestation, young born twice per year in March and August	LE	E
Keeled Earless Lizard	*Holbrookia propinqua*	coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)		
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		
Ocelot	*Leopardus pardalis*	dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November	LE	E
Reticulate Collared Lizard	*Crotaphytus reticulatus*	requires open brush-grasslands; thorn-scrub vegetation, usually on well-drained rolling terrain of shallow gravel, caliche, or sandy soils; often on scattered flat rocks below escarpments or isolated rock outcrops among scattered clumps of prickly pear and mesquite		T
Sandhill woolywhite	*Hymenopappus carrizoanus*	endemic; open areas in deep sands derived from Carrizo and similar Eocene formations, including disturbed areas; flowering late spring-fall		
Spot-tailed Earless Lizard	*Holbrookia lacerata*	central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates		

Page 1 of 2

Table H-27 (continued)

Common Name	***Scientific Name***	***Habitat Preference***	***Federal Status***	***State Status***
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		T
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 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
Yuma Myotis Bat	*Myotis yumanensis*	desert regions; most commonly found in lowland habitats near open water, where forages; roosts in caves, abandoned mine tunnels, and buildings; single offspring born May-early July		
Zone-tailed Hawk	*Buteo albonotatus*	arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, 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
Status Key: LE, LT-Federally Listed Endangered/Threatened, PE, PT-Federally Proposed Endangered/Threatened, E/SA, T/SA-Federally Listed Endangered/Threatened by Similarity of Appearance, C1-Federal Candidate for Listing, E,T-State Listed Endangered/Threatened, "blank"-Rare, but with no regulatory listing status				
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