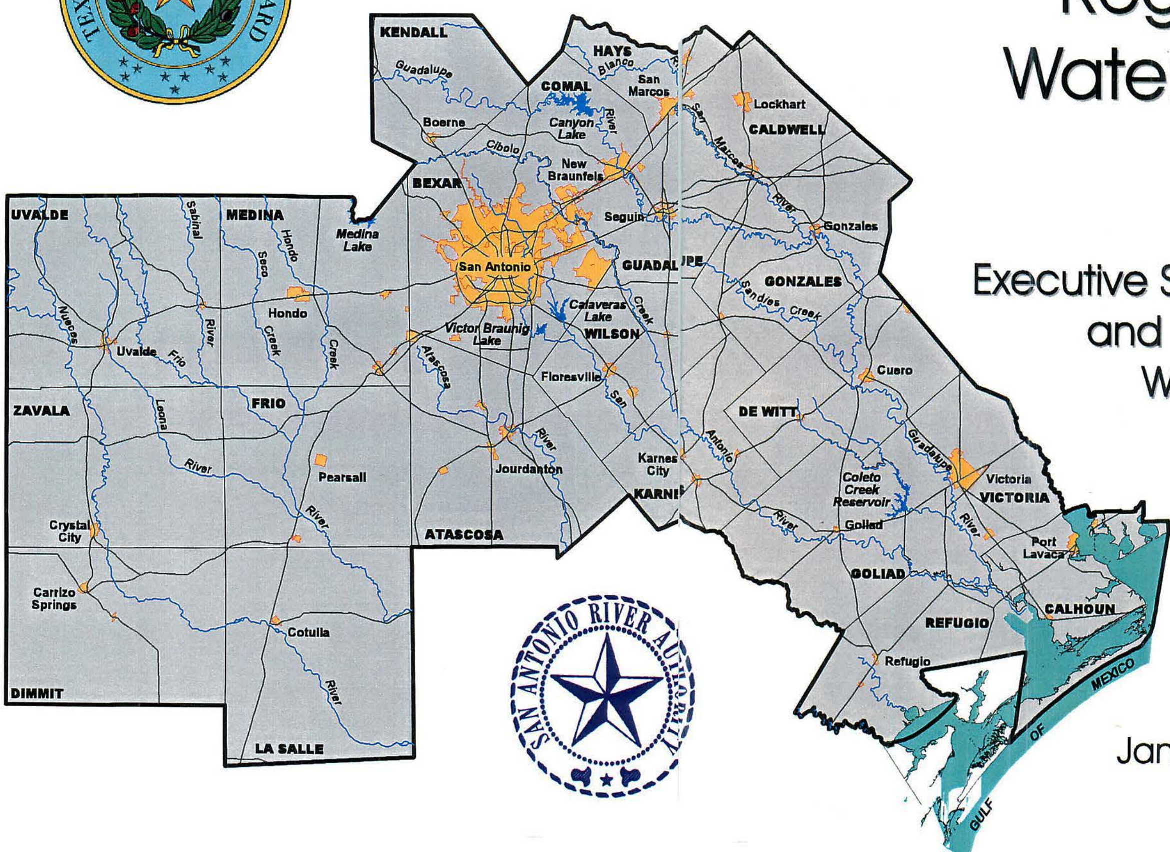
South Central Texas
Regional Water Planning Area

Regional Water Plan

Volume I
Executive Summary and Regional Water Plan



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Section 5
Regional, County, City, Water User Group, and Major Provider Plans

5.1 Regional Water Planning Process

The South Central Texas Regional Water Planning Group (SCTRWPG) has employed a planning process (Figure 5.1-1) focused on the development of a Regional Water Plan to meet the needs of every water user group in the region for a period of fifty years. 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). 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.

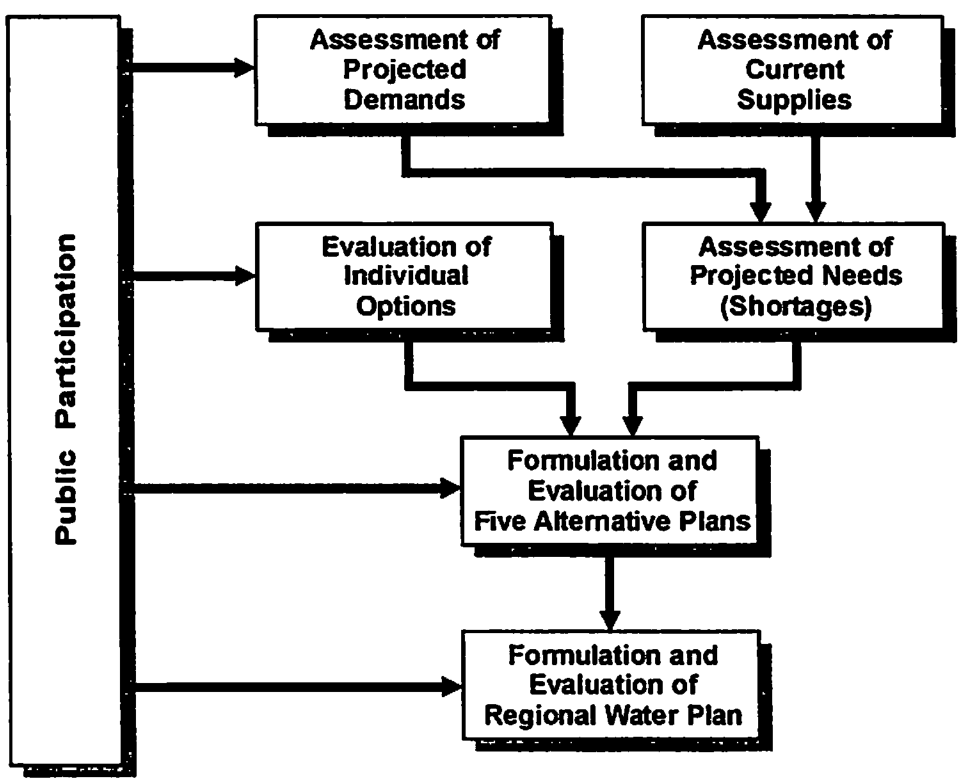

Figure 5.1-1. Planning Process

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 will be given consideration. It has thus been central to the viability of the planning process itself that the evaluation of water supply options and combinations of these options in the context of a regional plan receive extraordinary attention.

To this end, the SCTRWPG has employed a planning process that ensures evaluation of virtually all the water supply options or management strategies that have been proposed or discussed in the past, together with several new ones that have never before been subjected to technical evaluation. To achieve confidence by all constituencies in the planning process, it has been necessary to evaluate the options both on a stand-alone basis (Volume III—Technical Evaluations of Water Supply Options) and in various combinations in the context of alternative plans (Volume II—Technical Evaluations of Alternative Regional Water Plans). Given the fact that some of the proposed strategies for regional management are at odds with one another, it has been important to look at a series of alternative regional water plans. By formulating five alternative regional water plans, the SCTRWPG has carefully considered many diverse management strategies. In keeping with logical and acceptable planning methods, the SCTRWPG has taken the best components of these alternative plans and developed a Regional Water Plan (Volume I – Executive Summary and Regional Water Plan).

5.1.1 Water Supply Options

The SCTRWPG completed the technical evaluation of some 61 water supply options identified for potential inclusion in alternative plans and ultimately the Regional Water Plan (see Volume III, Introduction for a description of procedures used to identify and evaluate water supply options). These options can be generally categorized by source of water as follows:

- Local/Conservation/Reuse/Exchange
- Edwards Aquifer Recharge
- River Diversions with Storage
- Existing Reservoirs
- Potential New Reservoirs
- Carrizo and Other Aquifers

Table 5.1-1 summarizes key information regarding some 79 water supply options (including variations of the 61 originally identified for consideration) for which technical evaluations were completed. In Table 5.1-1, the water supply options are categorized in accordance with the manner in which the water might be used within the context of a regional plan and ranked by unit cost of supply. Additional summary information in Table 5.1-1 includes quantity of water, land impacted, time to implement, and qualitative measures of environmental sensitivity, public acceptability, and reliability. Comprehensive documentation of the technical evaluation of these water supply options is included in Volume III.

5.1.2 Alternative Regional Water Plans

The SCTRWPG defined a Regional Water Management Alternative Plan (hereinafter referenced as an Alternative Regional Water Plan) as a combination of options and strategies that could meet the water needs of the entire South Central Texas Region. The SCTRWPG formulated five alternative regional water plans using the water supply options in Table 5.1-1 (and others identified through public participation) and authorized technical evaluation of each plan. Appendix B summarizes the procedures followed in the formulation of alternative regional water plans. The five alternative regional water plans are identified as follows:

- Planning Unit (PU) Alternative
- Environmental/Conservation (EC) Alternative
- Economic/Reliability/Environmental/Public Acceptance (EREPA) Alternative
- Inter-Regional Cooperation (IRC) Alternative
- Recharge & Recirculation (R&R) Alternative

Technical evaluations and comparisons of these five alternative regional water plans are summarized in Volume II. Upon review and consideration of these five alternative plans, the SCTRWPG formulated the Regional Water Plan which is summarized at the regional, county, city, and water user group level in Section 5.2. General procedures and assumptions for technical evaluation of the five alternative plans and the Regional Water Plan are enumerated in Appendix B. Y-2

In Volume III, the technical evaluations of the water supply options are presented as if each would be a stand-alone, individual management strategy. These stand-alone options were often modified in the formulation of alternative regional water plans. In many cases, only a portion of the potential water supply of an individual option was needed to satisfy the projected water needs of water users of the region. In other cases, a similar option evaluated at one location on a stand-alone basis was included in an alternative regional water plan at another location. Incorporating such modifications and refinements, the Regional Water Plan and the alternative regional water plans were individually evaluated using technical procedures and assumptions similar to those for the evaluations of water supply options.

In order to facilitate and expedite the technical evaluations of alternative regional water plans, the Guadalupe–San Antonio River Basin Water Availability Model (WAM)[1] and the Edwards Aquifer Model (GWSIM4)[2,3] were enhanced and computationally linked. Enhancements to GWSIM4 include program logic and data development for simulation of Critical Period Management Rules under development by the Edwards Aquifer Authority, Edwards Aquifer pumpage transfers from irrigation to municipal use, and the southern Bexar County aquifer storage and recovery program being developed by the San Antonio Water System. Enhancements to the WAM include the addition of program logic to facilitate daily computations necessary for application of Consensus Environmental Water Needs Criteria (Appendix B, Volume III) in the simulation of new reservoirs and river diversions with storage. In addition, GWSIM4 and the WAM may now be computationally linked so that options and alternative plans involving diversions of springflow and other streamflow to the outcrop of the Edwards Aquifer for recharge enhancement and increased pumpage from the aquifer may be simulated efficiently.

In the process of evaluating alternative regional water plans, consideration of seasonal and peak day water demands was essential to ensure that sufficient water treatment and distribution capacities would be included. Daily variations in water supplied by the San Antonio Water System during 1996 were assumed representative of typical urban areas during drought. For planning purposes, it has been assumed that regional water treatment and distribution

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[1] HDR Engineering, Inc., "Water Availability in the Guadalupe – San Antonio River Basin," Texas Natural Resource Conservation Commission, December 1999.

[2] Klemt, W.B., Knowles, T.R., Elder, G.R., and Sieh, T.W., "Ground-water Resources and Model Applications for the Edwards (Balcones Faulty Zone) Aquifer in the San Antonio Region, Texas," Texas Water Development Board Report 239, 1979.

[3] Thorkildsen, D. and McElhaney, P.D.., "Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Texas Water Development Board Report 340, 1992.

Table 5.1-1. South Central Texas Regional Water Plan
Water Supply Option Summary Sorted by Unit Cost*

Count No.	Section	Option No.	Water Supply Options	Type of W ter Supply Option	Type of Water Supply	Efficiency / Unit Cost ($/acft)	Quantity of Water (acft/yr)	Environmental Composite Average[1]	Public Acceptability[2]	Reliability[3]	Time to Implement (years)	Land Impacted (acres)
			Treated Water Supply Options									
1	1.10	SCTN-17	Desalination of Brackish Groundwater	Local/Conservat n/Reuse/Exchange	Treated Water Delivered	564	476	1.0	1.0	1.0	1 to 5	0
2	6.1	CZ-10C	Carrizo-Wilcox Aquifer between San Marcos and Frio Rivers (75,000 acft/yr)	Carrizo and Oth Aquifers	Treated Water Distributed	590	75,000	1.1	2.0	1.0	1 to 5	429
3	6.2	CZ-10D	Carrizo-Wilcox Aquifer between Colorado and Frio Rivers	Carrizo and Oth Aquifers	Treated Water Distributed	632	220,000	1.3	2.0	1.0	1 to 5	1,437
4	4.1	G-15C	Canyon Reservoir Water Released to Lake Nolte - Treated Water to Distribution System or Recharge Zone	Existing Reserv rs	Treated Water Distributed	672	15,000	1.0	1.0	1.0	1 to 5	151
5	3.3	C-17A	Colorado River in Colorado County - Buy Stored Water and Irrigation Rights; Firm Yield	River Diversion ith Storage	Treated Water Distributed	677	125,000	1.0	3.0	1.0	5 to 15	749
6	6.3	SCTN-3c	Simsboro Aquifer - Bastrop, Lee, and Milam Counties with Delivery to Major Municipal Demand Center	Carrizo and Oth Aquifers	Treated Water Distributed	707	75,000	1.2	3.0	1.0	1 to 5	671
7	5.12	G-16C1	Cuero Reservoir - Firm Yield	Potential New R servoirs	Treated Water Distributed	718	152,606	2.3	3.0	1.0	> 15	41,886
8	3.1	G-38C	Guadalupe River Diversion at Gonzales to Mid-Cities and/or Major Water Providers, with Regional Water Treatment Plant	River Diversion ith Storage	Treated Water Delivered	736	29,217	1.0	1.0	1.0	1 to 5	644
9	3.2c	SCTN-16c	Lower Guadalupe River Diversions	River Diversion ith Storage	Treated Water Distributed	755	94,000	1.4	1.0	1.0	1 to 5	2,040
10	4.4	C-13C	Colorado River at Bastrop - Purchase of Stored Water - Firm Yield	Existing Reserv rs	Treated Water Distributed	769	50,000	1.0	3.0	1.0	5 to 15	440
11	5.2b	S-15Db	Cibolo Reservoir with Imported Water from the San Antonio and Guadalupe Rivers - Firm Yield	Potential New R servoirs	Treated Water Distributed	773	91,942	2.1	3.0	1.0	5 to 15	17,160
12	5.2a	S-15Da	Cibolo Reservoir with Imported Water from the San Antonio River - Firm Yield	Potential New R servoirs	Treated Water Distributed	779	69,925	2.1	3.0	1.0	5 to 15	16,960
13	3.2b	SCTN-16b	Lower Guadalupe River Diversions	River Diversion ith Storage	Treated Water Distributed	788	74,000	1.4	1.0	1.0	1 to 5	1,886
14	5.4	S-16C	Goliad Reservoir - Firm Yield	Potential New R servoirs	Treated Water Distributed	856	99,687	2.4	3.0	1.0	> 15	28,272
15	5.11	G-17C1	Sandies Creek Reservoir - Firm Yield	Potential New R servoirs	Treated Water Distributed	865	80,836	2.4	3.0	1.0	> 15	27,240
16	4.3b	SCTN-14b	Joint Development of Water Supply with Corpus Christi - Firm Yield	Existing Reserv rs	Treated Water Distributed	869	148,200	1.4	1.0	1.0	1 to 5	958
17	3.2a	SCTN-16a	Lower Guadalupe River Diversions	River Diversion ith Storage	Treated Water Distributed	870	56,276	1.1	1.0	1.0	1 to 5	1,884
18	3.6c	SCTN-20c	Lower Colorado River Basin - Combined Diversion of Unused Irrigation Water Supplies and Unappropriated Streamflow	River Diversion ith Storage	Treated Water Distributed		117,077	1.7	2.0	1.0	5 to 15	5,466
19	5.2c	S-15Dc	Cibolo Reservoir with Imported Water from the San Antonio, Guadalupe, and Colorado Rivers - Firm Yield	Potential New R servoirs	Treated Water Distributed	965	106,482	2.3	3.0	1.0	5 to 15	17,493
20	3.4	C-17B	Colorado River in Wharton County - Buy Irrigation Rights and Groundwater; Firm Yield	River Diversion ith Storage	Treated Water Distributed	974	69,000	1.1	3.0	1.0	5 to 15	2,216
21	5.3a	S-15Ea	Cibolo Reservoir with Imported Water from the Guadalupe River Saltwater Barrier - Firm Yield	Potential New R servoirs	Treated Water Distributed	993	68,688	2.1	3.0	1.0	5 to 15	17,396
22	3.6b	SCTN-20b	Lower Colorado River Basin - Diversion of Unappropriated Streamflow	River Diversion ith Storage	Treated Water Distributed		57,037	1.6	2.0	1.0	5 to 15	3,050
23	3.5	SCTN-11	Purchase/Lease Surface Water Irrigation Rights for Municipal/Industrial Use	River Diversion ith Storage	Treated Water Delivered	1,007	40,000	1.1	2.0	1.0	5 to 15	3,260
24	4.3a	SCTN-14a	Joint Development of Water Supply with Corpus Christi - Firm Yield	Existing Reserv rs	Treated Water Distributed	1,015	79,000	1.2	1.0	1.0	1 to 5	810
25	5.16	B-10C	Allens Creek Reservoir - Firm Yield	Potential New R servoirs	Treated Water Distributed	1,016	57,800	1.9	1.0	1.0	5 to 15	9,036
26	3.6a	SCTN-20a	Lower Colorado River Basin - Water Sales Contract for Unused Irrigation Water Supplies	River Diversion ith Storage	Treated Water Distributed		100,060	1.2	2.0	1.0	5 to 15	5,162
27	5.15	SCTN-15	Cummins Creek Off-Channel Reservoir (Colorado River Basin)	Potential New R servoirs	Treated Water Distributed	1,111	45,712	1.9	3.0	1.0	5 to 15	7,274
28	5.1	S-15C	Cibolo Reservoir - Firm Yield	Potential New R servoirs	Treated Water Distributed	1,131	33,200	1.8	3.0	1.0	5 to 15	16,914
29	5.14	C-18	Shaws Bend Reservoir - Firm Yield (Colorado River Basin)	Potential New R servoirs	Treated Water Distributed	1,178	51,576	2.1	3.0	1.0	5 to 15	13,023
30	1.10	SCTN-17	Desalination of Seawater (100 MGD)	Local/Conservat n/Reuse/Exchange	Treated Water Distributed	1,333	112,016	1.2	1.0	1.0	1 to 5	704
31	5.3b	S-15Eb	Cibolo Reservoir with Imported Water from the Guadalupe River Saltwater Barrier and the Colorado River near Bay City	Potential New R servoirs	Treated Water Distributed	1,357	79,090	2.1	3.0	1.0	5 to 15	17,787
32	1.10	SCTN-17	Desalination of Seawater (75 MGD)	Local/Conservat n/Reuse/Exchange	Treated Water Distributed	1,407	84,012	1.2	1.0	1.0	1 to 5	694
33	1.10	SCTN-17	Desalination of Seawater (50 MGD)	Local/Conservat n/Reuse/Exchange	Treated Water Distributed	1,447	56,008	1.2	1.0	1.0	1 to 5	684
34	4.2	G-24	Wimberley and Woodcreek Water Supply from Canyon Reservoir; 2030 Demands	Existing Reserv rs	Treated Water Delivered	1,595	1,048	1.0	1.0	1.0	1 to 5	119
35	1.10	SCTN-17	Desalination of Seawater (25 MGD)	Local/Conservat n/Reuse/Exchange	Treated Water Distributed	1,621	28,004	1.2	1.0	1.0	1 to 5	678
36	5.5	S-14D	Applewhite Reservoir - Firm Yield	Potential New R servoirs	Treated Water Distributed	3,295	4,032	1.8	3.0	1.0	5 to 15	2,607
			Raw Water in Aquifer Water Supply Options									
37	2.3	S-13B	Medina Lake - Existing Rights and Contracts with Irrigation Use Reduction for Recharge Enhancement	Edwards Aquife Recharge	Raw Water in Aquifer	193	8,136	1.0	3.0	1.0	1 to 5	0
38	2.2	L-18c	Edwards Aquifer Recharge from Natural Drainage - Type 2 Projects (Program 2C)	Edwards Aquife Recharge	Raw Water in Aquifer	486	13,451	1.2	1.0	1.0	5 to 15	2,595
39	6.4	SCTN-7a	Wintergarden Carrizo Recharge Enhancement (Nueces River Alternative)	Carrizo and Oth Aquifers	Raw Water in Aquifer	511	11,000	1.3	1.0	1.0	5 to 15	1,633
40	2.6	SCTN-6a	Edwards Aquifer Recharge Enhancement with Guadalupe River Diversions at Lake Dunlap (SCTN-6a)	Edwards Aquife Recharge	Raw Water in Aquifer	534	42,121	1.2	1.0	1.0	5 to 15	443
41	6.4	SCTN-7b	Wintergarden Carrizo Recharge Enhancement (Atascosa River Alternative)	Carrizo and Oth Aquifers	Raw Water in Aquifer	627	7,200	1.3	1.0	1.0	5 to 15	1,210
42	1.2	L-11	Exchange Reclaimed Water for Edwards Irrigation Water	Local/Conservat n/Reuse/Exchange	Raw Water in Aquifer	743	10,300	1.2	1.0	1.0	1 to 5	827
43	2.2	L-18b	Edwards Aquifer Recharge from Natural Drainage - Type 2 Projects (Program 2B)	Edwards Aquife Recharge	Raw Water in Aquifer	800	15,980	1.8	1.0	1.0	5 to 15	4,186
44	2.2	L-18a	Edwards Aquifer Recharge from Natural Drainage - Type 2 Projects (Program 2A)	Edwards Aquife Recharge	Raw Water in Aquifer	1,087	21,577	1.8	1.0	1.0	5 to 15	8,448
45	6.10	SCTN-8	Trinity Aquifer Optimization	Carrizo and Oth Aquifers	Raw Water in Aquifer	1,888	390	1.2	1.0	1.0	5 to 15	460
46	2.6	SCTN-6b	Edwards Aquifer Recharge Enhancement with Guadalupe River Diversions near Gonzales (SCTN-6b)	Edwards Aquife Recharge	Raw Water in Aquifer	1,941	51,133	1.3	1.0	1.0	5 to 15	893
47	2.4	G-30	Guadalupe River Diversion near Comfort to Recharge Zone via Medina Lake	Edwards Aquife Recharge	Raw Water in Aquifer	2,079	3,902	1.4	1.0	1.0	1 to 5	256
48	2.1	L-17a	Edwards Aquifer Recharge from Natural Drainage - Type 1 Projects (Program 1B)	Edwards Aquife Recharge	Raw Water in Aquifer	2,557	1,958	1.9	1.0	1.0	5 to 15	1,340
49	2.1	L-17b	Edwards Aquifer Recharge from Natural Drainage - Type 1 Projects (Program 1A)	Edwards Aquife Recharge	Raw Water in Aquifer	3,309	5,554	2.2	1.0	1.0	5 to 15	4,042
50	2.5	G-32	Diversion of Canyon Reservoir Flood Storage to Recharge Zone via Cibolo Creek - Long-Term Average	Edwards Aquife Recharge	Raw Water in Aquifer	6,198	2,088	1.4	1.0	1.0	1 to 5	518
			Raw (Surface) Water Supply Options									
51	1.4	L-20	Transfer of SAWS Reclaimed Water to Coleto Creek Reservoir (Exchange for CP&L Rights and GBRA Canyon Contract)	Local/Conservat n/Reuse/Exchange	Raw Water at Source	79	17,000	1.3	1.0	1.0	1 to 5	24
52	6.3	SCTN-3a	Simsboro Aquifer - Bastrop, Lee, and Milam Counties with Delivery to Colorado River	Carrizo and Oth Aquifers	Raw Water Delivered	203	75,000	1.1	3.0	1.0	1 to 5	78
53	5.7	G-20	Gonzales Reservoir - Firm Yield	Potential New R servoirs	Raw Water at Reservoir	260	69,897	2.2	1.0	1.0	> 15	21,370
54	6.3	SCTN-3b	Simsboro Aquifer - Bastrop, Lee, and Milam Counties with Delivery to Plum Creek	Carrizo and Oth Aquifers	Raw Water Delivered	290	75,000	1.1	3.0	1.0	1 to 5	269
55	1.5	L-14	Transfer of Reclaimed Water to Corpus Christi through Choke Canyon Reservoir	Local/Conservat n/Reuse/Exchange	Raw Water at Reservoir	297	23,903	1.3	1.0	1.0	1 to 5	240
56	5.17	SCTN-18	Cotulla Reservoir - Raw Water at the Reservoir	Potential New R servoirs	Raw Water at Reservoir	299	57,080	1.7	1.0	1.0	> 15	31,410
57	5.13	SCTN-13	Palmetto Bend Stage II Reservoir (Delivery to Corpus Christi)	Potential New R servoirs	Raw Water Delivered	431	28,200	1.4	1.0	1.0	5 to 15	4,701
58	1.9	SCTN-12b	Exchange of Groundwater from the Gulf Coast Aquifer for Irrigation Surface Water Rights (Guadalupe-San Antonio River Basin)	Local/Conservat n/Reuse/Exchange	Raw Water at Source	437	13,200	1.1	1.0	1.0	1 to 5	1,015
59	5.9	G-22	Dilworth Reservoir - Raw Water at the Reservoir	Potential New R servoirs	Raw Water at Reservoir	446	19,705	1.7	1.0	1.0	> 15	15,400
60	5.10	G-40	Cloptin Crossing Reservoir - Raw Water at the Reservoir	Potential New R servoirs	Raw Water at Reservoir	473	32,458	2.2	1.0	1.0	> 15	6,060
61	1.9	SCTN-12b	Exchange of Groundwater from the Gulf Coast Aquifer for Irrigation Surface Water Rights (Colorado River Basin)	Local/Conservat n/Reuse/Exchange	Raw Water at Source	518	10,748	1.0	1.0	1.0	1 to 5	656
62	5.13	SCTN-13	Palmetto Bend Stage II Reservoir (Delivery to Bay City)	Potential New R servoirs	Raw Water Delivered	560	30,200	1.4	1.0	1.0	5 to 15	4,902
63	5.13	SCTN-13	Palmetto Bend Stage II Reservoir (Delivery to Saltwater Barrier)	Potential New R servoirs	Raw Water Delivered	585	28,100	1.4	1.0	1.0	5 to 15	4,891
64	5.6	G-19	Guadalupe River Dam No. 7 - Firm Yield	Potential New R servoirs	Raw Water at Reservoir	732	30,890	2.2	1.0	1.0	> 15	12,830
65	5.8	G-21	Lockhart Reservoir - Raw Water at the Reservoir	Potential New R servoirs	Raw Water at Reservoir	764	5,627	1.2	1.0	1.0	5 to 15	2,910
			Other Water Supply Options									
66	1.1	L-10 (Mun.)	Demand Reduction (Water Conservation) - Municipal	Local/Conservat n/Reuse/Exchange		~400	~43,000	1.0	1.0	1.0	1 to 5	N/A
67	1.1	L-10 (Irr.)	Demand Reduction (Water Conservation) - Irrigation	Local/Conservat n/Reuse/Exchange		~54	~80,000	1.0	1.0	1.0	1 to 5	N/A
68	1.3	L-15	Purchase or Lease of Edwards Irrigation Water for Municipal and Industrial Use	Local/Conservat n/Reuse/Exchange	Raw Water in Aquifer	51	95430 Max.	1.0	1.0	3.0	1 to 5	N/A
69	1.6	SCTN-4	Brush Management	Local/Conservat n/Reuse/Exchange		Undetermined	Undetermined	1.2	1.0	3.0	> 15	Undetermined
70	1.7	SCTN-5	Weather Modification	Local/Conservat n/Reuse/Exchange		Undetermined	Undetermined	1.0	1.0	3.0	1 to 5	Undetermined
71	1.8	SCTN-9	Rainwater Harvesting	Local/Conservat n/Reuse/Exchange		16,178	.057/household	1.0	1.0	3.0	1 to 5	0
72	1.11	SCTN-10	Off-Channel Local Storage (Guadalupe River near Victoria)	Local/Conservat n/Reuse/Exchange	Treated Water Delivered	587	10,000	1.1	1.0	3.0	1 to 5	481
73	1.11	SCTN-10	Off-Channel Local Storage (Guadalupe River near Boerne)	Local/Conservat n/Reuse/Exchange	Treated Water Delivered	2,681	1,500	1.4	1.0	3.0	1 to 5	595
74	1.11	SCTN-10	Off-Channel Local Storage (Medina River near Von Ormy)	Local/Conservat n/Reuse/Exchange	Treated Water Delivered	1,190	5,000	1.2	1.0	3.0	1 to 5	595
75	6.5	SCTN-2a	Groundwater Supplies for Municipal Water Systems in the Carrizo-Wilcox Aquifer	Carrizo and Oth Aquifers		N/A	N/A	1.0	1.0	1.0	1 to 5	N/A
76	6.6	SCTN-2b	Groundwater Supplies for Municipal Water Systems in the Gulf Coast Aquifer	Carrizo and Oth Aquifers		N/A	N/A	1.0	1.0	1.0	1 to 5	N/A
77	6.7	SCTN-2c	Groundwater Supplies for Municipal Water Systems in the Trinity Aquifer	Carrizo and Oth Aquifers		N/A	N/A	1.0	1.0	3.0	1 to 5	N/A
78	6.8	SCTN-1a	Aquifer Storage and Recovery (ASR)	Carrizo and Oth Aquifers		2428 to 1009	2,792	1.0	1.0	1.0	1 to 5	286
79	6.9	SCTN-1b	Aquifer Storage and Recovery (ASR) - Local Option	Carrizo and Oth Aquifers		2,089	279	1.0	1.0	1.0	1 to 5	3

Notes:

*This is the list of stand alone options as presented in Volume III. As these options were fitted into the Regional Water Plan, the quantities were reduced in some cases, and the costs wer recalculated for the quantity included in the plan.

1 Environmental Composite Average based on nine Qualitative Measures of Environmental Impacts (High = 3; Medium = 2; Low = 1) and one measure of Sustainability (High = 1; Medi. 1 = 2; Low = 3).

2 Public Acceptability based on present existence of organized local opposition to the water supply option at the source of water (Yes = 3, Limited = 2, No = 1).

3 Reliability based on availability of supply during drought of record (Yes = 1, No/Uncertain = 3)

Table 5.1-1

facilities would be developed to serve multiple user groups with water from multiple sources, thereby realizing economies of scale. Considering the dependable annual supply and transmission capacity associated with each of the various water supply options comprising an alternative plan as well as the daily variations in water demand, small reservoirs providing balancing storage were sized and located near regional water treatment facilities in Bexar, Comal, and Hays Counties.

5.2 South Central Texas Regional Water Plan

5.2.1 Regional Summaries

The South Central Texas Regional Water Plan includes water management strategies which emphasize water conservation and reuse and maximize use of available water rights and existing reservoirs. The Plan avoids development of large new reservoirs and minimizes depletion of water stored in aquifers. The Plan recognizes and includes several projects that are in various stages of implementation at this time, but are not yet complete. Additional strategies having significant support within the region, yet requiring further study regarding quantity of dependable water supply made available during severe drought, feasibility, and/or cost of implementation, are also included in the Plan. The water management strategies included in the South Central Texas Regional Water Plan are shown in Figure 5.2-1 and identified in Table 5.2-1 along with the associated new supply and presumed allocation to each county in the year 2050.

Water management strategies emphasizing conservation and reuse are expected to provide for about 21 percent of new supplies available in the year 2050 and include:

- Municipal Demand Reduction (Conservation) (L-10 Mun.);
- Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.);
- SAWS Recycled Water Program;
- Aquifer Storage & Recovery (ASR) (SCTN-1a); and
- Irrigation Demand Reduction (Conservation) (L-10 Irr.).

Water management strategies maximizing use of available water rights and resources and existing reservoirs are expected to provide for about 61 percent of new supplies available in the year 2050 and include:

- Edwards Irrigation Transfers (L-15);
- Canyon Reservoir – River Diversion (G-15C);

- Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24);
- Lower Guadalupe River Diversions (SCTN-16);
- New Colorado River Diversion (LCRA);[4]
- Simsboro Aquifer (SCTN-3c);
- Purchase Water from Major Provider (PMP); and
- Desalination of Seawater (SCTN-17).

Water management strategies that simultaneously develop groundwater supplies and minimize depletion of storage in regional aquifers are expected to provide for about 11 percent of new supplies available in the year 2050 and include:

- Edwards Recharge – Type 2 Projects (L-18a);
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C);
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D); and
- Carrizo Aquifer – Local Supply (SCTN-2a).

Projects recognized in the Plan that are presently being implemented are expected to provide for about 7 percent of new supplies available in the year 2050 and include:

- Schertz-Seguin Water Supply Project (SSWSP);
- Western Canyon Regional Water Supply Project (WCRWSP);
- Hays/IH35 Water Supply Project (HIH35WSP)
- Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA);
- Carrizo Aquifer – Bexar & Guadalupe (BMWD);
- Trinity Aquifer – Bexar (BMWD); and
- Canyon Reservoir Contract Renewal (GBRA).

[4] On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in Region L and Region K, and acknowledcges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost would be increased somewhat. This change could affect supplies to Hays County and Bexar County, and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr; however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" sauppies available within the Region L Plan to compensate for the proposed reduction in yield of the project.

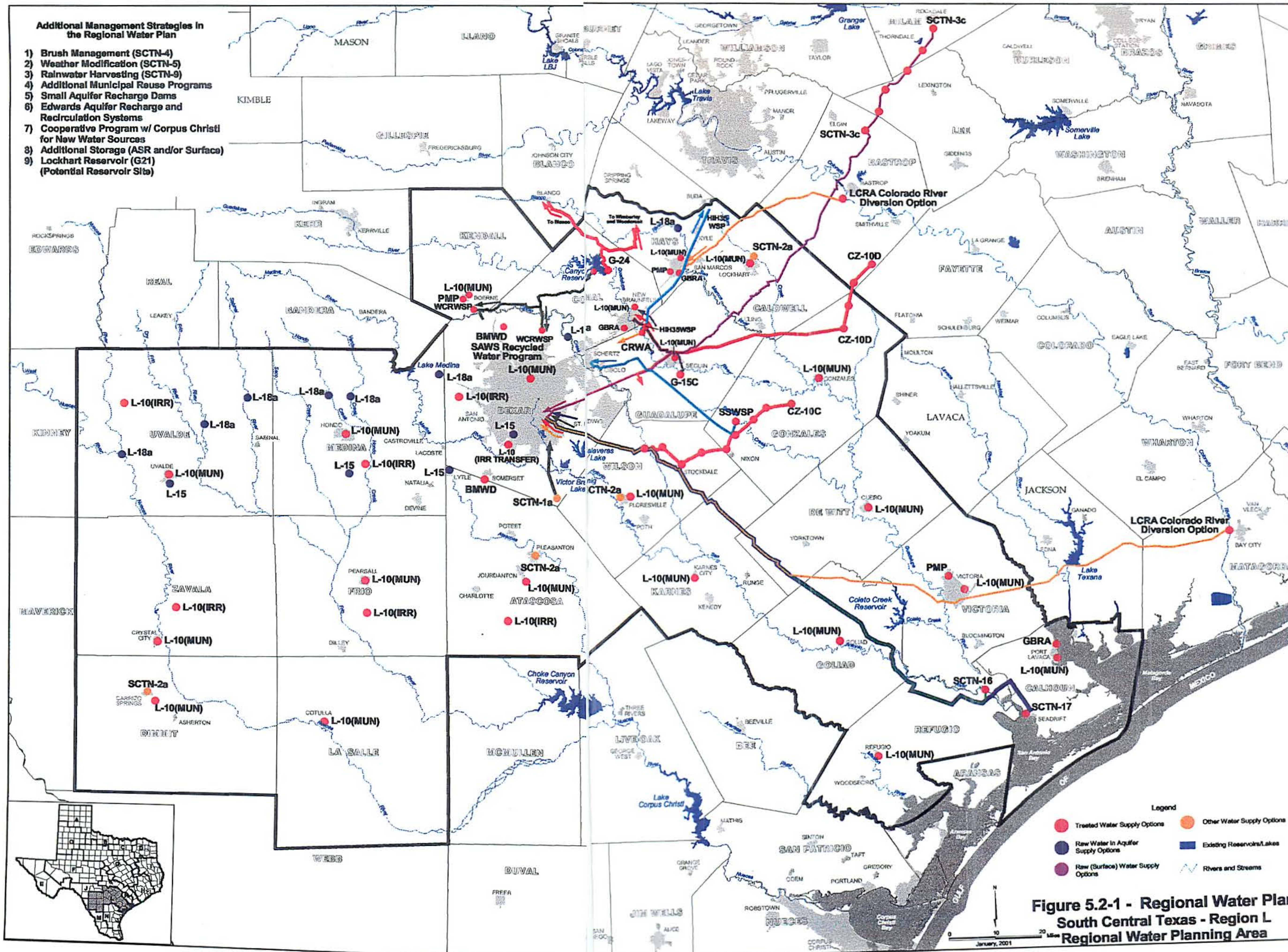

Figure 5.2-1 - Regional Water Plan South Central Texas - Region L Regional Water Planning Area

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 (SCTN-4);
- Weather Modification (SCTN-5);
- Rainwater Harvesting (SCTN-9);
- Additional Municipal Recycling (Reuse) Programs;
- Small Aquifer Recharge Dams;
- Edwards Aquifer Recharge & Recirculation Systems;
- Cooperation with Corpus Christi for New Water Sources; 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 Regional Water Plan also includes the Edwards Aquifer Recharge and Recirculation Systems. The SCTRWPG recommends State and local funding for research at a level that would ensure consideration of this strategy in the next 5-year planning cycle. However, this management strategy may not be implemented unless the Plan is specifically amended to allow implementation.

Following publication of the Initially Prepared Plan (IPP) on August 17, 2000, the Regional Water Planning Group carefully reconsidered this strategy in light of its fundamental importance to many interests. The IPP included a footnote (IPP at pages ES-25 and 5-8) that indicated the strategy was included for research but not for implementation "unless the Plan is specifically amended to allow implementation." The Planning Group has replaced that footnote with a discussion of its reasons for including the water management strategy for research and not for implementation.

Members of the SCTRWPG have expressed a wide range of views about this strategy. On the one hand, the Recharge and Recirculation System is viewed as experimental at best and dangerous at worst by several members of the RWPG. First, communities dependent on springflow from the Edwards formation to meet needs in the Guadalupe River Basin point to computer model runs showing potential aquifer drawdowns to levels far below its historic lows in the San Antonio area and the consequent potential for drying up the springs. The downstream Guadalupe River Basin interests state that they cannot accept a regional plan that jeopardizes this essential source of water. They want to see a clear demonstration that implementing Recharge and Recirculation will not damage the springs. Environmental groups wanting to protect endangered and threatened species at the springs also find the risk associated with what is regarded as an unproven technology to be unacceptable. They are also concerned about the potential damage to riparian and estuarine species and habitat if base flows are diverted during drought periods and/or flood flows are diverted during wetter periods. Utility managers, citing their requirements under Certificates of Convenience and Necessity to provide reliable supplies for municipal uses, are concerned that the lack of experience with this technology and the adverse results of computer model runs conducted by the Technical Consultant raise too many questions about the strategy for it to be recommended for implementation.

On the other hand, some members of the RWPG believe that the computer modeling done to date does not present an accurate picture of the system's effects and capabilities. They believe the modeling is unfair in presenting results for a time period beginning with the drought of record, and they compare this to modeling the yield of a reservoir built early in the drought of record—there would be no yield for many years. (The Technical Consultant states that the modeling of this strategy was based on beginning conditions of a full aquifer and advise that substantial start-up time could be needed upon implementation in order for this strategy to provide additional dependable water supply during drought.) Others fear that implementation of some of the water management strategies included in the plan would preclude implementation of Recharge and Recirculation at a later time. They focus, in particular, on the need to include in the plan the strategy of Lake Dunlap diversions to the recharge area of the Edwards Aquifer. If the strategy of diverting water from the Guadalupe River at the Saltwater Barrier is implemented first, they fear that the Dunlap diversions would be impossible. That would mean that a major component of Recharge and Recirculation System would be precluded, damaging the chances of ever implementing this strategy.

All these interests nevertheless agree that the Recharge and Recirculation strategy may hold great promise and that optimizing use of the Edwards Aquifer is a cornerstone of water policy for the Water User Groups dependent on this underground source. They all support inclusion of this strategy in the Regional Water Plan for purposes of assuring continued research. They agree that implementation of the strategy would require an amendment of the Regional Water Plan. The amendment process can occur at any time after formal approval of the Regional Water Plan and requires a public hearing after a 30-day notice period.

The members of the South Central Texas Regional Water Planning Group have further agreed that the Recharge and Recirculation strategy must move as expeditiously as possible through the necessary phases of research to resolve uncertainties about how it could work in practice. To this end, the Planning Group members agree to support the accelerated research effort in the manner appropriate to each, whether by providing funding, reviewing research findings, offering in-kind services or other means. The goal of this effort will be to conclude the research as soon as practicable, possibly within a 3-year period and in any case in time for reviewing results for possible inclusion of this strategy in the next planning cycle. In this way, the Regional Water Planning Group intends to maintain its consensus approach to planning with careful regard to all interests it represents across the South Central Texas Region.

The Lockhart Reservoir is recommended as a potential reservoir site. Although the Regional Plan recommends other means of meeting projected water needs in Caldwell County, the SCTRWPG recognizes the strong interest of the local government in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the local government to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, 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 SCTRWPG will review the Lockhart Reservoir water supply option as a possible amendment to the Regional Water Plan.

The majority of the projected water supply needs or shortages in the South Central Texas Region are associated with municipal, industrial, steam-electric, and mining uses. Figure 5.2-2

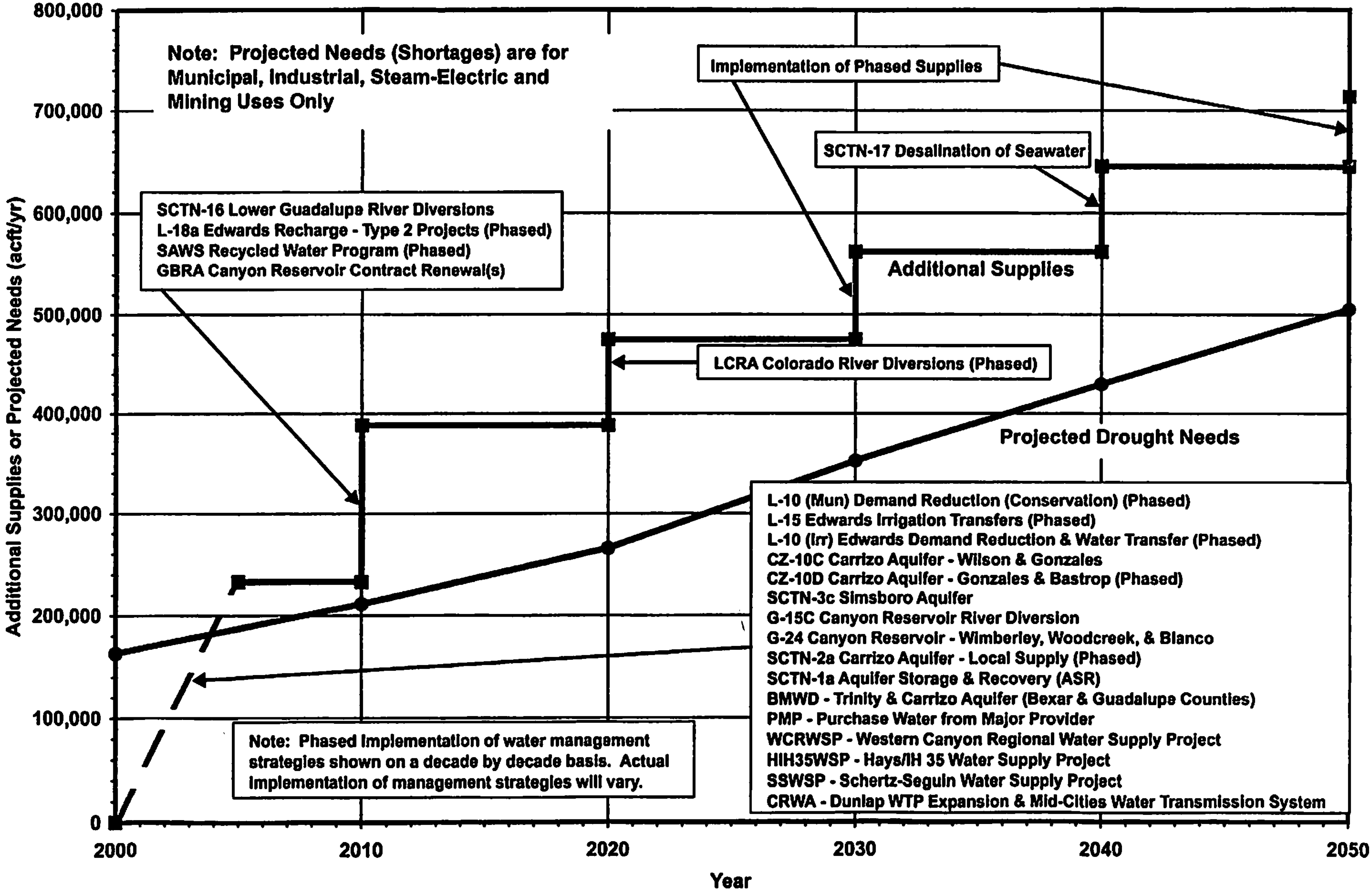

Figure 5.2-2. Regional Water Plan

summarizes these projected needs and illustrates the phased implementation of water management strategies necessary to ensure that these needs are satisfied. Clearly, 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. Implementation of the South Central Texas Regional Water Plan could result in the development of more than 700,000 acft/yr of new water supplies that will be reliable in the event of a repeat of the most severe drought on record.

Substantial water supply needs or shortages are also projected for irrigation use in the South Central Texas Region. The Regional Water Planning Group 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 (Section 6). However, installation of Low Energy Precision Application (LEPA) equipment in six counties (Table 5.2-1) is recommended as part of the Irrigation Demand Reduction (Conservation) (L-10 Irr.) water supply strategy included in the Plan. During the next planning cycle, the RWPG intends to examine agricultural needs throughout the region and to undertake additional socio-economic studies of Regional Water Plan impacts on agricultural resources. It will also review water management strategies that may meet irrigation needs during the planning period of 2005–2055.

Costs associated with the implementation and long-term operations and maintenance of water management strategies have been estimated in accordance with Texas Water Development Board rules and general guidelines. Projected annual and unit costs for the South Central Texas Regional Water Plan are summarized by decade in Figures 5.2-3 and 5.2-4, respectively. Annual costs (in 1999 dollars) are estimated to range from a low of about $120,000,000 in the immediate future, as some of the least costly water management strategies are developed, to a high of about $420,000,000 in 2040, at which time Desalination of Seawater (SCTN-17) is projected to be implemented. Estimated unit costs for the development of new supplies range from a low of $530 per acft to a high of $737 per acft and average $617 per acft or $1.89 per 1,000 gallons over the 50-year planning horizon. Unit costs tend to decrease beyond 2030 as the 30-year debt service period is completed for the many strategies to be implemented on an expedited basis. Cost estimates reflect regional water treatment capacity and balancing storage facilities sufficient to meet peak daily and seasonal water demands in the larger urban areas. Note also that no costs have been included for those projects in the Plan that are presently being implemented. Specific cost estimating procedures used in the technical evaluation of water management strategies for the South Central Texas Region are summarized in Appendix A of Volume III.

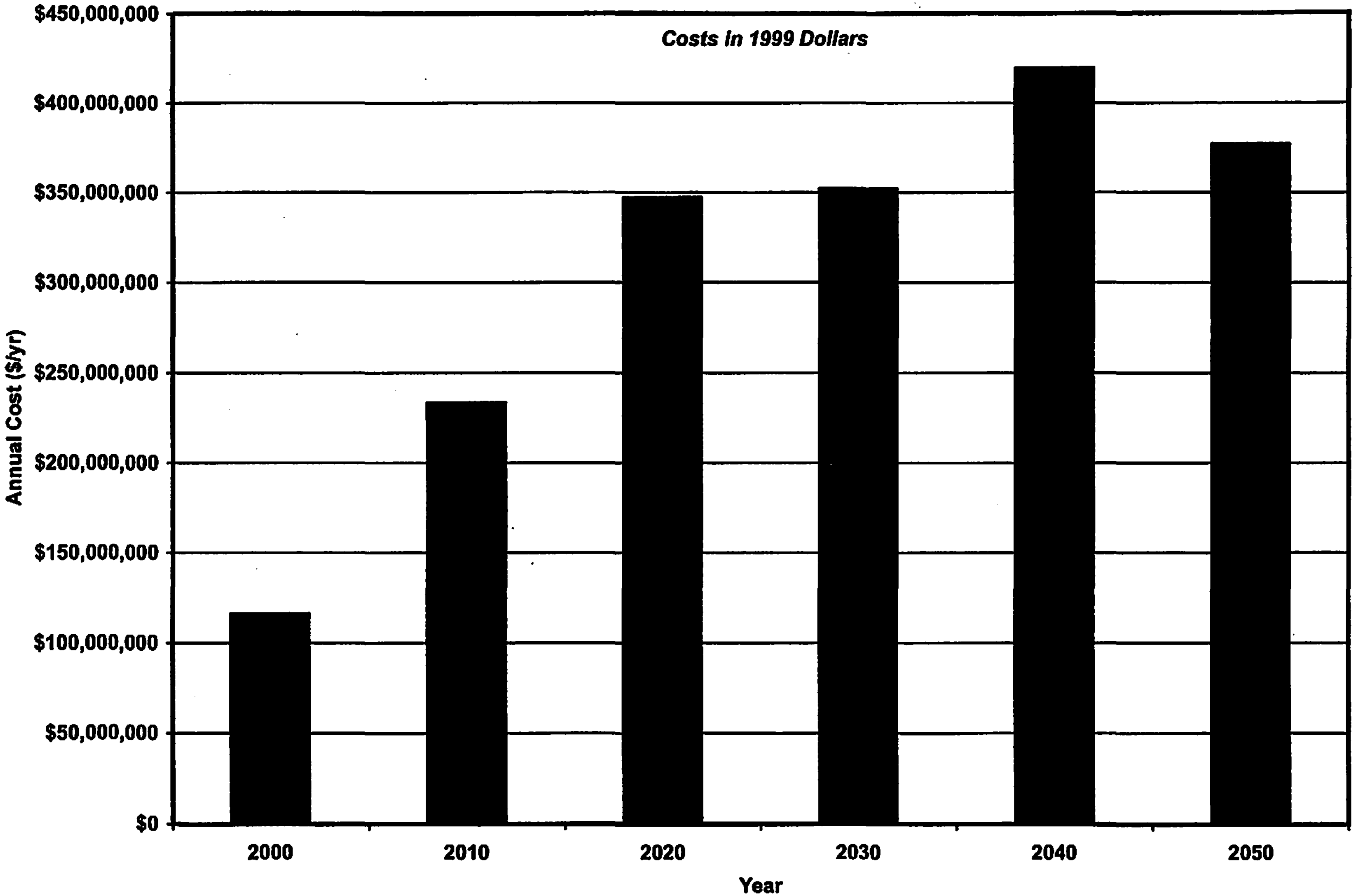

Figure 5.2-3. Regional Water Plan — Annual Cost of Cumulative Additional Water Supply

Table 5.2-1. South Central Texas Regional Water Plan
Water Management Strategies, County Needs, and County Allocation of New Supplies in 2050

Water Management Strategies for Municipal, Industrial, Steam-Electric, and/or Mining Needs (Shortages)

County Allocation of New Supplies in 2050 (acft/yr)

ID#	Description	Atascosa	Bexar	Caldwell	Calhoun	Comal	Dewitt	Dimmit	Frio	Goliad	Gonzales	Guadalupe	Hays	Karnes	Kendall	La Salle	Medina	Refugio	Uvalde	Victoria	Wilson	Zavala	Total
L-10 (Mun.)	Municipal Demand Reduction (Conservation)	319	40,934	104		942	74	133	12[illegible]		67	6	1,174		11	83	78		283		130	104	44,566
L-10 (Irr.)	Irrigation Demand Reduction (Conservation) w/ Transfer		27,314																				27,314
L-15	Edwards Irrigation Transfers	700	32,986														3,000		6,000				42,686
L-18a	Edwards Recharge - Type 2 Projects		21,577																				21,577
G-15C	Canyon Reservoir - River Diversion					15,700																	15,700
G-24	Canyon Reservoir - Wimberley, Woodcreek, & Blanco												1,348										1,348
SCTN-16	Lower Guadalupe River Diversions		94,500																				94,500
LCRA	New Colorado River Diversion Option*		132,000										18,000										150,000
CZ-10C	Carrizo Aquifer - Wilson & Gonzales		16,000																				16,000
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop					23,000						4,500											27,500
SCTN-2a	Carrizo Aquifer - Local Supply	10,000		1,000				3,500													200		14,700
SCTN-3c	Simsboro Aquifer		55,000																				55,000
SAWS	SAWS Recycled Water Program		52,215																				52,215
PMP	Purchase Water From Major Provider												5,000		8,000					1,240			14,240
SCTN-17	Desalination of Seawater		84,012																				84,012
SCTN-1a	Aquifer Storage & Recovery (ASR)																						
Management Strategies in Implementation																							
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)		3,919			1,315						14,766											20,000
WCRWSP	Western Canyon Regional Water Supply Project		500			7,716									2,311								10,527
CRWA	Lake Dunlap WTP Expansion and Mid-Cities Project																						0
HIH35WSP	Hays/IH 35 Water Supply Project												4,500										4,500
BMWD	Carrizo Aquifer - Bexar & Guadalupe (BMWD)		4,000																				4,000
BMWD	Trinity Aquifer - Bexar (BMWD)		1,000																				1,000
GBRA	GBRA Canyon Reservoir Contract Renewal				1,500	6,676							5,589										13,765
Additional Management Strategies Requiring Further Study Regarding Quantity, Cost, and/or Feasibility																							
SCTN-4	Brush Management**																						
SCTN-5	Weather Modification**																						
SCTN-9	Rainwater Harvesting**																						
	Additional Municipal Reuse Programs**																						
	Small Aquifer Recharge Dams**																						
	Edwards Aquifer Recharge & Recirculation Systems**																						
	Cooperation w/ Corpus Christi for New Water Sources**																						
	Additional Storage (ASR and/or Surface)**																						
G-21	Lockhart Reservoir																						
Total New Mun, Ind, S-E, & Min Supplies (Year 2050)		11,019	565,957	1,104	1,500	55,349	74	3,633	12[illegible]	0	67	19,272	35,611	0	10,322	83	3,078	0	6,283	1,240	330	104	715,150
Total Mun, Ind, S-E, & Min Needs (Year 2050)		10,330	378,480	737	1,093	45,122	0	1,959	[illegible]	0	0	15,158	34,232	0	9,581	0	2,826	0	5,609	0	145	0	505,272
Total Mun, Ind, S-E, & Min Management Supplies (Year 2050)		689	187,477	367	407	10,227	74	1,674	12[illegible]	0	67	4,114	1,379	0	741	83	252	0	674	1,240	185	104	209,878

Water Management Strategies for Irrigation Needs (Shortages)

County Allocation of New Supplies in 2050 (acft/yr)

ID#	Description	Atascosa	Bexar	Caldwell	Calhoun	Comal	Dewitt	Dimmit	Frio	Goliad	Gonzales	Guadalupe	Hays	Karnes	Kendall	La Salle	Medina	Refugio	Uvalde	Victoria	Wilson	Zavala	Total
L-10 (Irr.)	Irrigation Demand Reduction (Conservation)	3,692	1,905	0	0	0	0	0	5,9[illegible]	0	0	0	0	0	0	0	5,000	0	5,958	0	0	6,401	28,903
Total New Irrigation Supplies (Year 2050)		3,692	1,905	0	0	0	0	0	5,9[illegible]	0	0	0	0	0	0	0	5,000	0	5,958	0	0	6,401	28,903
Total Irrigation Needs (Year 2050)		40,713	5,082	0	0	0	0	0	70,6[illegible]	0	0	406	0	0	0	0	55,006	0	27,383	0	0	81,200	280,453
Total Irrigation Shortage (Year 2050)		-37,021	-3,177	0	0	0	0	0	-64,7[illegible]	0	0	-406	0	0	0	0	-50,006	0	-21,425	0	0	-74,799	-251,550

* On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus en[illegible]ronmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Regio[illegible] L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this infor[illegible]ation being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr; however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" supplies available within the Reg[illegible]n L Plan to compensate for the proposed reduction in yield of the project.

** Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

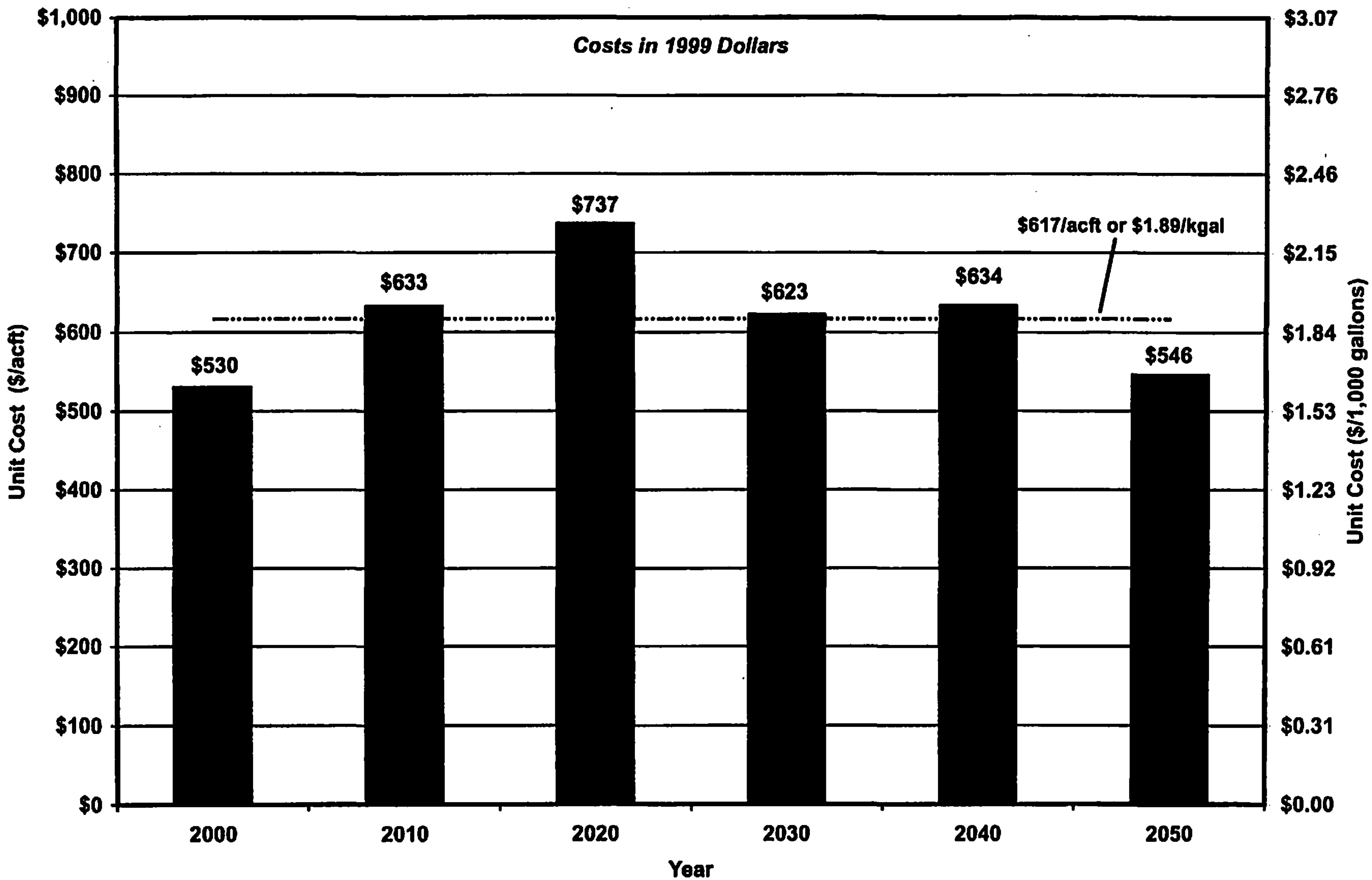

Figure 5.2-4. Regional Water Plan — Unit Cost of Cumulative Additional Water Supply

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5.2.2 County Summaries

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 Tables 5.2-2 through 5.2-22 and Figures 5.2-5 through 5.2-25. These tables and figures illustrate the phased implementation of water management strategies at the county level. Counties are presented in alphabetical order from Atascosa County to Zavala County. The counties having the greatest municipal, industrial, steam-electric, and mining needs and, hence, the greatest quantities of new water supply are Bexar, Comal, Hays, and Guadalupe. Particular attention to the notes at the base of 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 Section 5.3.

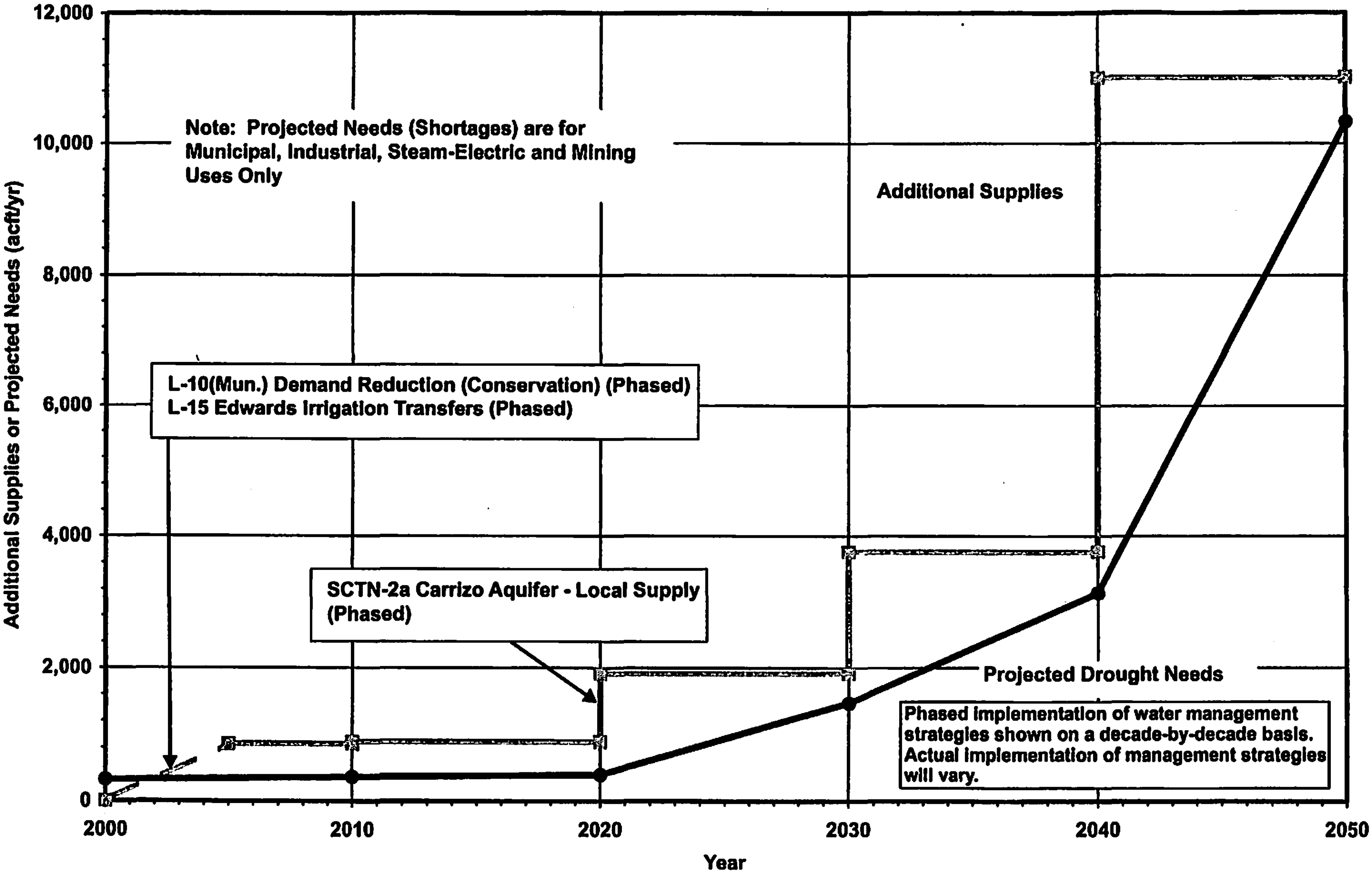

Figure 5.2-5. Regional Water Plan - Atascosa County

South Central Texas Region							County = Atascosa		
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							User Group(s) = all		
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		325	366	401	468	530	587	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	1,504	8,504	
	Mining		0	0	0	995	1,109	1,239	
	Irrigation		38,418	36,719	35,170	43,726	42,190	40,713	
	Total Needs		38,743	37,085	35,571	45,189	45,333	51,043	
	Mun, Ind, S-E, & Min Needs		325	366	401	1,463	3,143	10,330	
	Irrigation Needs		38,418	36,719	35,170	43,726	42,190	40,713	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		356	384	411	259	300	319	1
L-15	Edwards Irrigation Transfers	42,686	500	500	500	500	700	700	2, 3, 4
SCTN-2a	Carrizo Aquifer - Local Supply	10,000				1,000	3,000	10,000	5, 6
SCTN-4	Brush Management								7
SCTN-5	Weather Modification								7
SCTN-9	Rainwater Harvesting								7
	Small Aquifer Recharge Dams								7
L-10 (Irr.)	Demand Reduction (Conservation)		3,692	3,692	3,692	3,692	3,692	3,692	8
	Total New Supplies		4,548	4,576	4,603	5,451	7,692	14,711	
	Total System Mgmt. Supply / Deficit		-34,195	-32,509	-30,968	-39,738	-37,641	-36,332	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		531	518	510	296	857	689	
	Irrigation System Mgmt. Supply / Deficit		-34,726	-33,027	-31,478	-40,034	-38,498	-37,021	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Charlotte, Jourdanton, Lytle, Pleasanton, and Poteet.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Additional Edwards supply is for City of Lytle.
5	Additional Carrizo supply is for Steam-Electric and Mining use.
6	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
7	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
8	Estimates based upon use of LEPA systems on 50 percent of acreage irrigated in 1997, with conservation at 20 percent of irrigation application rate.

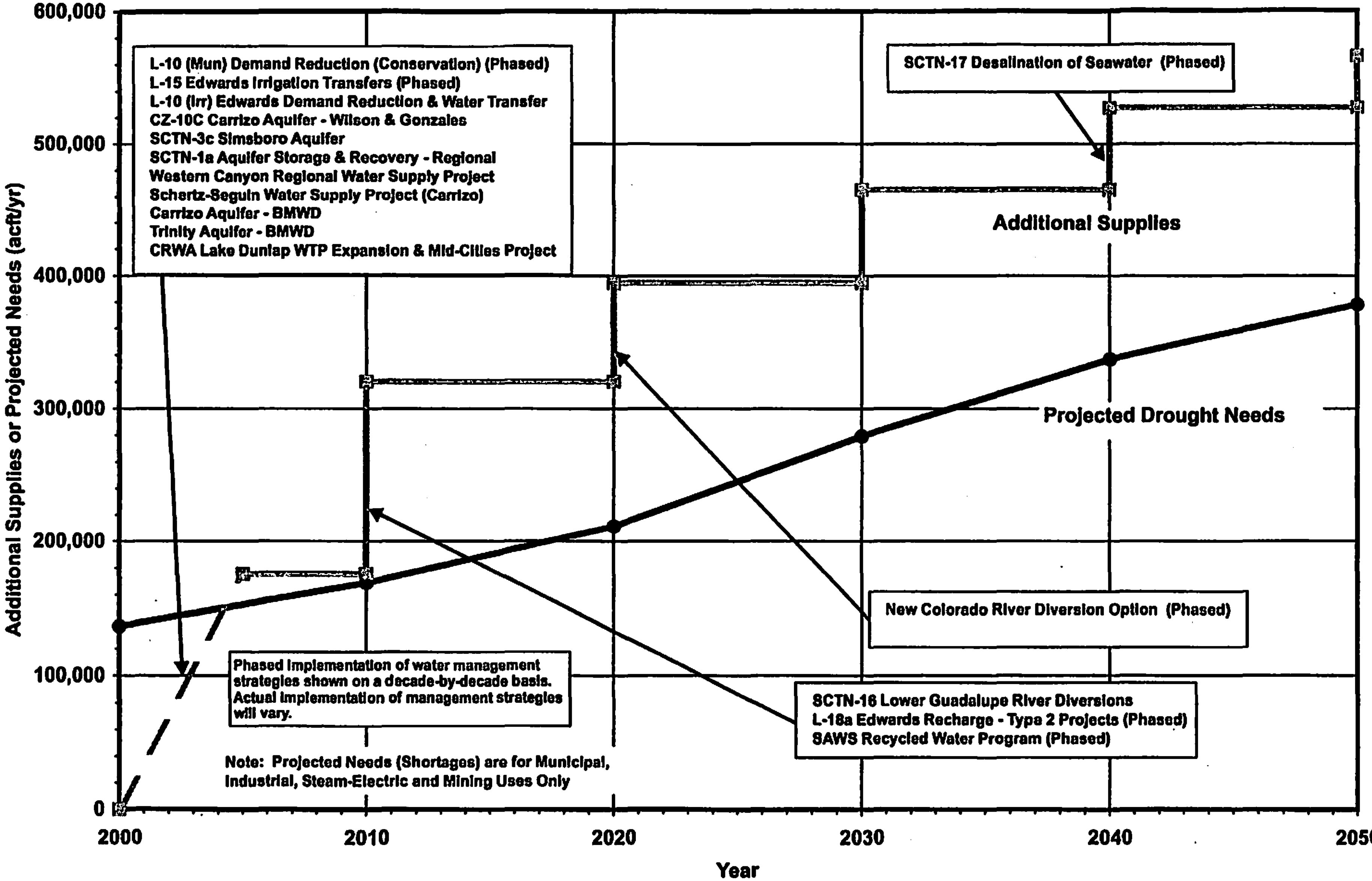

Figure 5.2-6. Regional Water Plan - Bexar County

South Central Texas Region — **County = Bexar**

County Summary of Projected Water Needs (Shortages) and Water Management Strategies — **User Group(s) = all**

Projected Water Needs (acft/yr)

User Group(s)	2000	2010	2020	2030	2040	2050	Notes
Municipal	131,884	164,107	206,398	272,467	326,339	364,328	
Industrial	0	0	0	1,428	4,757	8,190	
Steam-Electric	0	0	0	0	0	0	
Mining	4,963	4,936	5,201	5,406	5,645	5,962	
Irrigation	14,059	10,935	9,376	7,883	6,453	5,082	
Total Needs	**150,906**	**179,978**	**220,975**	**287,184**	**343,194**	**383,562**	
Mun, Ind, S-E, & Min Needs	**136,847**	**169,043**	**211,599**	**279,301**	**336,741**	**378,480**	
Irrigation Needs	**14,059**	**10,935**	**9,376**	**7,883**	**6,453**	**5,082**	

Water Management Strategies (acft/yr)

ID#	Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		33,528	42,509	41,210	36,533	38,834	40,934	1
L-15	Edwards Irrigation Transfers	42,686	25,000	32,986	32,986	32,986	32,986	32,986	2, 3
L-10 (Irr.)	Demand Reduction (Conservation) w/ Transfer	27,314	27,314	27,314	27,314	27,314	27,314	27,314	4
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)	20,000	3,919	3,919	3,919	3,919	3,919	3,919	5
WCRWSP	Western Canyon Regional Water Supply Project	10,527	4,500	4,500	4,500	4,500	500	500	6
CRWA	Lake Dunlap WTP Expansion & Mid-Cities Project	5,200	5,200	5,200	0	0	0	0	7
BMWD	Carrizo Aquifer - Bexar & Guadalupe (BMWD)	4,000	4,000	4,000	4,000	4,000	4,000	4,000	8
BMWD	Trinity Aquifer - Bexar (BMWD)	1,000	1,000	1,000	1,000	1,000	1,000	1,000	8
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	16,000	16,000	16,000	16,000	16,000	16,000	16,000	9
SCTN-3c	Simsboro Aquifer	55,000	55,000	55,000	55,000	55,000	55,000	55,000	10
SCTN-16	Lower Guadalupe River Diversions	94,500		94,500	94,500	94,500	94,500	94,500	11
L-18a	Edwards Recharge - Type 2 Projects	21,577		13,451	21,577	21,577	21,577	21,577	12
SAWS	SAWS Recycled Water Program	52,215		19,826	26,737	35,824	43,561	52,215	13, 14
LCRA	New Colorado River Diversion Option	150,000			66,000	132,000	132,000	132,000	15
SCTN-17	Desalination of Seawater (75 mgd)	84,012					56,008	84,012	16
SCTN-1a	Aquifer Storage & Recovery - Regional								17
SCTN-4	Brush Management								18
SCTN-5	Weather Modification								18
SCTN-9	Rainwater Harvesting								18
	Small Aquifer Recharge Dams								18
	Edwards Aquifer Recharge & Recirculation Systems								
	Cooperation w/ Corpus Christi for New Water Sources								
	Additional Storage (ASR and/or Surface)								
L-10 (Irr.)	Demand Reduction (Conservation)		1,905	1,905	1,905	1,905	1,905	1,905	19
	Total New Supplies		**177,366**	**322,110**	**396,648**	**467,058**	**529,104**	**567,862**	
	Total System Mgmt. Supply / Deficit		**26,460**	**142,132**	**175,673**	**179,874**	**185,910**	**184,300**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**38,614**	**151,162**	**183,144**	**185,852**	**190,458**	**187,477**	
	Irrigation System Mgmt. Supply / Deficit		**-12,154**	**-9,030**	**-7,471**	**-5,978**	**-4,548**	**-3,177**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 32,134 acft (based on installation of LEPA systems on about 53 percent of applicable acreage in Bexar, Medina, & Uvalde Counties).
5	Project in implementation phase. Includes delivery of groundwater from southern Gonzales County to the City of Schertz.
6	Project in implementation phase. Includes delivery of GBRA Canyon Reservoir water from Lake Dunlap to entities in Bexar County. Project is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.
7	Project in implementation phase. Includes delivery of Canyon Reservoir water to CRWA's member entities. Contract expires in 2018.
8	Project in implementation phase. Non-interruptible supplies identified by BMWD in Water Supply Program of 1/31/2000.
9	Includes 11,000 acft/yr and 5,000 acft/yr. from Wilson and Gonzales Counties, respectively. Effects on regional aquifer levels quantified.
10	Effects on regional aquifer levels quantified. Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. Regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
11	Candidate New Supply includes existing water rights, unappropriated streamflow, off-channel storage, and groundwater.
12	Includes 15 recharge enhancement projects on streams from the Nueces River in the west to the Blanco River in the east. Alternative size projects at identified locations are consistent with Regional Water Plan.
13	Current SAWS Reuse Water Program is included as 24,941 acft/yr (consumptive reuse) in existing supply.
14	Future use of reuse water for non-potable uses and based on goal of meeting 20 percent of SAWS projected water demand.
15	Candidate New Supply to be shared by Bexar and Hays Counties. Based on LCRA Regional Water Sharing Alternatives (7/6/2000). Delivery to Bexar County through diversion from Colorado River @ Bay City.
16	Saltwater intake located in San Antonio Bay.
17	SAWS ASR program in southern Bexar County increases reliability of Edwards Aquifer supply and reduces seasonal aquifer demands.
18	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
19	Estimates based on remaining irrigation water conservation potential through LEPA installation after consideration of Edwards Irrigation Transfers (L-15) and transfer of water conserved through irrigation Demand Reduction (L-10) to Bexar County municipal supply.

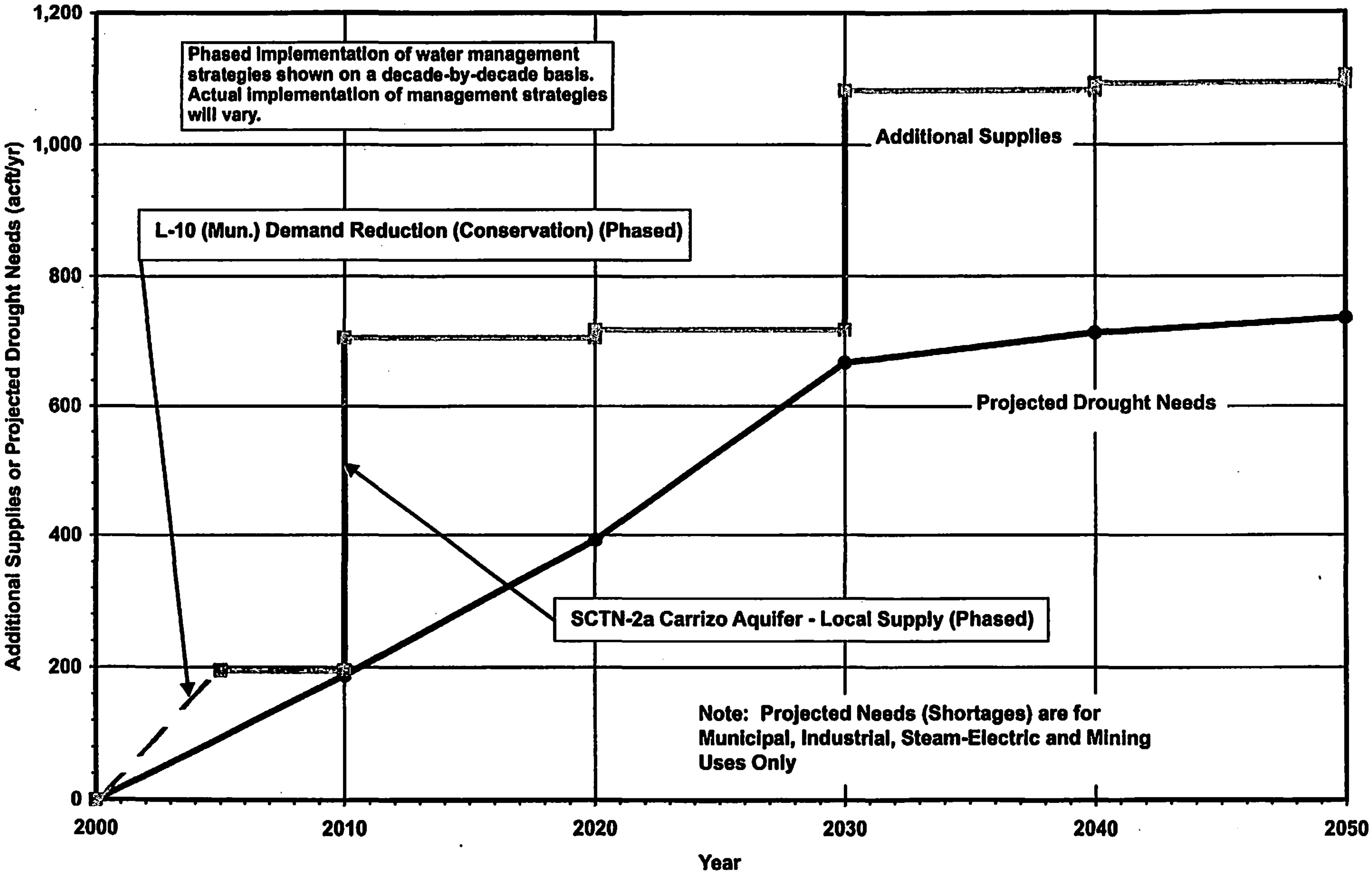

Figure 5.2-7. Regional Water Plan - Caldwell County

South Central Texas Region									**County = Caldwell**
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	188	393	668	714	737	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**188**	**393**	**668**	**714**	**737**	
	Mun, Ind, S-E, & Min Needs		**0**	**188**	**393**	**668**	**714**	**737**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		195	206	218	82	93	104	1
SCTN-2a	Carrizo Aquifer - Local Supply	1,000		500	500	1,000	1,000	1,000	2
	Small Aquifer Recharge Dams								3
G-21	Lockhart Reservoir								4
	Total New Supplies		**195**	**706**	**718**	**1,082**	**1,093**	**1,104**	
	Total System Mgmt. Supply / Deficit		**195**	**518**	**325**	**414**	**379**	**367**	
Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit			**195**	**518**	**325**	**414**	**379**	**367**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Lockhart, Luling, and Martindale.								
2	Additional well(s) for Lockhart.								
3	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								
4	Water supply option identified as a "potential reservoir" and may be considered as a possible amendment to the Regional Water Plan.								

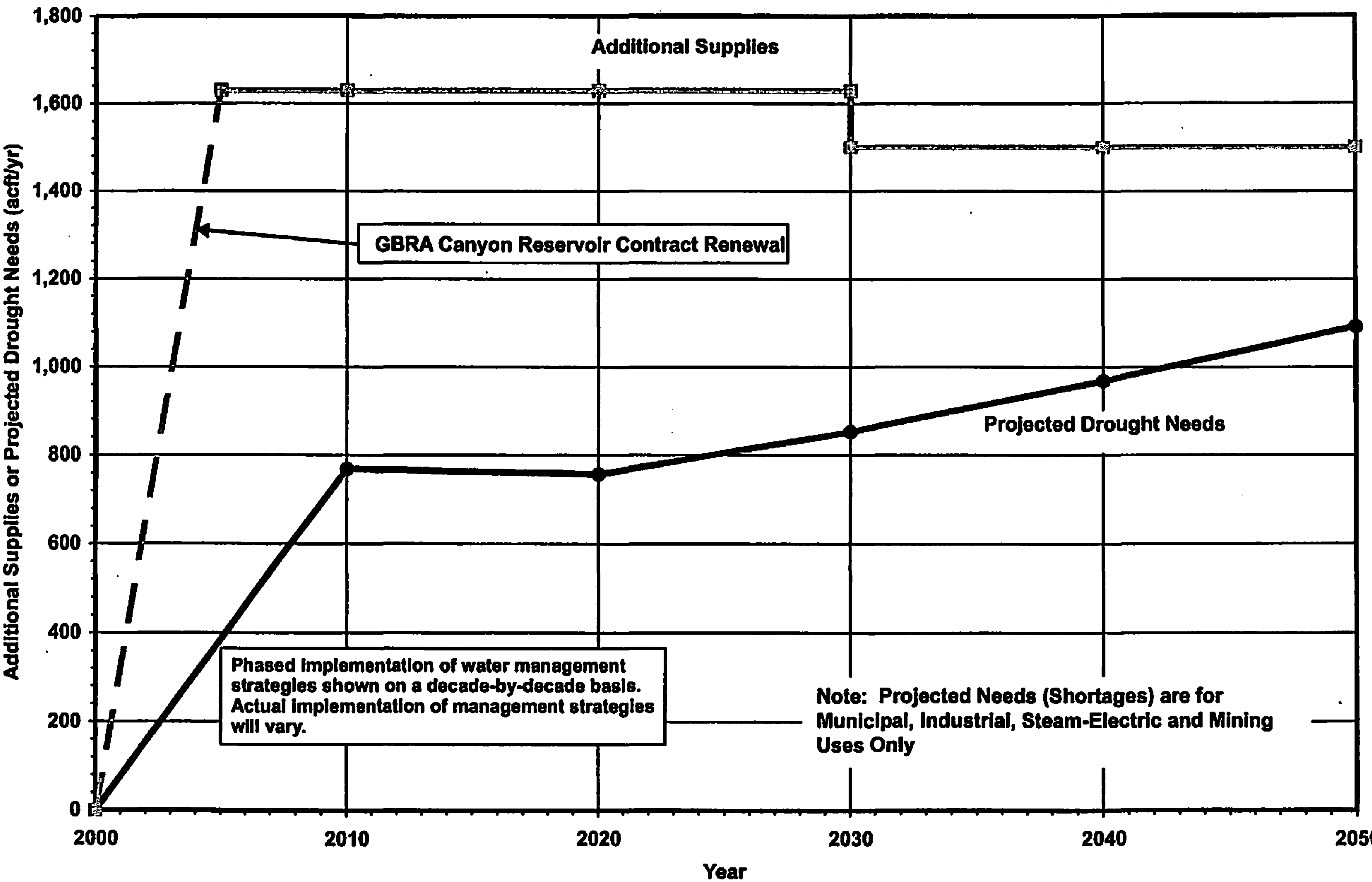

Figure 5.2-8. Regional Water Plan - Calhoun County

South Central Texas Region								**County = Calhoun**	
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								**User Group(s) = all**	
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	769	758	852	969	1,093	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**769**	**758**	**852**	**969**	**1,093**	
	Mun, Ind, S-E, & Min Needs		**0**	**769**	**758**	**852**	**969**	**1,093**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		129	129	129	0	0	0	1
GBRA	GBRA Canyon Reservoir Contract Renewal	1,500		1,500	1,500	1,500	1,500	1,500	2,3
	Total New Supplies		**129**	**1,629**	**1,629**	**1,500**	**1,500**	**1,500**	
	Total System Mgmt. Supply / Deficit		**129**	**860**	**871**	**648**	**531**	**407**	
Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit			**129**	**860**	**871**	**648**	**531**	**407**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Port Lavaca, Point Comfort, and Seadrift.
2	Renewal of current GBRA Canyon Reservoir Contract with the City of Port Lavaca which expires in February 2008.
3	Early implementation of contract renewal assumed to insure sufficient supply during drought.

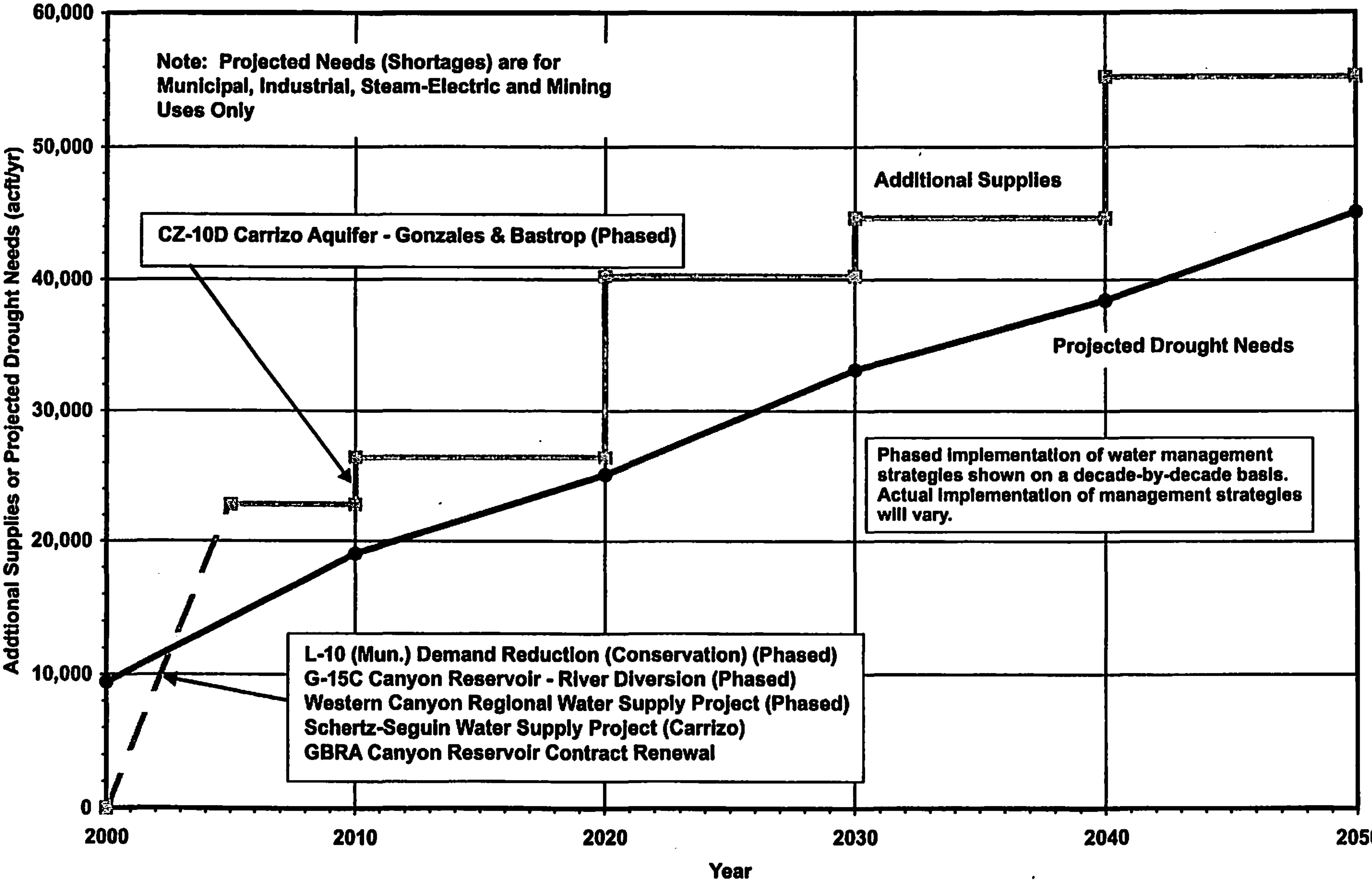

Figure 5.2-9. Regional Water Plan - Comal County

South Central Texas Region									County = Comal
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		3,850	13,576	19,483	27,365	34,366	42,347	
	Industrial		0	0	0	0	271	551	
	Steam-Electric		0	0	0	0	0	0	
	Mining		5,570	5,464	5,628	5,796	3,590	2,224	
	Irrigation		0	0	0	0	0	0	
	Total Needs		9,420	19,040	25,111	33,161	38,247	45,122	
	Mun, Ind, S-E, & Min Needs		9,420	19,040	25,111	33,161	38,247	45,122	
	Irrigation Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		616	718	848	718	824	942	1
WCRWSP	Western Canyon Regional Water Supply Project	10,527	3,716	3,716	3,716	3,716	7,716	7,716	2, 3
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)	20,000	1,315	1,315	1,315	1,315	1,315	1,315	4
G-15C	Canyon Reservoir - River Diversion	15,700	10,500	10,500	15,700	15,700	15,700	15,700	3, 5
GBRA	GBRA Canyon Reservoir Contract Renewal	6,676		6,676	6,676	6,676	6,676	6,676	6
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	27,500			3,500	12,000	16,500	23,000	7, 8, 9, 10
	Additional Municipal Reuse Programs								11
SCTN-4	Brush Management								11
SCTN-5	Weather Modification								11
SCTN-9	Rainwater Harvesting								11
	Small Aquifer Recharge Dams								11
	Total New Supplies		16,147	22,925	31,755	40,125	48,731	55,349	
	Total System Mgmt. Supply / Deficit		6,727	3,885	6,644	6,964	10,484	10,227	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		6,727	3,885	6,644	6,964	10,484	10,227	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	

Notes:	
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but may not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Fair Oaks Ranch, Garden Ridge, and New Braunfels.
2	Project in implementation phase. Includes delivery of GBRA Canyon Reservoir water to entities in Comal, Kendall, and Bexar Counties.
3	Project is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.
4	Project in implementation phase. Includes delivery of groundwater from southern Gonzales County to the City of Schertz.
5	Portion of Canyon firm yield diverted at or below New Braunfels. Includes water available upon expiration of CRWA contract in 2018.
6	Renewal of current GBRA Canyon Reservoir Contract with the City of New Braunfels which expires in December 2001.
7	Candidate New Supply to be shared by Comal and Guadalupe Counties. Effects on regional aquifer levels quantified.
8	Supply based on up to 15,000 acft/yr from northern Gonzales County and up to 12,500 acft/yr from southern Bastrop County.
9	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
10	Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. Regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
11	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

Revised Draft, 12/12/00

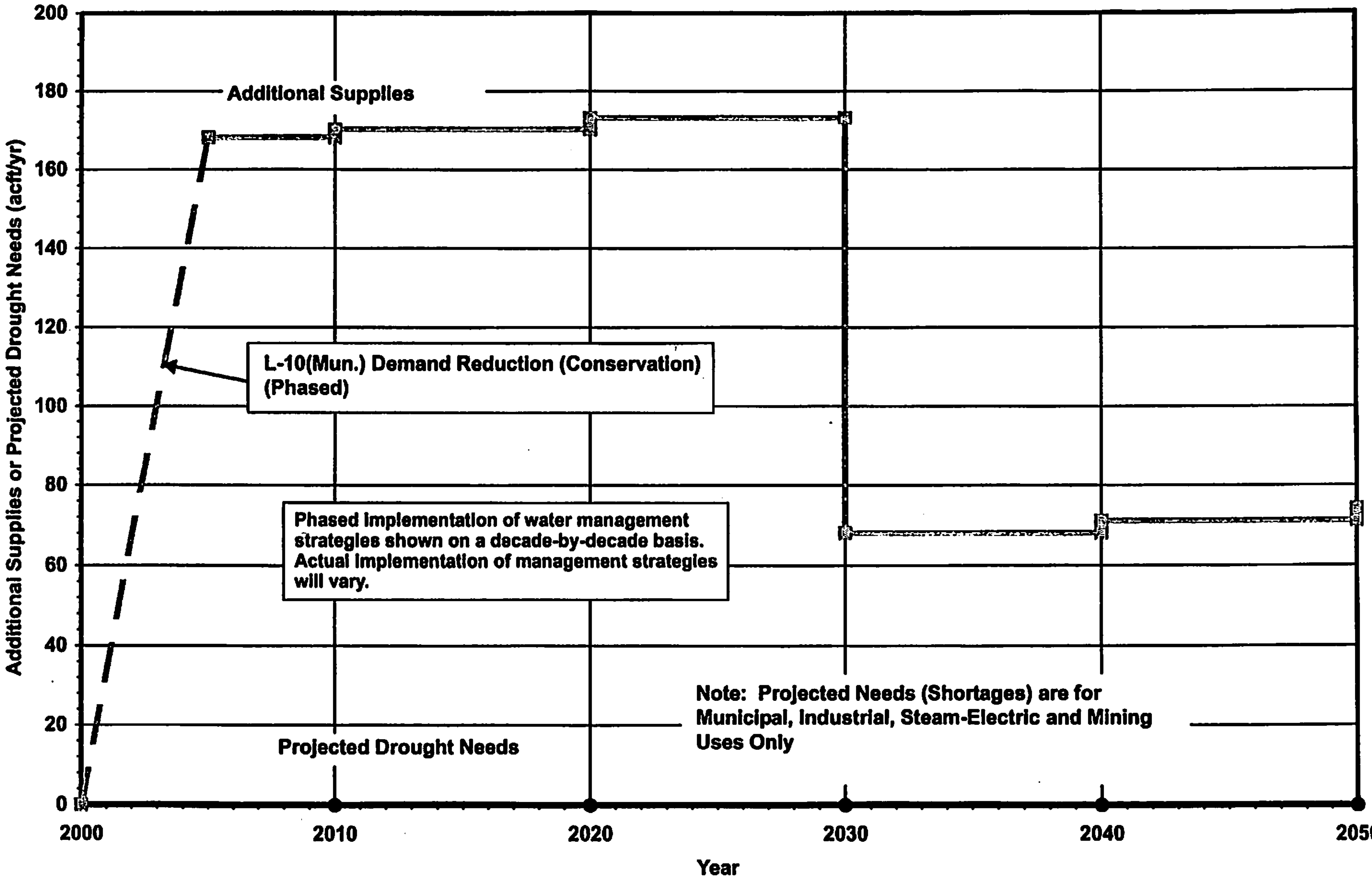

Figure 5.2-10. Regional Water Plan - DeWitt County

South Central Texas Region									County = DeWitt
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	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		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 Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		168	170	173	68	71	74	1
	Total New Supplies		168	170	173	68	71	74	
	Total System Mgmt. Supply / Deficit		168	170	173	68	71	74	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		168	170	173	68	71	74	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but may not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Cuero, Yoakum, and Yorktown.

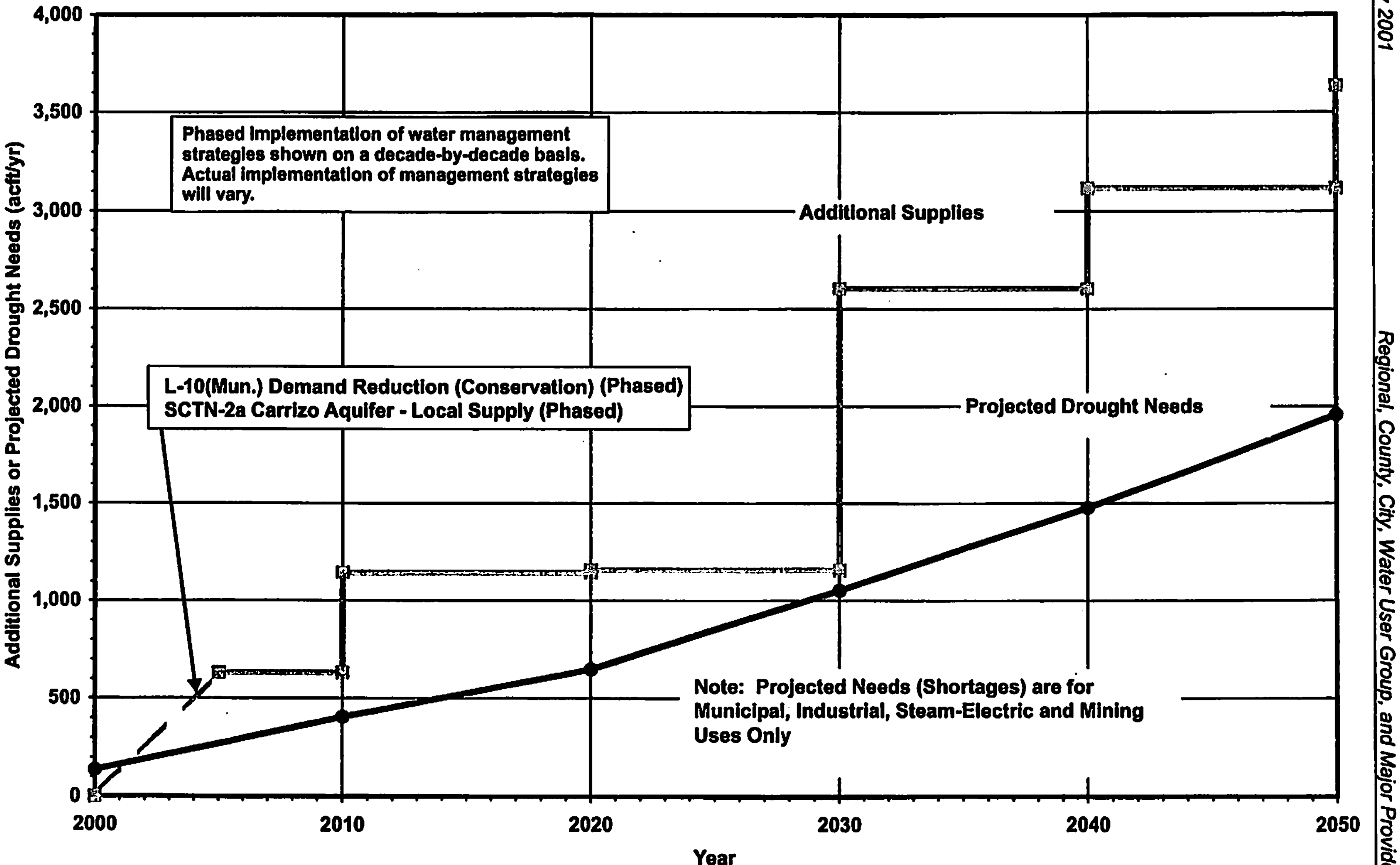

Figure 5.2-11. Regional Water Plan - Dimmit County

South Central Texas Region — **County = Dimmit**

County Summary of Projected Water Needs (Shortages) and Water Management Strategies — **User Group(s) = all**

Projected Water Needs (acft/yr)	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		138	405	649	1,054	1,479	1,959	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		138	405	649	1,054	1,479	1,959	
	Mun, Ind, S-E, & Min Needs		138	405	649	1,054	1,479	1,959	
	Irrigation Needs		0	0	0	0	0	0	

ID#	Water Management Strategies (acft/yr) Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		131	144	156	104	118	133	1
SCTN-2a	Carrizo Aquifer - Local Supply	3,500	500	1,000	1,000	2,500	3,000	3,500	2, 3
	Additional Municipal Reuse Programs								4
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
	Total New Supplies		631	1,144	1,156	2,604	3,118	3,633	
	Total System Mgmt. Supply / Deficit		493	739	507	1,550	1,639	1,674	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		493	739	507	1,550	1,639	1,674	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Big Wells and Carrizo Springs.
2	Additional well(s) for Carrizo Springs supply.
3	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
4	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

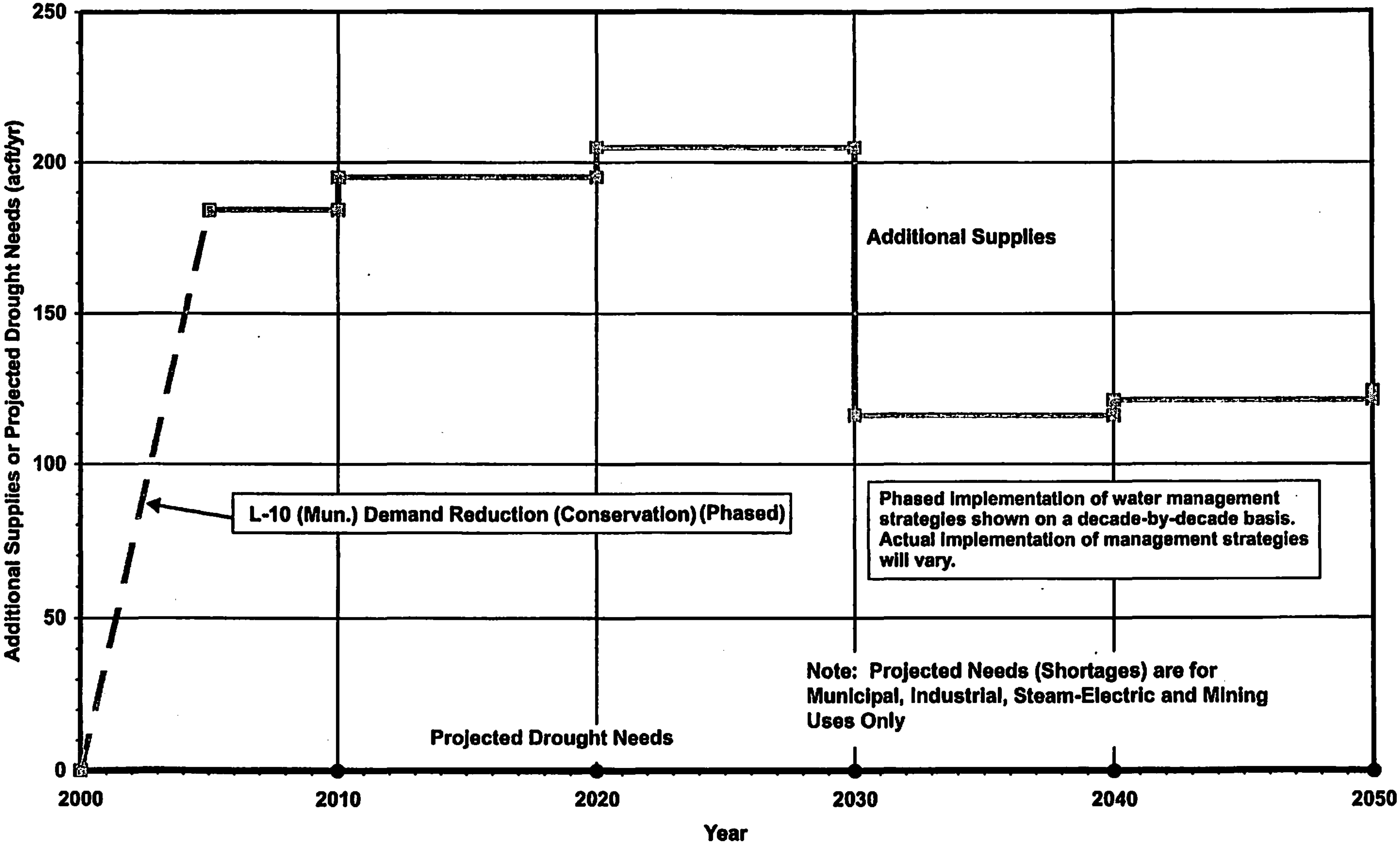

Figure 5.2-12. Regional Water Plan - Frio County

South Central Texas Region									County = Frio
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	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		71,125	67,645	64,365	76,506	73,520	70,663	
	Total Needs		71,125	67,645	64,365	76,506	73,520	70,663	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		71,125	67,645	64,365	76,506	73,520	70,663	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		184	195	205	116	121	124	1
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								2
L-10 (Irr.)	Demand Reduction (Conservation)		5,947	5,947	5,947	5,947	5,947	5,947	3
	Total New Supplies		6,131	6,142	6,152	6,063	6,068	6,071	
	Total System Mgmt. Supply / Deficit		-64,994	-61,503	-58,213	-70,443	-67,452	-64,592	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		184	195	205	116	121	124	
	Irrigation System Mgmt. Supply / Deficit		-65,178	-61,698	-58,418	-70,559	-67,573	-64,716	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Dilley and Pearsall.
2	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
3	Estimates based upon use of LEPA systems on 50 percent of acreage irrigated in 1997, with conservation at 20 percent of irrigation application rate.

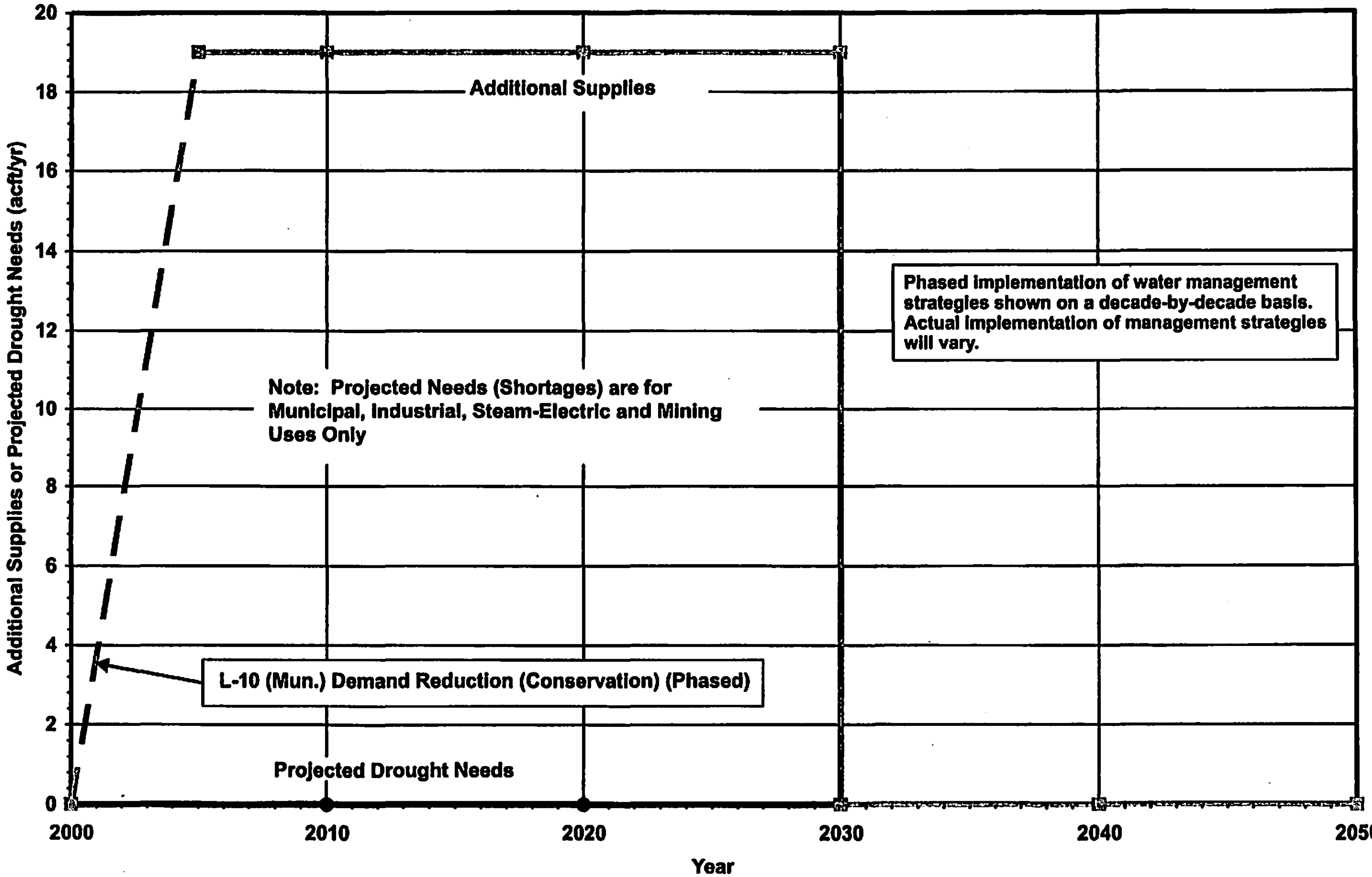

Figure 5.2-13. Regional Water Plan - Goliad County

South Central Texas Region									County = Goliad
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	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		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 Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		19	19	19	0	0	0	1
	Total New Supplies		19	19	19	0	0	0	
	Total System Mgmt. Supply / Deficit		19	19	19	0	0	0	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		19	19	19	0	0	0	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the City of Goliad.

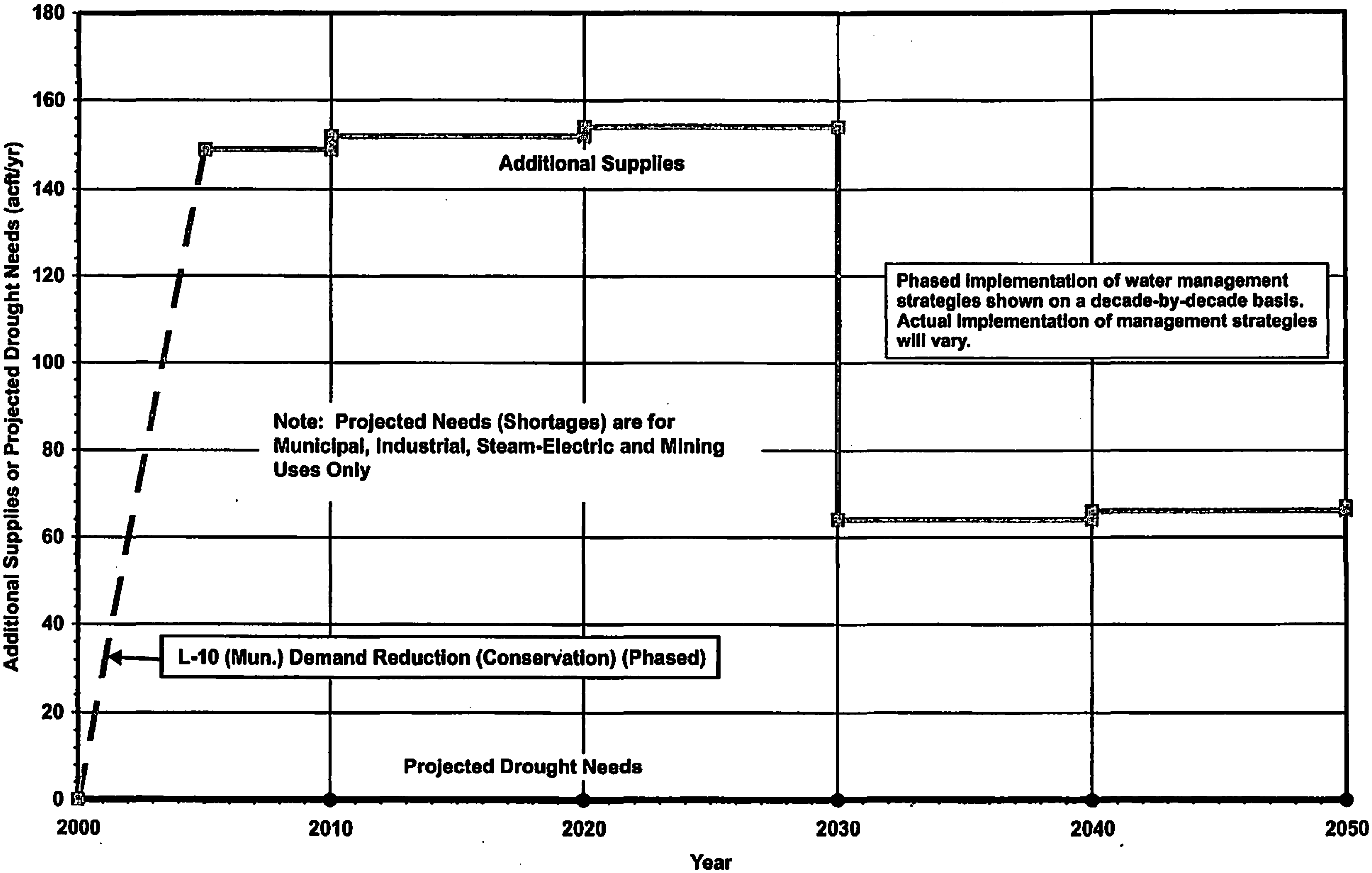

Figure 5.2-14. Regional Water Plan - Gonzales County

South Central Texas Region							**County = Gonzales**		
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							**User Group(s) = all**		
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**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		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 Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		149	152	154	64	66	67	1
	Total New Supplies		149	152	154	64	66	67	
	Total System Mgmt. Supply / Deficit		149	152	154	64	66	67	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		149	152	154	64	66	67	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Gonzales, Nixon, and Waelder.

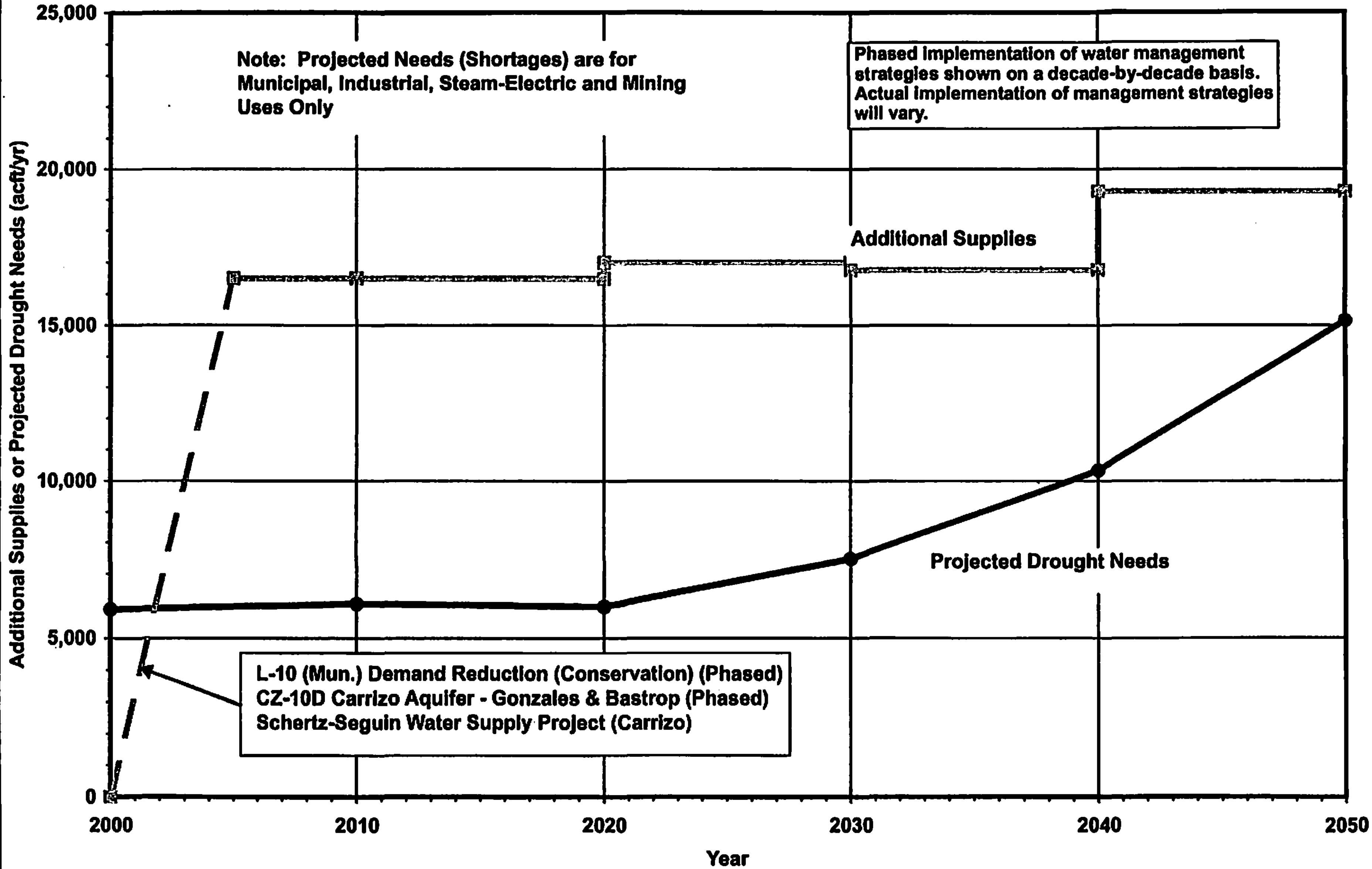

Figure 5.2-15. Regional Water Plan - Guadalupe County

South Central Texas Region								County = Guadalupe		
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								User Group(s) = all		
Projected Water Needs (acft/yr)										
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		3,795	3,740	3,507	4,870	7,529	12,132	
	Industrial		979	1,198	1,344	1,481	1,686	1,893	
	Steam-Electric		920	920	920	920	920	920	
	Mining		196	198	200	202	207	213	
	Irrigation		883	777	677	582	492	406	
	Total Needs		6,773	6,833	6,648	8,055	10,834	15,564	
	Mun, Ind, S-E, & Min Needs		5,890	6,056	5,971	7,473	10,342	15,158	
	Irrigation Needs		883	777	677	582	492	406	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		235	236	236	5	5	6	1
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	27,500	1,500	1,500	2,000	2,000	2,500	4,500	2, 3, 4, 5
SSWSP	Schertz-Seguin Water Supply Project (Carrizo)	20,000	14,766	14,766	14,766	14,766	14,766	14,766	6
	Additional Municipal Reuse Programs								7
	Small Aquifer Recharge Dams								7
CRWA	Lake Dunlap WTP Expansion & Mid-Cities Project								
	Total New Supplies		16,501	16,502	17,002	16,771	17,271	19,272	
	Total System Mgmt. Supply / Deficit		9,728	9,669	10,354	8,716	6,437	3,708	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		10,611	10,446	11,031	9,298	6,929	4,114	
	Irrigation System Mgmt. Supply / Deficit		-883	-777	-677	-582	-492	-406	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Cibolo, Marion, McQueeney, New Braunfels, and Seguin.
2	Candidate New Supply to be shared by Comal and Guadalupe Counties. Effects on regional aquifer levels quantified.
3	Supply based on up to 15,000 acft/yr from northern Gonzales County and up to 12,500 acft/yr from southern Bastrop County.
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
5	Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. Regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
6	Project in implementation phase. Includes delivery of groundwater from southern Gonzales County to the Cities of Schertz and Seguin.
7	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

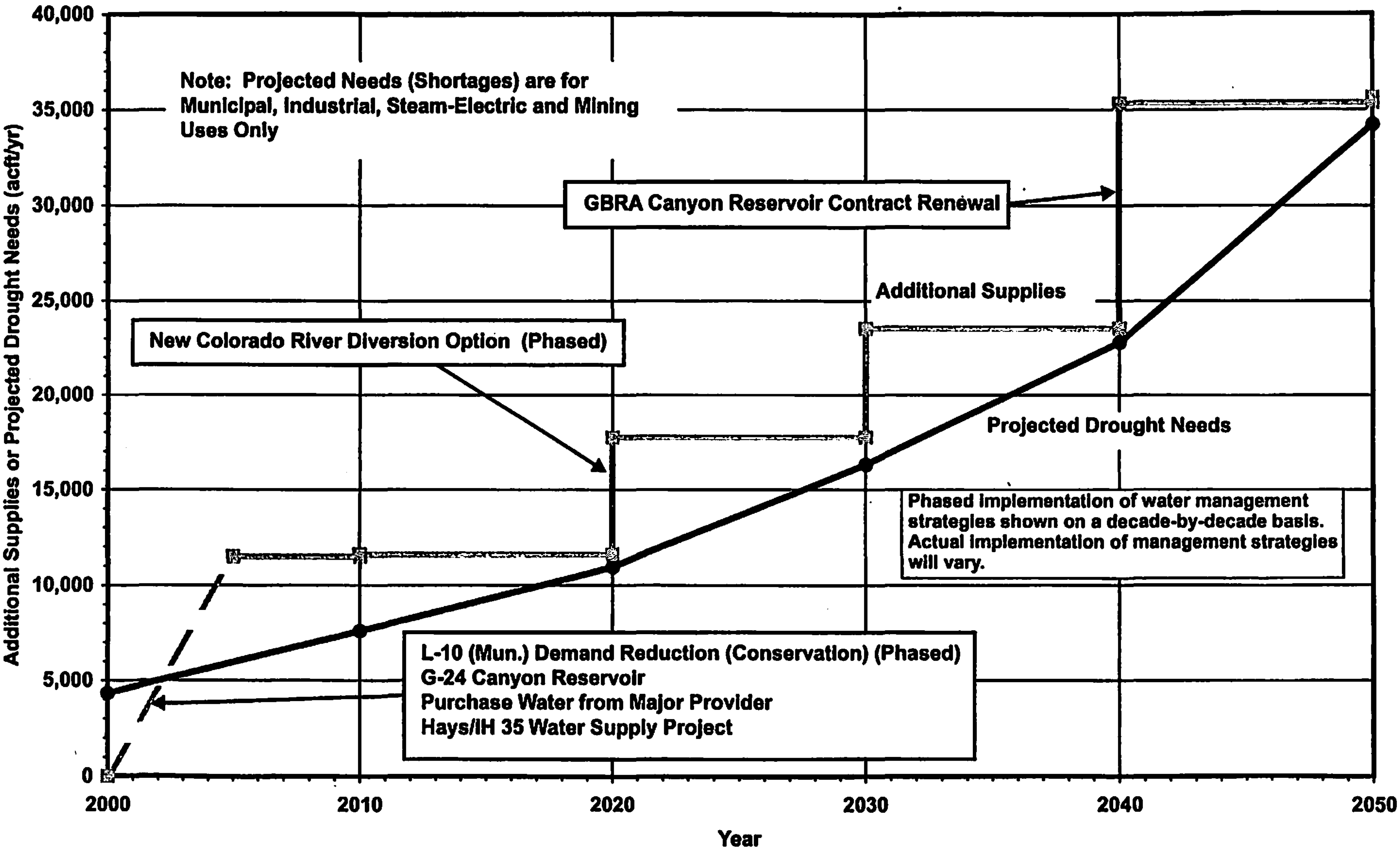

Figure 5.2-16. Regional Water Plan - Hays County

South Central Texas Region									County = Hays
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		4,245	7,529	10,900	16,269	22,772	34,204	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		84	82	68	55	37	28	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**4,329**	**7,611**	**10,968**	**16,324**	**22,809**	**34,232**	
	Mun, Ind, S-E, & Min Needs		**4,329**	**7,611**	**10,968**	**16,324**	**22,809**	**34,232**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		647	747	873	699	906	1,174	1
PMP	Purchase Water from Major Provider	5,000	5,000	5,000	5,000	5,000	5,000	5,000	2, 3
HIH35WSP	Hays/IH 35 Water Supply Project	4,500	4,500	4,500	4,500	4,500	4,500	4,500	3
G-24	Canyon Reservoir	1,348	1,348	1,348	1,348	1,348	1,348	1,348	4
LCRA	New Colorado River Diversion Option	150,000				6,000	12,000	18,000	5, 6
GBRA	GBRA Canyon Reservoir Contract Renewal						589	5,589	7
	Additional Municipal Reuse Programs								8
SCTN-4	Brush Management								8
SCTN-5	Weather Modification								8
SCTN-9	Rainwater Harvesting								8
	Small Aquifer Recharge Dams								8
	Total New Supplies		**11,495**	**11,595**	**11,721**	**17,547**	**24,343**	**35,611**	
	Total System Mgmt. Supply / Deficit		**7,166**	**3,984**	**753**	**1,223**	**1,534**	**1,379**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**7,166**	**3,984**	**753**	**1,223**	**1,534**	**1,379**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Kyle, San Marcos, Wimberley, and Woodcreek.								
2	Purchase of additional water supply under GBRA Canyon Reservoir Contract. Delivery through existing facilities.								
3	Purchase dependent upon CA#18-2074 amendment authorizing additional diversions from Canyon Reservoir. Project in implementation phase.								
4	Candidate New Supply for Wimberley, Woodcreek, and Blanco. Blanco located in Region K and has estimated need of 300 acft/yr.								
5	Candidate New Supply to be shared by Bexar and Hays Counties. Delivery to Hays County through diversion from Colorado River @ Bastrop.								
6	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.								
7	Renewal of current GBRA Canyon Reservoir Contracts with the Cities of Kyle and San Marcos which expire in December 2038 and July 2047, respectively.								
8	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

Revised Draft, 12/12/00

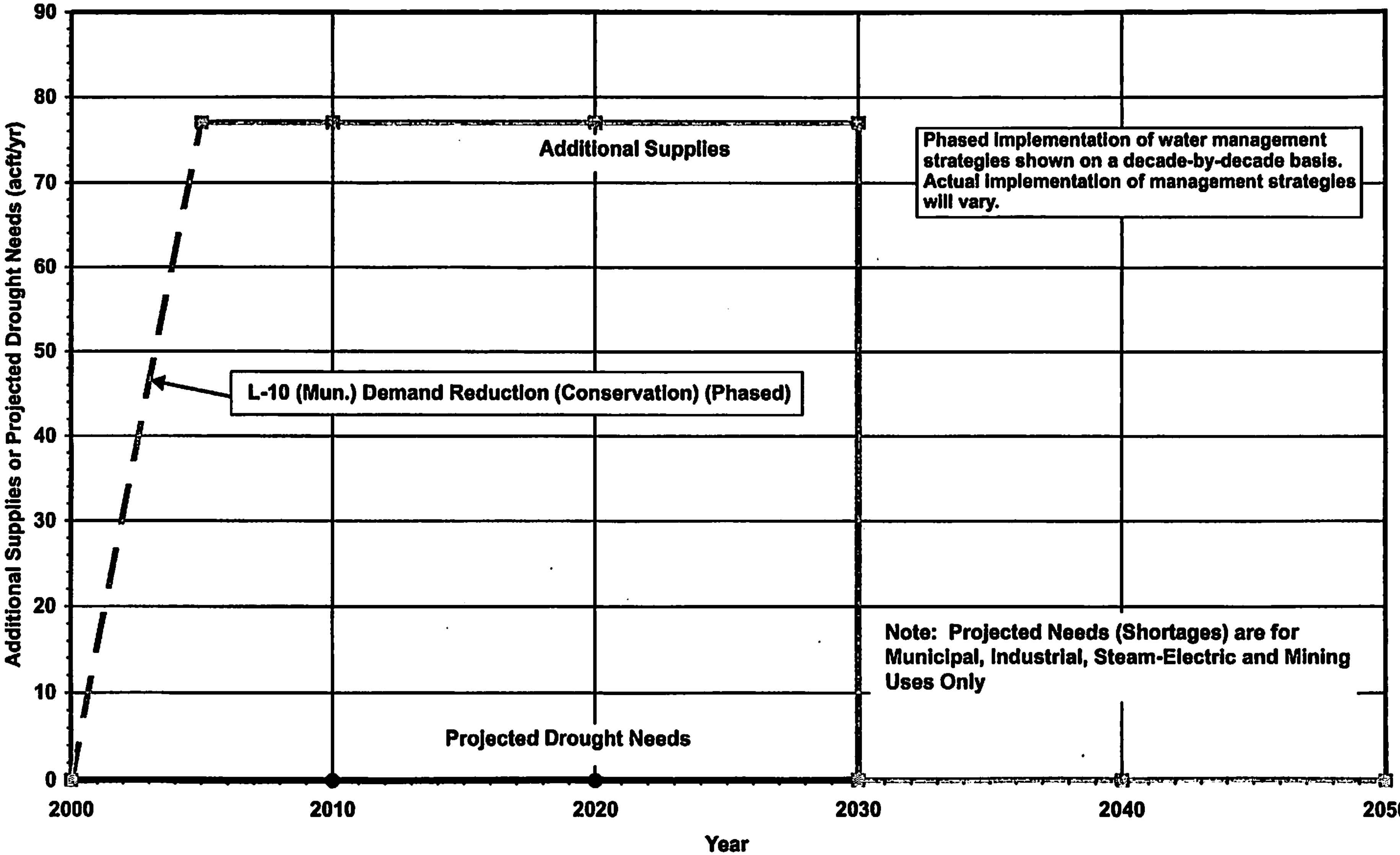

Figure 5.2-17. Regional Water Plan - Karnes County

South Central Texas Region									**County = Karnes**
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**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		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 Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		77	77	77	0	0	0	1
	Total New Supplies		**77**	**77**	**77**	**0**	**0**	**0**	
	Total System Mgmt. Supply / Deficit		**77**	**77**	**77**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**77**	**77**	**77**	**0**	**0**	**0**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Karnes City, Kenedy, and Runge.

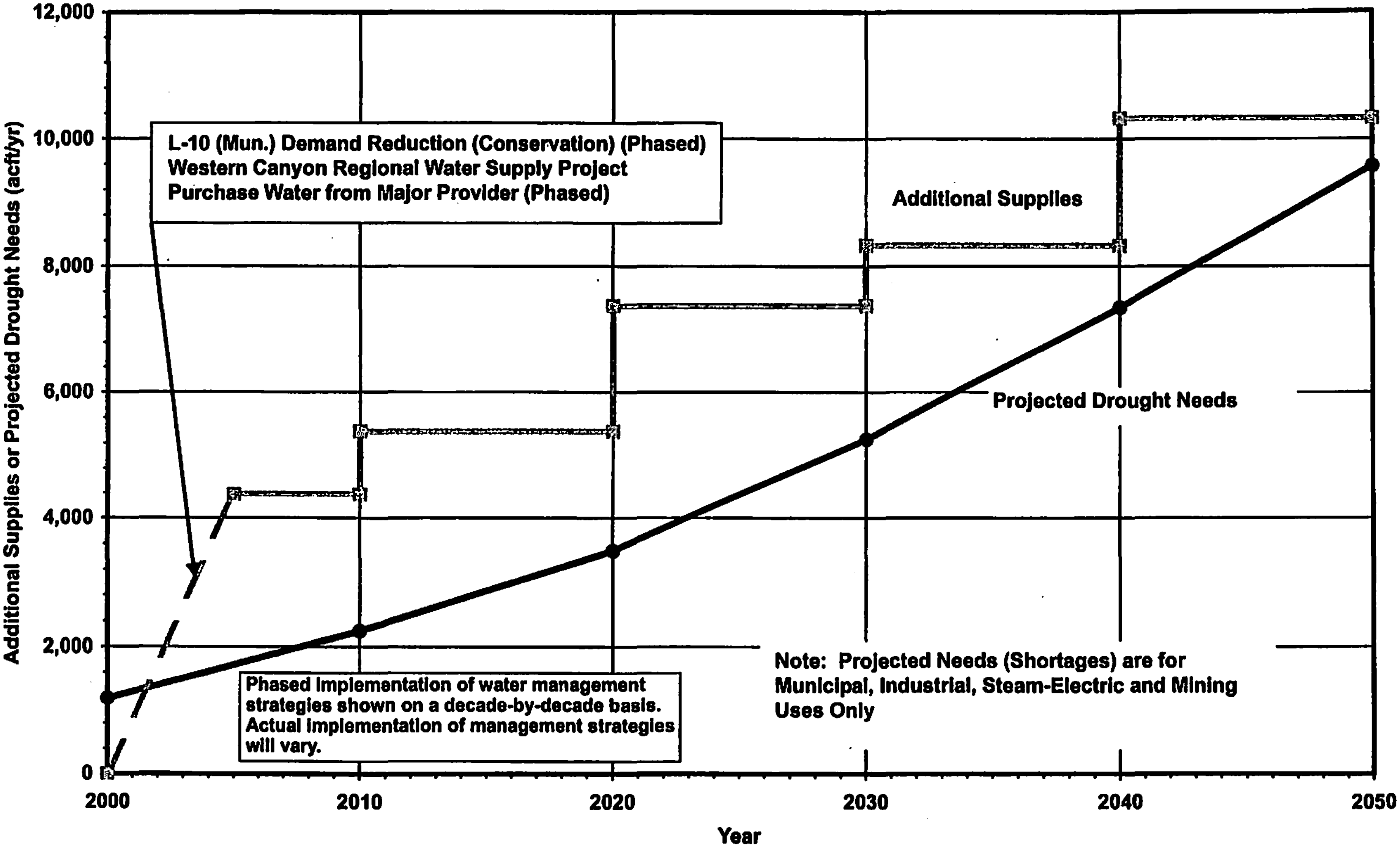

Figure 5.2-18. Regional Water Plan - Kendall County

South Central Texas Region									County = Kendall
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									User Group(s) = all
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		1,194	2,242	3,485	5,262	7,359	9,575	
	Industrial		2	3	4	4	5	6	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		1,196	2,245	3,489	5,266	7,364	9,581	
	Mun, Ind, S-E, & Min Needs		1,196	2,245	3,489	5,266	7,364	9,581	
	Irrigation Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		67	71	71	11	11	11	1
WCRWSP	Western Canyon Regional Water Supply Project	10,527	2,311	2,311	2,311	2,311	2,311	2,311	2
PMP	Purchase Water from Major Provider	8,000	2,000	2,000	3,000	5,000	6,000	8,000	3, 4
	Additional Municipal Reuse Programs								5
SCTN-4	Brush Management								5
SCTN-5	Weather Modification								5
SCTN-9	Rainwater Harvesting								5
	Small Aquifer Recharge Dams								5
	Total New Supplies		4,378	4,382	5,382	7,322	8,322	10,322	
	Total System Mgmt. Supply / Deficit		3,182	2,137	1,893	2,056	958	741	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		3,182	2,137	1,893	2,056	958	741	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Boerne, Comfort, and Fair Oaks Ranch.								
2	Project in implementation phase. Includes delivery of GBRA Canyon Reservoir water from Lake Dunlap to Boerne and Fair Oaks Ranch. Project is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.								
3	Assumed purchase from Regional Water Provider for Bexar County or other major provider. Kendall County water needs are not reflected in Bexar County table.								
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.								
5	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

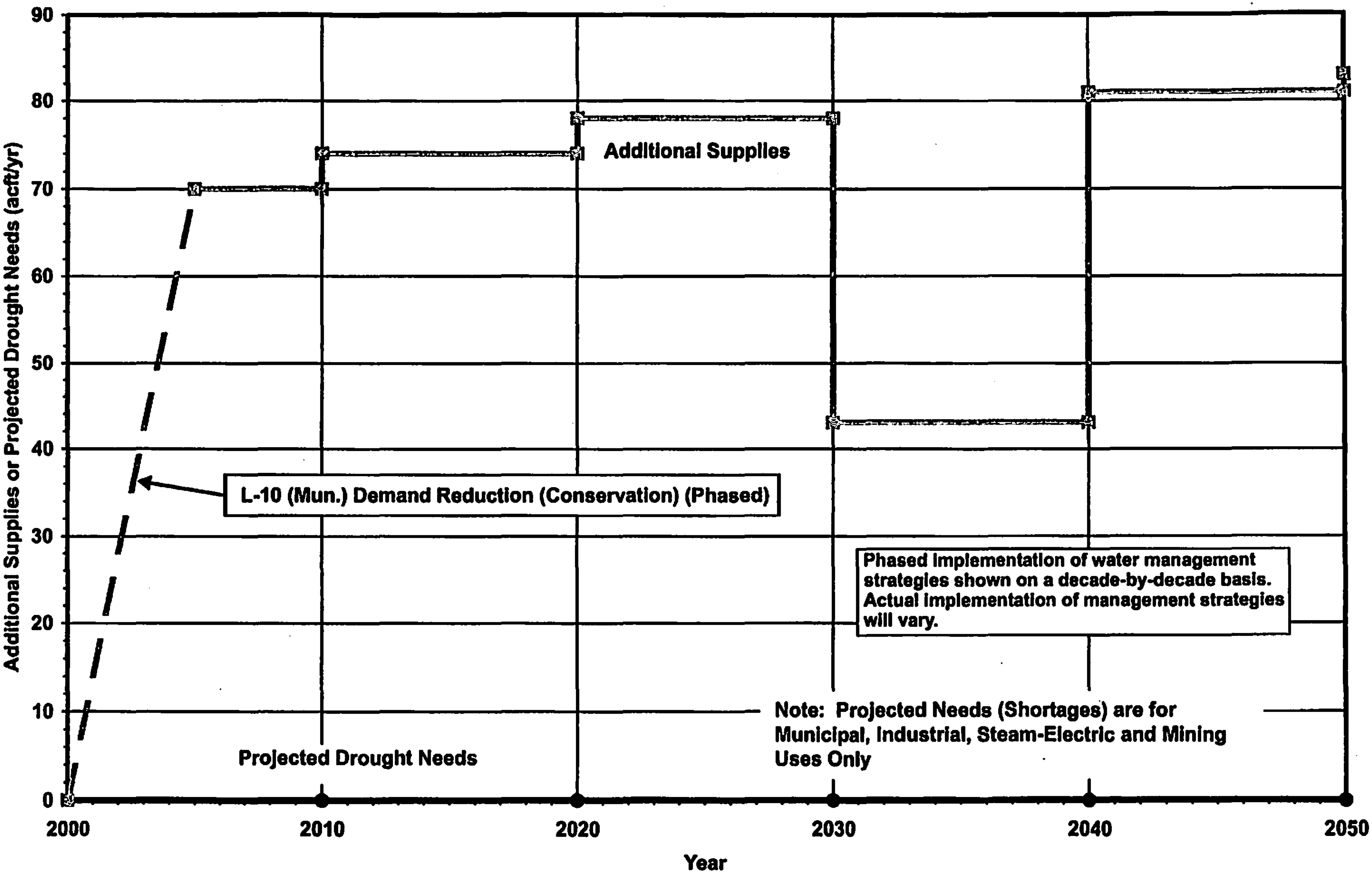

Figure 5.2-19. Regional Water Plan - La Salle County

South Central Texas Region							County = La Salle		
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							User Group(s) = all		
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**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		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 Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		76	80	84	43	81	83	1
	Total New Supplies		76	80	84	43	81	83	
	Total System Mgmt. Supply / Deficit		76	80	84	43	81	83	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		76	80	84	43	81	83	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Cotulla and Encinal.

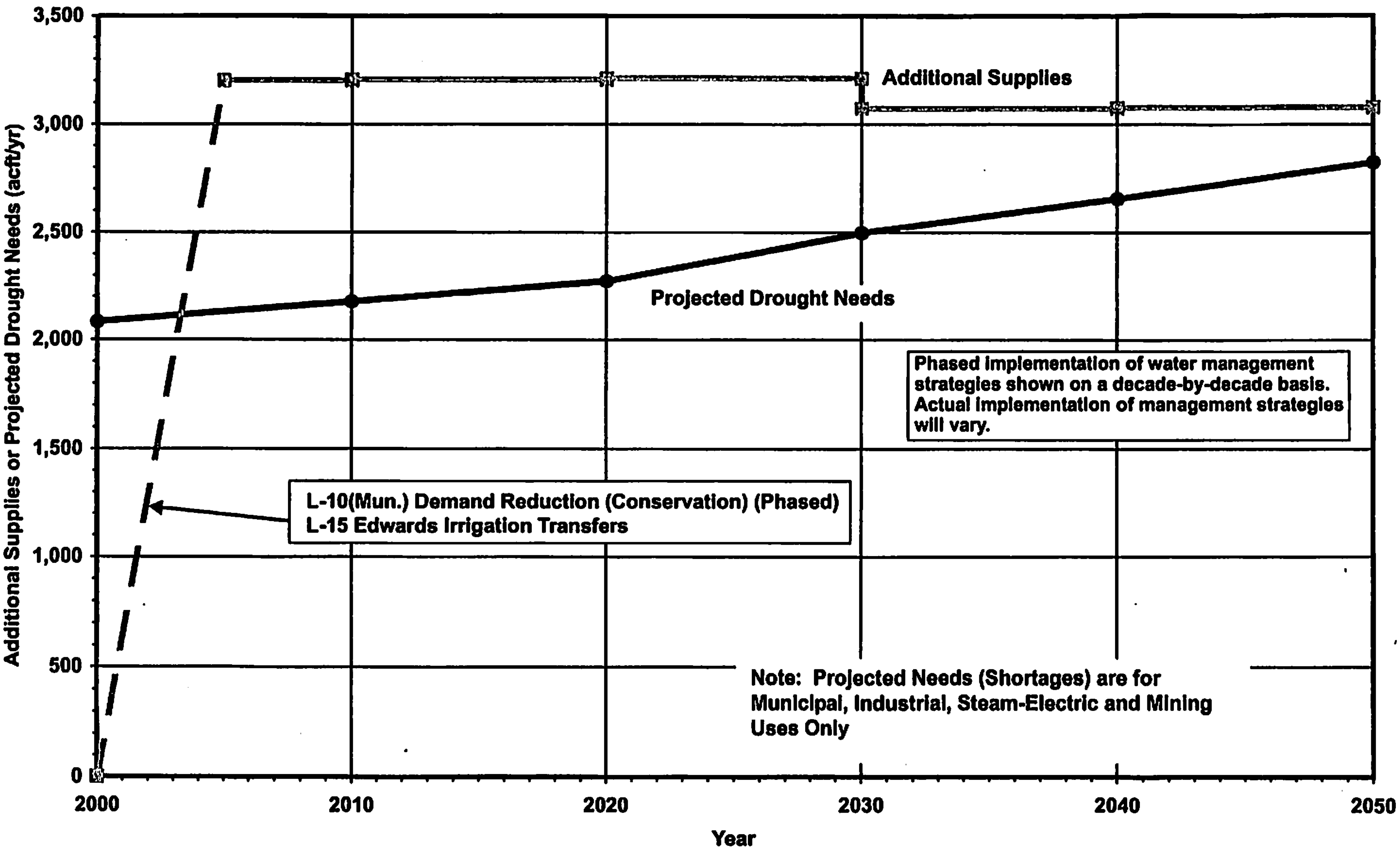

Figure 5.2-20. Regional Water Plan - Medina County

South Central Texas Region								**County = Medina**	
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								**User Group(s) = all**	
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		2,015	2,110	2,206	2,427	2,582	2,750	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		68	68	70	72	74	76	
	Irrigation		78,206	72,360	66,580	65,382	60,082	55,006	
	Total Needs		**80,289**	**74,538**	**68,856**	**67,881**	**62,738**	**57,832**	
	Mun, Ind, S-E, & Min Needs		**2,083**	**2,178**	**2,276**	**2,499**	**2,656**	**2,826**	
	Irrigation Needs		**78,206**	**72,360**	**66,580**	**65,382**	**60,082**	**55,006**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		200	205	211	73	76	78	1
L-15	Edwards Irrigation Transfers	42,686	3,000	3,000	3,000	3,000	3,000	3,000	2, 3
	Additional Municipal Reuse Programs								4
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)		5,000	5,000	5,000	5,000	5,000	5,000	5
	Total New Supplies		**8,200**	**8,205**	**8,211**	**8,073**	**8,076**	**8,078**	
	Total System Mgmt. Supply / Deficit		**-72,089**	**-66,333**	**-60,645**	**-59,808**	**-54,662**	**-49,754**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**1,117**	**1,027**	**935**	**574**	**420**	**252**	
	Irrigation System Mgmt. Supply / Deficit		**-73,206**	**-67,360**	**-61,580**	**-60,382**	**-55,082**	**-50,006**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Castroville, Devine, Hondo, Lacoste, and Natalia.								
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.								
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).								
4	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								
5	Estimates based on remaining irrigation water conservation potential through LEPA installation after consideration of Edwards Irrigation Transfers (L-15) and transfer of water conserved through Irrigation Demand Reduction (L-10) to Bexar County municipal supply.								

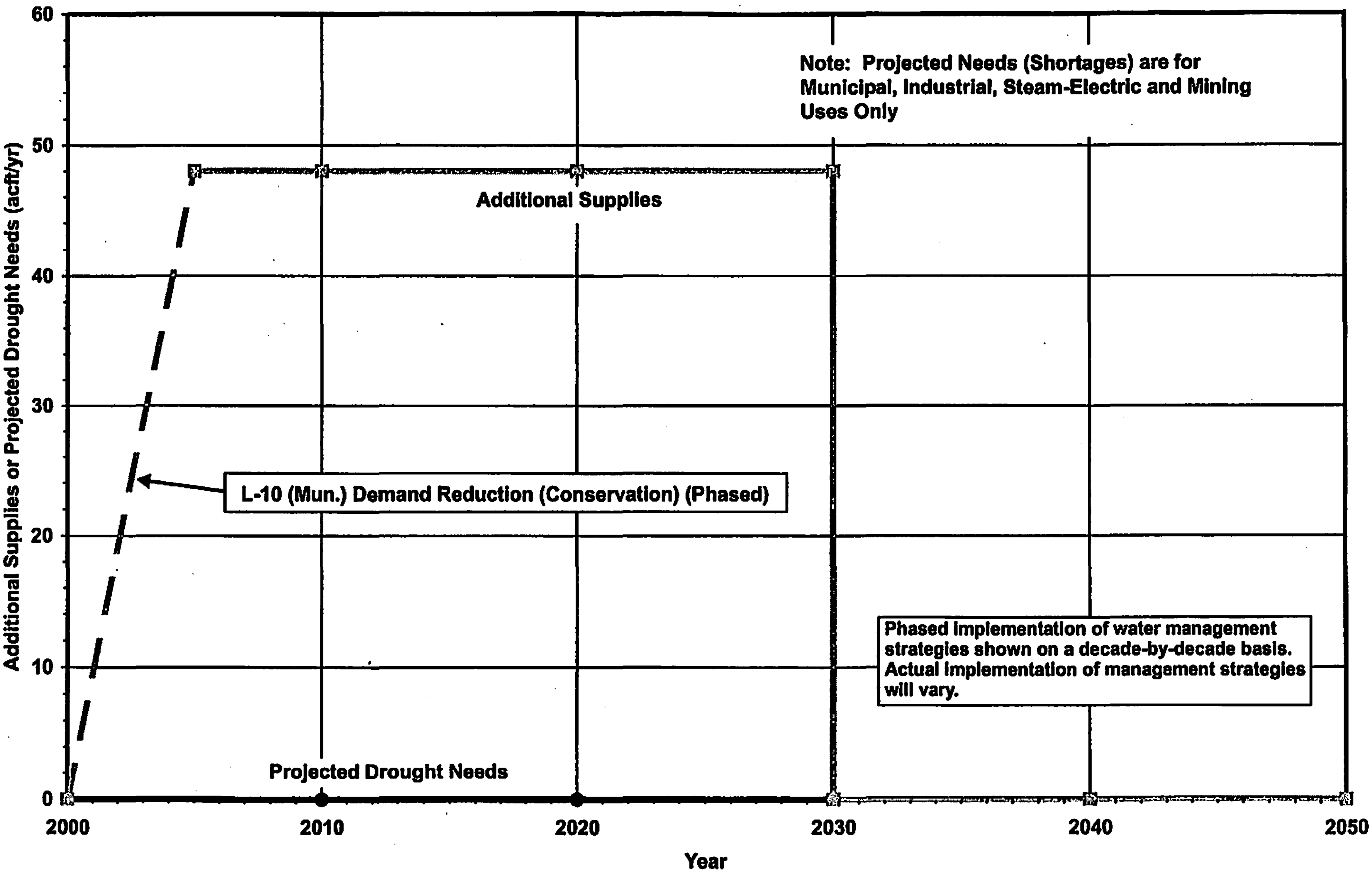

Figure 5.2-21. Regional Water Plan - Refugio County

South Central Texas Region									**County = Refugio**
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**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		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 Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		48	48	48	0	0	0	1
	Total New Supplies		**48**	**48**	**48**	**0**	**0**	**0**	
	Total System Mgmt. Supply / Deficit		**48**	**48**	**48**	**0**	**0**	**0**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**48**	**48**	**48**	**0**	**0**	**0**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Refugio and Woodsboro.

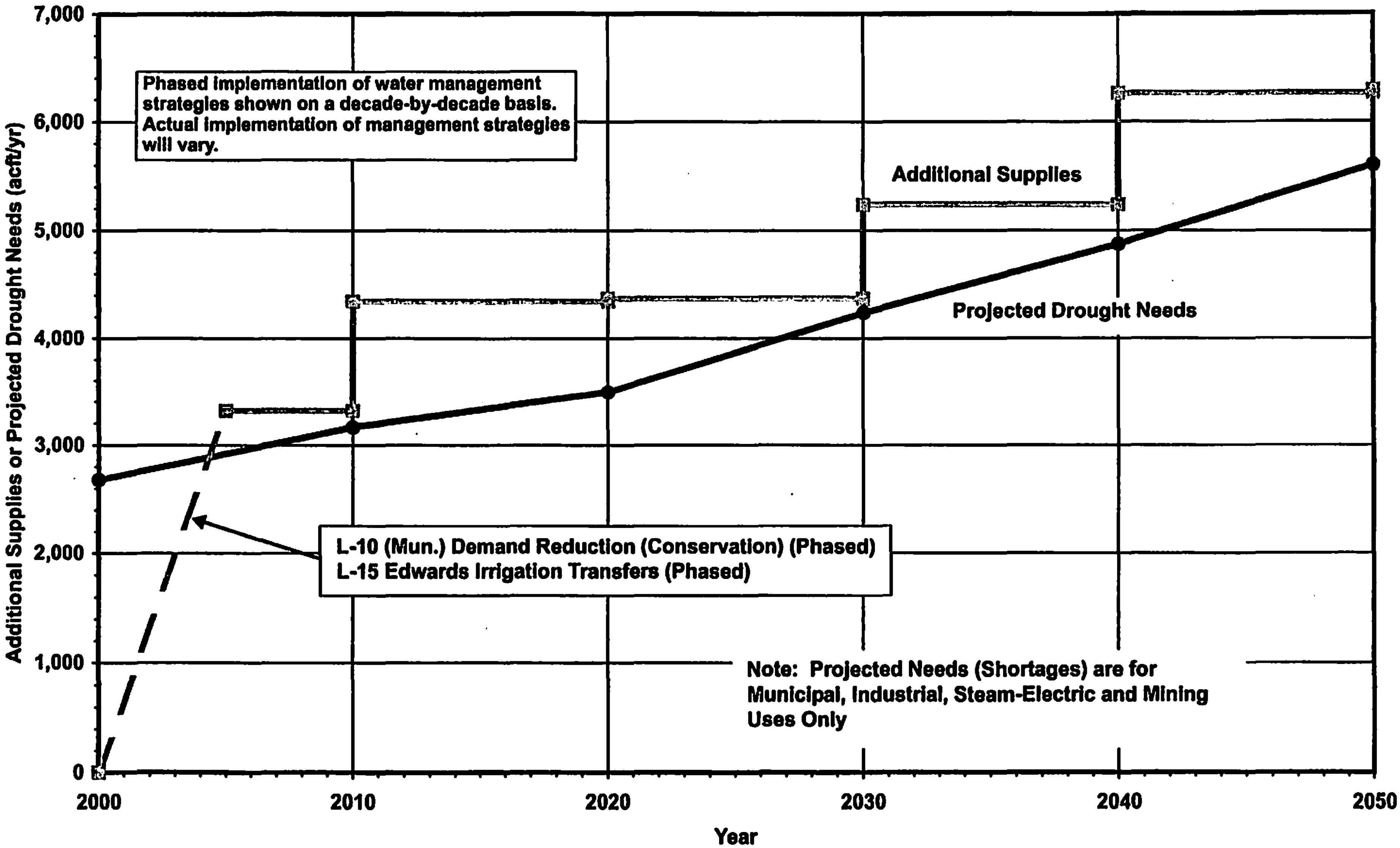

Figure 5.2-22. Regional Water Plan - Uvalde County

South Central Texas Region									**County = Uvalde**
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		2,682	3,166	3,493	4,241	4,880	5,609	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		48,551	43,250	38,243	36,274	31,674	27,383	
	Total Needs		**51,233**	**46,416**	**41,736**	**40,515**	**36,554**	**32,992**	
	Mun, Ind, S-E, & Min Needs		**2,682**	**3,166**	**3,493**	**4,241**	**4,880**	**5,609**	
	Irrigation Needs		**48,551**	**43,250**	**38,243**	**36,274**	**31,674**	**27,383**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		318	346	371	235	258	283	1
L-15	Edwards Irrigation Transfers	42,686	3,000	4,000	4,000	5,000	5,000	6,000	2, 3, 4
	Additional Municipal Reuse Programs								5
SCTN-4	Brush Management								5
SCTN-5	Weather Modification								5
SCTN-9	Rainwater Harvesting								5
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)		5,958	5,958	5,958	5,958	5,958	5,958	6
	Total New Supplies		**9,276**	**10,304**	**10,329**	**11,193**	**11,216**	**12,241**	
	Total System Mgmt. Supply / Deficit		**-41,957**	**-36,112**	**-31,407**	**-29,322**	**-25,338**	**-20,751**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**636**	**1,180**	**878**	**994**	**378**	**674**	
	Irrigation System Mgmt. Supply / Deficit		**-42,593**	**-37,292**	**-32,285**	**-30,316**	**-25,716**	**-21,425**	

Notes:

*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Sabinal and Uvalde.
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties.
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated annual transfer of 50,219 acft (about 53 percent of a maximum annual transfer of 95,430 acft based on Proposed Permits prorated to 400,000 acft/yr).
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.
5	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.
6	Estimates based on remaining irrigation water conservation potential through LEPA installation after consideration of Edwards Irrigation Transfers (L-15) and transfer of water conserved through irrigation Demand Reduction (L-10) to Bexar County municipal supply.

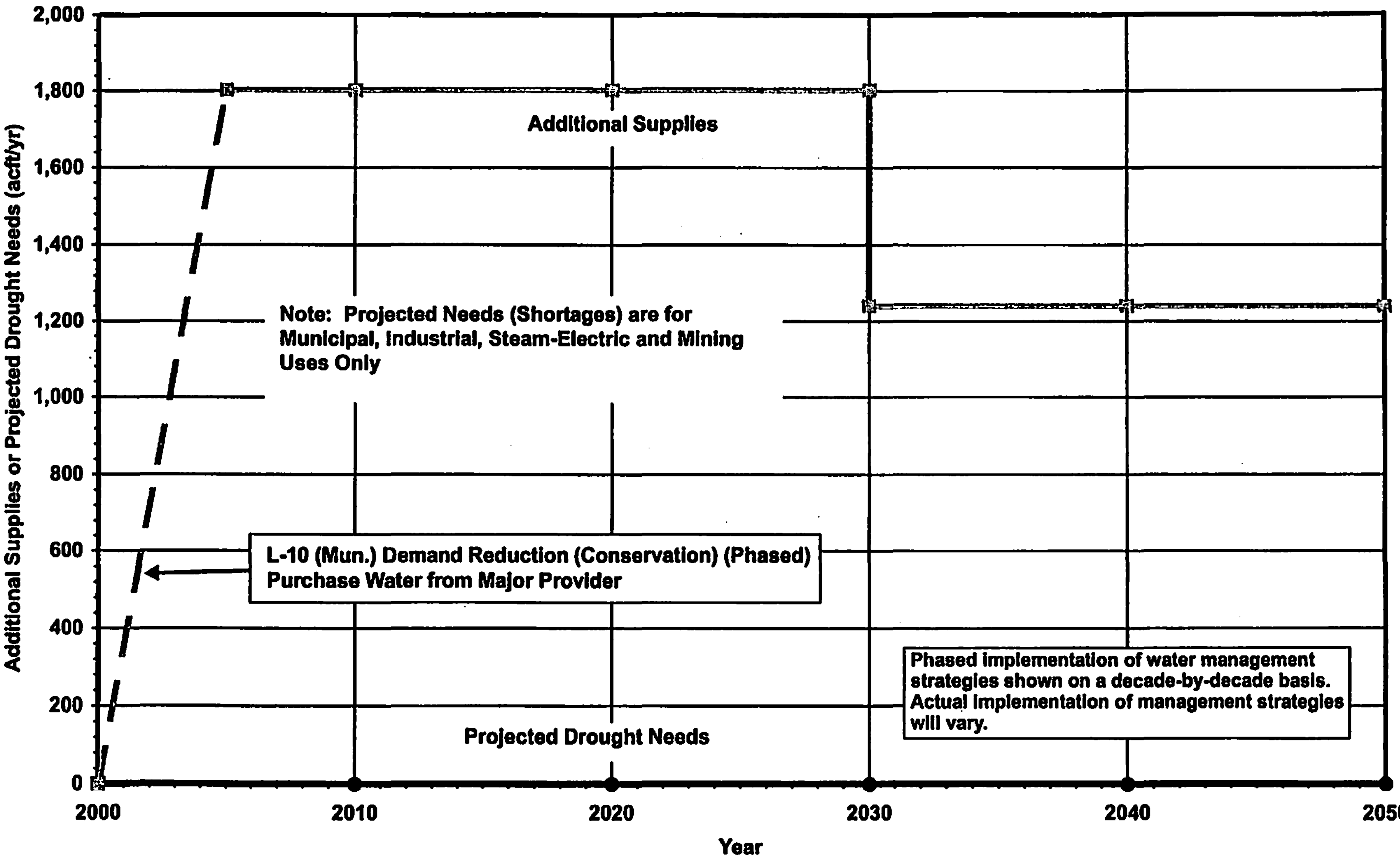

Figure 5.2-23. Regional Water Plan - Victoria County

South Central Texas Region							County = Victoria		
County Summary of Projected Water Needs (Shortages) and Water Management Strategies							User Group(s) = all		
Projected Water Needs (acft/yr)									
	User Group(s)		2000	2010	2020	2030	2040	2050	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		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 Needs		0	0	0	0	0	0	
Water Management Strategies (acft/yr)		Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		562	562	562	0	0	0	1
PMP	Purchase Water from Major Provider	1,240	1,240	1,240	1,240	1,240	1,240	1,240	2
	Total New Supplies		1,802	1,802	1,802	1,240	1,240	1,240	
	Total System Mgmt. Supply / Deficit		1,802	1,802	1,802	1,240	1,240	1,240	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,802	1,802	1,802	1,240	1,240	1,240	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Victoria and Bloomington.								
2	Contract is dependent upon amendment of CA# 18-2074 authorizing additional diversions from Canyon Reservoir.								

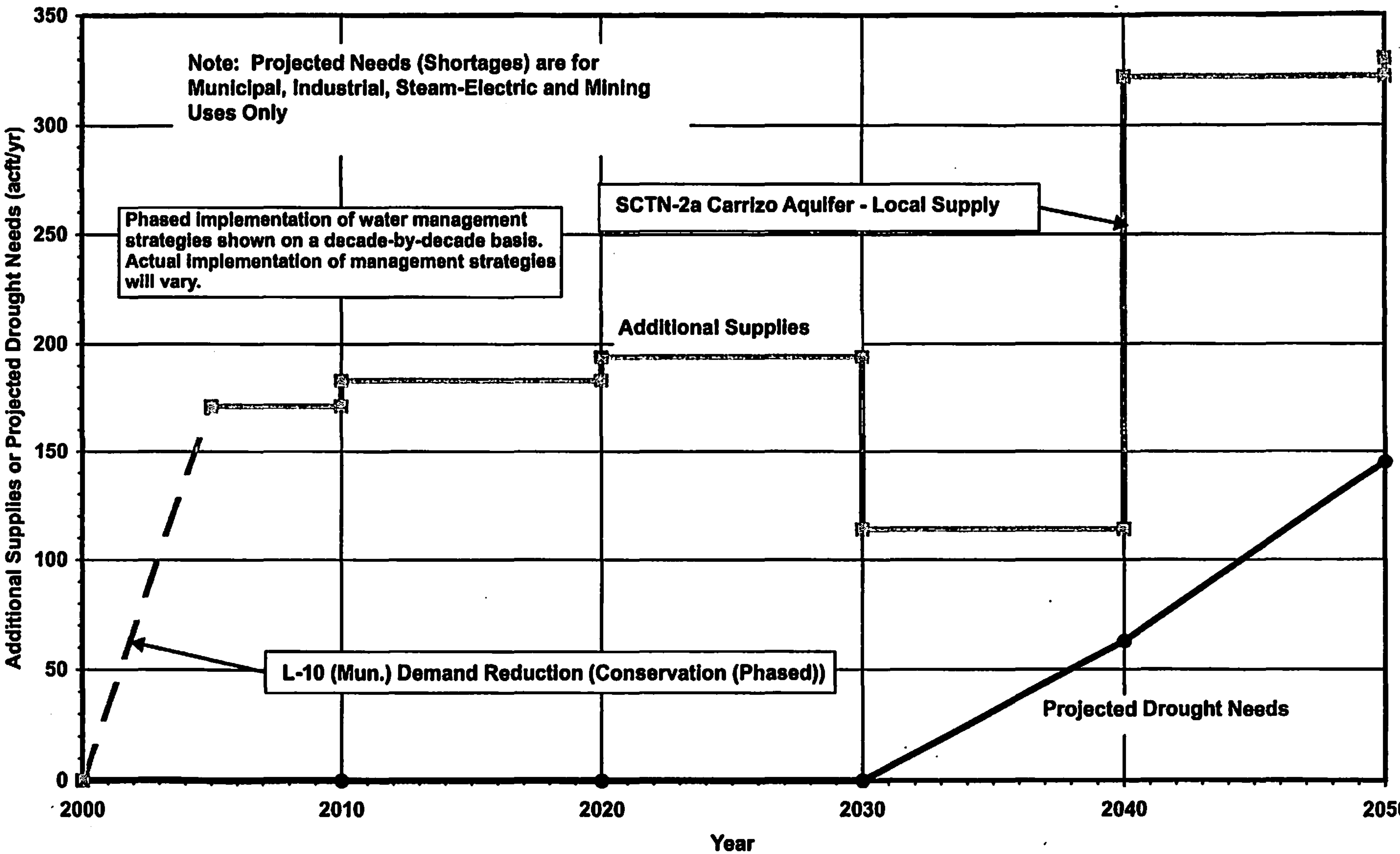

Figure 5.2-24. Regional Water Plan - Wilson County

South Central Texas Region								**County = Wilson**	
County Summary of Projected Water Needs (Shortages) and Water Management Strategies								**User Group(s) = all**	
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
	Municipal		0	0	0	0	63	145	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		**0**	**0**	**0**	**0**	**63**	**145**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**63**	**145**	
	Irrigation Needs		**0**	**0**	**0**	**0**	**0**	**0**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		171	183	194	114	122	130	1
SCTN-2a	Carrizo Aquifer - Local Supply	200					200	200	2
	Small Aquifer Recharge Dams								3
	Total New Supplies		**171**	**183**	**194**	**114**	**322**	**330**	
	Total System Mgmt. Supply / Deficit		**171**	**183**	**194**	**114**	**259**	**185**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**171**	**183**	**194**	**114**	**259**	**185**	
	Irrigation System Mgmt. Supply / Deficit		**0**	**0**	**0**	**0**	**0**	**0**	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Floresville, LaVernia, Poth, and Stockdale.								
2	Additional well(s) for Floresville.								
3	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

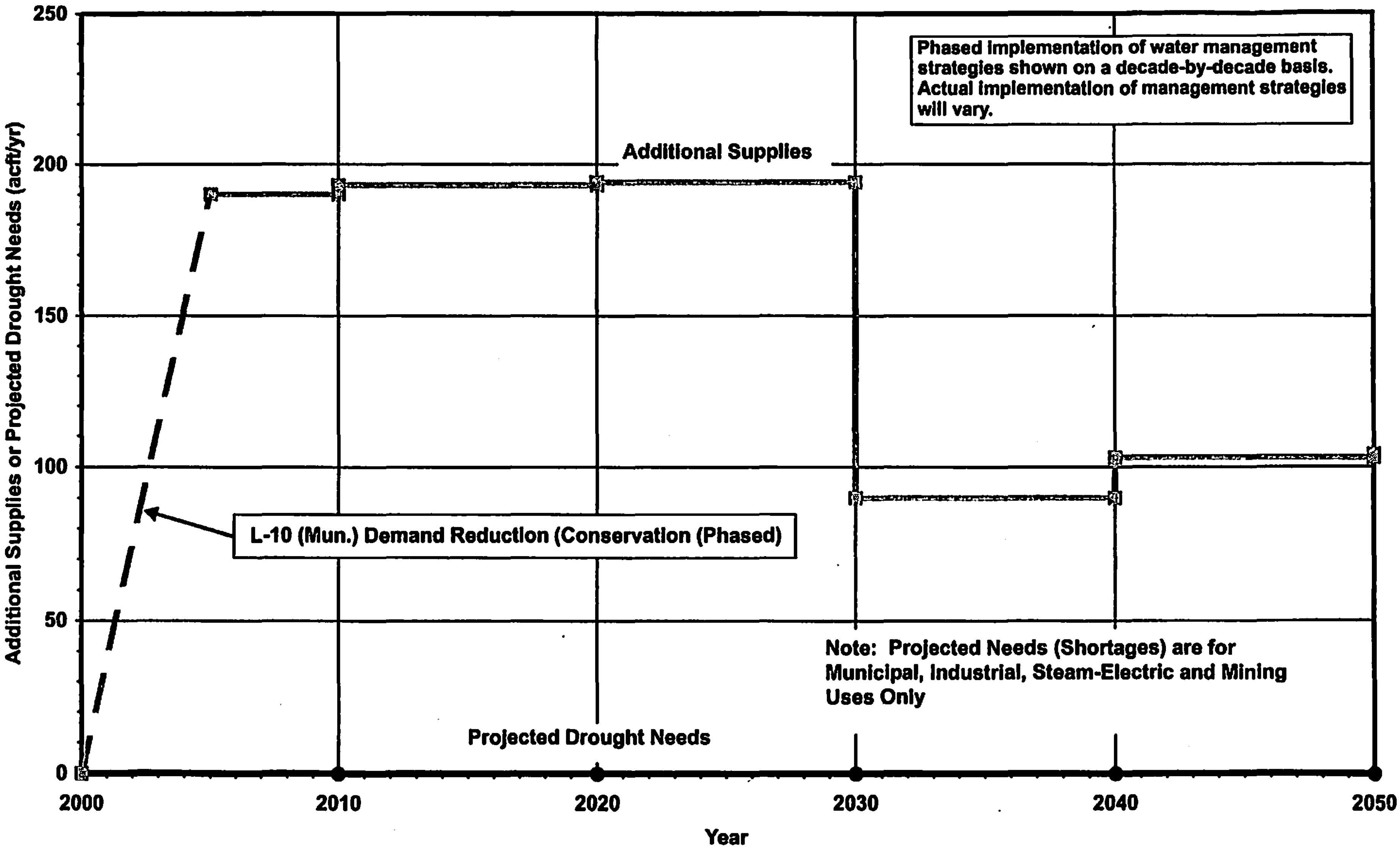

Figure 5.2-25. Regional Water Plan - Zavala County

South Central Texas Region									**County = Zavala**
County Summary of Projected Water Needs (Shortages) and Water Management Strategies									**User Group(s) = all**
Projected Water Needs (acft/yr)									
	User Group(s)		**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**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		80,722	76,589	72,655	88,293	84,673	81,200	
	Total Needs		**80,722**	**76,589**	**72,655**	**88,293**	**84,673**	**81,200**	
	Mun, Ind, S-E, & Min Needs		**0**	**0**	**0**	**0**	**0**	**0**	
	Irrigation Needs		**80,722**	**76,589**	**72,655**	**88,293**	**84,673**	**81,200**	
Water Management Strategies (acft/yr)		**Candidate**							
ID#	**Description**	**New Supply**	**2000***	**2010**	**2020**	**2030**	**2040**	**2050**	**Notes**
L-10 (Mun.)	Demand Reduction (Conservation)		190	193	194	90	103	104	1
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								2
L-10 (Irr.)	Demand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	3
	Total New Supplies		**6,591**	**6,594**	**6,595**	**6,491**	**6,504**	**6,505**	
	Total System Mgmt. Supply / Deficit		**-74,131**	**-69,995**	**-66,060**	**-81,802**	**-78,169**	**-74,695**	
	Mun, Ind, S-E, & Min System Mgmt. Supply / Deficit		**190**	**193**	**194**	**90**	**103**	**104**	
	Irrigation System Mgmt. Supply / Deficit		**-74,321**	**-70,188**	**-66,254**	**-81,892**	**-78,272**	**-74,799**	

Notes:

* Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.

1 Many Conservation strategies included in projected water demands. Supplies shown reflect implementation of additional conservation measures in the Cities of Batesville, Crystal City, and LaPryor.

2 Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.

3 Estimates based upon use of LEPA systems on 50 percent of acreage irrigated in 1997, with conservation at 20 percent of irrigation application rate.

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5.2.3 Water Management Strategies

Following is a brief description of each of the water management strategies included in the South Central Texas Regional Water Plan along with the associated dependable water supply during drought.

Municipal Demand Reduction (Conservation) (L-10 Mun.)

Management strategy includes municipal water conservation practices and programs to reduce per capita water use in cities by amounts in addition to reductions already incorporated into the TWDB advanced water conservation case water demand projections. Planned additional municipal water conservation focused on public education programs, accelerated retrofit of toilets, and changes in lawn irrigation could effectively increase supply through demand reduction in the South Central Texas Region by about 44,600 acft/yr in the year 2050. Volume III, Section 1.1 includes a detailed discussion of this management strategy.

Irrigation Demand Reduction (Conservation) (L-10 Irr.)

Management strategy achieves water conservation through the installation of Low Energy Precision Application (LEPA) irrigation systems and furrow dikes. Planned implementation of these conservation measures in Bexar, Medina, Uvalde, Atascosa, Frio, and Zavala Counties could effectively increase supply for irrigation through demand reduction by about 28,900 acft/yr after adjustment for planned Edwards Irrigation Transfers (L-15). Volume III, Section 1.1 includes a detailed discussion of this management strategy.

Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.)

Management strategy involves voluntary transfer of water conserved through the installation of Low Energy Precision Application (LEPA) irrigation systems and furrow dikes on farms obtaining supplies from the Edwards Aquifer to municipal users. Planned implementation of these conservation measures on about 53 percent of applicable acreage in Bexar, Medina, and Uvalde Counties could effectively increase municipal water supply for Bexar County by about 27,300 acft/yr (85 percent of 32,134 acft/yr), after adjustment for planned Edwards Irrigation Transfers (L-15) and consideration of Critical Period Management reductions during drought.

Edwards Irrigation Transfers (L-15)

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. Planned voluntary transfers of 50,219 acft/yr (about 53 percent of eligible proposed Edwards irrigation rights in Bexar, Medina, and Uvalde Counties totaling 95,430 acft/yr) could effectively increase municipal water supply by about 42,700 acft/yr (85 percent of 50,219 acft/yr), after consideration of Critical Period Management reductions during drought. Volume III, Section 1.3 includes a detailed discussion of this management strategy.

Edwards Recharge – Type 2 Projects (L-18a)

Management strategy 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 Environmental Criteria were applied in the technical evaluations of projects comprising this management strategy located on streams which typically flow. Summaries of applicable instream flow criteria are included in Volume III, Appendix F. 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 Regional Water Plan. Volume III, Section 2.2 includes a detailed discussion of this management strategy.

Canyon Reservoir – River Diversion (G-15C)

Management strategy involves the purchase of stored water from Canyon Reservoir made available by amendment of Certificate of Adjudication No. 18-2074 to authorize additional diversions. An application for this amendment has been submitted by the Guadalupe-Blanco River Authority (GBRA) and is presently under consideration by the Texas Natural Resource

Conservation Commission (TNRCC). Planned implementation of this strategy could include diversion from Lake Nolte, transmission and treatment facilities, and distribution of an additional dependable supply of about 15,700 acft/yr in Comal County.

Volume III, Section 4.1 includes a detailed discussion of a water supply option identified as Canyon Lake Water Released to Lake Nolte – Treated Water to Distribution System or Recharge Zone. The SCTRWPG has considered the utility of this management strategy as a potential new treated water supply to Comal, Guadalupe, and/or Hays Counties in the context of alternative regional water plans (Volume II) and has recommended its implementation to meet projected needs in Comal County in the Regional Water Plan. Estimates of cost and assessments of environmental issues and cumulative effects of implementation are presented herein.

Canyon Reservoir – Wimberley, Woodcreek, and Blanco (G-24)

Management strategy involves the purchase of stored water from Canyon Reservoir made available by amendment of Certificate of Adjudication No. 18-2074 to authorize additional diversions. An application for this amendment has been submitted by GBRA and is presently under consideration by the TNRCC. Planned implementation of this strategy would include diversion from Canyon Reservoir, transmission and treatment facilities, and distribution of an additional dependable supply of about 1,350 acft/yr to the Cities of Wimberley, Woodcreek, and Blanco in rural Hays and Blanco Counties.

Lower Guadalupe River Diversions (SCTN-16)

Management strategy involves the diversion of water from the San Antonio River above the Guadalupe River Saltwater Barrier to two 25,000 acft off-channel reservoirs, transmission to a regional water treatment facility, and distribution in Bexar County. Sources of water include presently underutilized surface water rights held by GBRA and Union Carbide Corporation (up to about 67,200 acft/yr), unappropriated streamflow, and groundwater from the Gulf Coast Aquifer (up to 20,000 acft/yr). Planned implementation of this strategy will provide a dependable supply of about 94,500 acft/yr beginning in 2010. Based on long-term averages derived from monthly simulations over a 56 year historical period, this dependable supply is comprised of 66,200 acft/yr available under existing water rights, 20,200 acft/yr available as unappropriated streamflow, 11,200 acft/yr available as groundwater from the Gulf Coast Aquifer, and a loss of 3,100 acft/yr to net evaporation from the off-channel reservoirs. The off-channel reservoirs would be located in Refugio, Victoria, or Calhoun Counties proximate to the diversion facilities. Technical evaluations of this management strategy have assumed that this off-channel storage will be in the form of reservoirs created by two "ring-dike" embankments and will have no contributing drainage area. Consensus Environmental Criteria were applied in the technical evaluation of this management strategy. Summaries of applicable instream flow criteria are included in Volume III, Appendix F.

New Colorado River Diversion Option (LCRA)

Management strategy is based on a July 6, 2000 proposal by the Lower Colorado River Authority (LCRA) and involves the diversion of water from the Colorado River near Bastrop and Bay City to off-channel reservoirs, transmission to regional water treatment facilities, and distribution in Hays and Bexar Counties. Sources of water include presently underutilized surface water rights, stored water from the Highland Lakes System, and groundwater from the Gulf Coast Aquifer. Planned implementation of this strategy will provide a dependable supply of about 150,000 acft/yr to the South Central Texas Region in 2050 as well as an additional 180,000 acft/yr to meet irrigation needs in the Lower Colorado Region.

The SCTRWPG has, with certain qualifications, adopted this management strategy and its associated facilities necessary to provide for a new supply of 150,000 acft/yr as proposed by the LCRA and Region K. The recommended management strategy includes approximately 100,000 acft of off-channel storage to be located in Wharton and Matagorda Counties. Estimates of cost have assumed that this off-channel storage will be in the form of reservoirs created by four "ring-dike" embankments and having no contributing drainage area. Potential sharing of costs for such associated facilities is a subject of on-going negotiations. Estimated costs for purchase of water from the LCRA shown in the Regional Water Plan are based on LCRA's current in-basin rate of $105 acft/yr plus a 25 percent out-of-basin surcharge. Ultimate costs for purchase of water will be a subject of negotiation.

The SCTRWPG has been informed that evaluations of this option have been completed by Region K in accordance with applicable law. The SCTRWPG is also cognizant of various comments and concerns regarding potential effects of this option on instream flows and freshwater inflows to bays and estuaries and has included summary information provided by LCRA regarding potential changes in streamflow in Section 5.2.4. As the quantity of water which may ultimately be made available to Region L by the LCRA and Region K is uncertain at this time, the SCTRWPG has included the originally proposed quantity of 150,000 acft/yr in the Regional Water Plan.[5] More specifically, the Plan includes up to 18,000 acft/yr diverted near Bastrop for delivery to Hays County and up to 132,000 acft/yr diverted near Bay City for delivery to Bexar County.

Carrizo Aquifer – Wilson & Gonzales (CZ-10C)

Management strategy involves the immediate development of well fields in the Carrizo Aquifer in northern Wilson and southern Gonzales Counties, a collection system, transmission to a regional water treatment facility, and distribution in Bexar County. Strategy has been formulated subject to the rules and policies of the Evergreen and Gonzales County Underground Water Conservation Districts. Planned implementation of this strategy includes annual production of approximately 11,000 acft and 5,000 acft from Wilson and Gonzales Counties, respectively, throughout the 50-year planning period.

Volume III, Section 6.1 includes a detailed discussion of water supply options identified as Carrizo-Wilcox Aquifer between San Marcos and Frio Rivers which involve the potential production of either 40,000 acft/yr or 75,000 acft/yr from new well fields in Wilson and Gonzales Counties. Upon consideration of simulated Carrizo Aquifer drawdown associated with these production rates in the context of alternative regional water plans (Volume II), the SCTRWPG has included the production rate of 16,000 acft/yr in the Regional Water Plan. The cumulative effects of implementation and long-term operation of this management strategy, as included in the Regional Water Plan, are summarized in Section 5.2.4.

Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Management strategy involves the phased development of well fields in the Carrizo Aquifer in northern Gonzales and southern Bastrop Counties, a collection system, transmission

[5] On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr, however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" supplies available wtihin the Region L plan to compensate for the proposed reduction in yield of the project.

to a regional water treatment facility, and distribution in Comal and Guadalupe Counties. Strategy has been formulated subject to the rules and policies of the Gonzales County Underground Water Conservation District and consideration of the draft rules of the Lost Pines Groundwater Conservation District. Well field development in southern Bastrop County is not expected to occur prior to the year 2040. Planned implementation of this strategy includes maximum annual production of approximately 15,000 acft and 12,500 acft from Gonzales and Bastrop Counties, respectively, in 2050.

Volume III, Section 6.2 includes a detailed discussion of a water supply option identified as Carrizo-Wilcox Aquifer between Colorado and Frio Rivers which involves the potential production of 220,000 acft/yr from new well fields in Atascosa, Wilson, Gonzales, and Bastrop Counties. Upon consideration of simulated Carrizo Aquifer drawdown associated with production rates of 58,500 acft/yr and 90,000 acft/yr from Gonzales and Bastrop Counties in the context of alternative regional water plans (Volume II), the SCTRWPG has included a maximum production rate of 27,500 acft/yr in the Regional Water Plan at year 2050. The cumulative effects of implementation and long-term operation of this management strategy, as included in the Regional Water Plan, are summarized in Section 5.2.4. It is noted that the Region L estimates of groundwater production in Bastrop County exceed Region K estimates of availability in and beyond year 2030. The two Regional Water Planning Groups have agreed that discussion of differences will be more productive upon completion of the new Groundwater Water Availability Models presently under development by the TWDB.

Carrizo Aquifer – Local Supply (SCTN-2a)

Management strategy involves the phased development or expansion of well fields in the Carrizo Aquifer for the purpose of meeting local municipal, industrial, steam-electric, or mining needs in Atascosa, Caldwell, Dimmit, and Wilson Counties. Planned implementation of this strategy provides new dependable supplies totaling about 14,700 acft/yr for the South Central Texas Region in 2050.

Simsboro Aquifer (SCTN-3c)

Management strategy involves the phased development and expansion of well fields in the Simsboro Aquifer in Milam, Lee, and Bastrop Counties for the purposes of facilitating on-going mining operations and production of municipal and industrial water supply.

Implementation of this management strategy maximizes the beneficial use of water that is pumped to depressurize the mines by developing collection, transmission, treatment, and distribution facilities for use in Bexar County as opposed to being discharged into local streams for disposal. Planned implementation of this strategy will provide a dependable annual supply of approximately 55,000 acft throughout the 50-year planning period.

Projected pumpage associated with this management strategy is consistent with the Brazos G Initially Prepared Regional Water Plan (Milam and Lee Counties) for the entire 50-year planning period. Projected pumpage in Bastrop County after 2020, however, exceeds the current estimate of available supply adopted by the Lower Colorado Regional Water Planning Group (Region K). Periodic discussions between representatives of the South Central Texas and Lower Colorado Regions have focused on concerns regarding potential water level declines in the outcrop of the Simsboro Aquifer, three different groundwater models of the area, mitigation of impacts to affected wells, and equitable treatment of property owners within a groundwater district. Differences between Region L's projected pumpage and Region K's estimate of available supply are more than 20 years from the present while development of new Carrizo (Simsboro) Aquifer Groundwater Availability Models (GAMs) under Texas Water Development Board direction is to be completed by about 2002. Hence, it has been agreed that discussions will be more productive upon completion of the GAMs at which time additional scientific information will be available to both regions.

Volume III, Section 6.3 includes a detailed discussion of a water supply option identified as Simsboro Aquifer – Bastrop, Lee, and Milam Counties with Delivery to a Major Municipal Demand Center which involves the potential production of 75,000 acft/yr from new and existing well fields. Subsequent to the completion this analysis in late 1999, the San Antonio Water System completed a study of its own[5] and recommended that a production rate of 55,000 acft/yr be considered in the technical evaluation of alternative regional water plans in which this management strategy would be included. The cumulative effects of implementation and long-term operation of this management strategy, as included in the Regional Water Plan, are summarized in Section 5.2.4.

[5] HDR Engineering, Inc. and Paul Price Associates, Inc., "Preliminary Feasibility of Options to Deliver Alcoa/CPS Groundwater to Bexar County," San Antonio Water System, January 2000.

SAWS Recycled Water Program (SAWS)

Management strategy involves the phased expansion of SAWS Recycled Water Program to provide dependable water supplies for non-potable uses and meet 20 percent of SAWS projected water demand. Current SAWS Recycled Water Program is capable of delivering about 35,000 acft/yr and consumptive reuse of about 25,000 acft/yr is included as current supply. Planned phased implementation of this management strategy will provide an additional dependable annual supply of about 19,800 acft in 2010 and about 52,200 acft in 2050.

This management strategy involves the continued implementation and expected future expansion of the SAWS Recycled Water Program. Facilities for future expansion are expected to include Southern Interconnections between the Leon Creek, Dos Rios, and Salado Creek wastewater treatment facilities as well as a Northern Interconnection linking the Leon Creek and Salado Creek transmission lines. Costs for expected future expansion are based on actual costs for implementation to-date and are included in the Regional Water Plan.

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 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 low. Such lawful reuse of treated wastewater is consistent with the South Central Texas Regional Water Plan.

Purchase Water from Major Provider (PMP)

Management strategy involves the purchase of water supplies from, or participation in the development of new water supplies with, an identified Major Water Provider. Major water providers include the San Antonio Water System (SAWS), Bexar Metropolitan Water District (BMWD), Guadalupe-Blanco River Authority (GBRA), City of New Braunfels, City of San Marcos, and Canyon Regional Water Authority (CRWA). 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(s) for Bexar County.

Three purchases of water from major providers have been specifically identified in the Regional Water Plan and total 14,240 acft/yr. The largest of these involves the phased purchase of up to 8,000 acft/yr by Kendall County water user groups from the Regional Water Provider for Bexar County or another major provider. Costs for this management strategy include those for purchase, treatment, transmission, and distribution of water and are based on detailed feasibility studies for the Western Canyon Regional Water Supply Project. The Plan includes a purchase of 5,000 acft/yr by the City of San Marcos from the Guadalupe-Blanco River Authority (GBRA) for diversion at Lake Dunlap and transmission in an existing pipeline to a regional treatment facility at San Marcos. Costs include those for water purchase, expansion of the treatment facility, and distribution. The Plan also includes the purchase of 1,240 acft/yr by the City of Victoria from GBRA. This additional water supply would be delivered from Canyon Reservoir via the Guadalupe River and diverted, treated, and distributed using primarily existing facilities.

Desalination of Seawater (SCTN-17)

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 distribution in Bexar County. This 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 56,000 acft beginning in 2040 and increasing to about 84,000 acft by 2050. Volume III, Section 1.10 includes a detailed discussion of this management strategy.

The SCTRWPG also considered an alternative water supply option involving desalination of seawater[6] sponsored by the TWDB and the Lavaca Regional Water Planning Group (Region P). This option would include intake and treatment facilities at the Joslin Steam-Electric Station near Point Comfort with additional facilities for transmission to and distribution within Bexar County. The option has not been included in the Regional Water Plan because the intake is located in an estuary reportedly having sediments contaminated with mercury and Polycyclic

[6] Turner, Collie & Braden, Inc., "Investigation of Joslin Steam Electric Station for Co-Location of a Desalination Facility," Lavaca Regional Water Planning Group in Conjunction with Region L and N Planning Groups, June 2000.

Aromatic Hydrocarbons[7]. In addition, the Calhoun County Navigation District has communicated to members of the SCTRWPG that the location of such a facility is unacceptable because of potential liability to the District. Should these matters be favorably resolved, the SCTRWPG may consider amendment of the Regional Water Plan at some time in the future.

Aquifer Storage & Recovery (ASR) (SCTN-1a)

Management strategy involves the immediate development of SAWS planned 60 mgd aquifer storage and recovery (ASR) system in southern Bexar County so that supplies available from the Edwards Aquifer in winter months may be stored in the Carrizo Aquifer for subsequent recovery in the summer months, thereby substantially reducing peak municipal demands on the Edwards Aquifer during the summer. Planned implementation of this strategy does not increase overall water supply on an annual basis, but does increase the reliability of current supplies for all municipal water user groups dependent upon the Edwards Aquifer. While Volume III, Section 6.8 includes detailed discussions of similar management strategies, the specific strategy included in the Regional Water Plan is best described in a report prepared for SAWS.[8]

Schertz-Seguin Water Supply Project (SSWSP)

Management strategy involves the development of a well field located primarily in southern Gonzales County by the Schertz-Seguin Local Government Corporation and is currently in the implementation phase. This Corporation will be responsible for creating and operating a wholesale water supply system to serve the long-term needs of these two communities located in Guadalupe and Bexar Counties. Planned implementation of this strategy will provide a dependable annual supply of approximately 20,000 acft.

Western Canyon Regional Water Supply Project (WCRWSP)

Management strategy is currently in the implementation phase and involves the development of a water treatment plant west of Canyon Reservoir and a water transmission system to deliver treated water to project participants. This strategy is dependent upon the amendment of Certificate of Adjudication No. 18-2074 authorizing additional diversions from

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[7] U.S. Environmental Protection Agency, "Alcoa/Lavaca Bay, Texas," EPA ID# TXD008123168, EPA Region 6, February 2, 2000.
[8] CH2M Hill, "Aquifer Storage Recovery Project, Preliminary Investigation and Feasibility Analysis Step 2 Report," San Antonio Water System, February 2000.

Canyon Reservoir which is currently pending before the Texas Natural Resource Conservation Commission. Planned implementation of this strategy by the Guadalupe-Blanco River Authority will provide a dependable annual supply of approximately 10,500 acft to participants including the Bulverde Utility Company, Apex Water Services, Comal Independent School District, City of Boerne, City of Fair Oaks Ranch, San Antonio Water System, Bexar Metropolitan Water District, and San Antonio River Authority.

Hays/IH35 Water Supply Project

Management strategy is currently in the implementation phase and involves the delivery of stored water from Canyon Reservoir via a diversion facility at Lake Dunlap and transmission pipeline paralleling IH 35 to supply water user groups in Hays County. A regional water treatment plant near San Marcos and a raw water pipeline connecting the plant to Lake Dunlap have been completed to-date. Planned facilities include a potable water pipeline from the San Marcos Water Treatment Plant to the City of Kyle, Creedmoor-Maha, City of Buda, and other county entities.

Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA)

Management strategy is a part of the Canyon Regional Water Authority plan, and is currently in the design and construction phase. The Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System will supply approximately 5,200 acft/yr of additional supply to Canyon Regional Water Authority's member entities which include Crystal Clear WSC, Springs Hill WSC, Green Valley SUD, East Central WSC, City of Marion, City of Cibolo, and BMWD (NE Service Area). The water will be diverted from Lake Dunlap north of the City of Seguin and delivered via a new pipeline network to those participating entities.

Carrizo Aquifer – Bexar & Guadalupe (BMWD)

Management strategy is a part of Bexar Metropolitan Municipal Water District (BMWD) plan. The strategy is being implemented and will supply about 4,000 acft/yr to BMWD to supply to its customers in southern and northeastern Bexar County.

Trinity Aquifer – Bexar (BMWD)

Management strategy is a part of Bexar Metropolitan Municipal Water District (BMWD) plan. The strategy is in the process of being implemented and is estimated to supply about 1,000 acft/yr to BMWD to supply to its customers in Northern Bexar County.

Canyon Reservoir Contract Renewal (GBRA)

Management strategy is renewal of existing contracts with New Braunfels (December 5, 2001 expiration) for 6,700 acft/yr, with San Marcos (July 7, 2047 expiration) for 5,000 acft/yr, with Kyle (December 31, 2038 expiration) for 589 acft/yr, and with Port Lavaca (February 20, 2008 expiration) for 1,500 acft/yr. Other existing Canyon Reservoir contracts remain in force throughout the planning period or are assumed to be renewed upon expiration.

Brush Management (SCTN-4)

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 or having 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.

Weather Modification (SCTN-5)

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 is being practiced in 15 counties of the region's 21 county area at the present time. 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.

Rainwater Harvesting (SCTN-9)

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.

Additional Municipal Recycling (Reuse) Programs

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, 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 river walks and waterways. This strategy is being used within the region by entities including SAWS, SARA, and CCMA 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.

With additional treatment, this water can be reclaimed for further use, as opposed to being discharged for disposal, at a cost to the municipalities that have used it once.

The SCTRWPG recognizes that SAWS, SARA, CCMA, 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 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 South Central Texas Regional Water Plan.

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.

Edwards Aquifer Recharge & Recirculation Systems

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

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 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.

Additional Storage (ASR and/or Surface)

Management strategy involves implementing large, regional scale 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 issue 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.

Lockhart Reservoir (G-21)

The Lockhart Reservoir 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 government in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the local government to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, 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 supply option as a possible amendment to the Regional Water Plan.

5.2.4 Cumulative Effects

Sophisticated hydrologic models have been employed to quantify the cumulative effects of implementation of the South Central Texas Regional Water Plan through the year 2050. These 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. Cumulative effects of plan implementation on the Edwards Aquifer are measured against a baseline representative of full utilization of proposed 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 activation of available Management Supplies as may be necessary to offset Edwards Aquifer pumpage reductions necessary to maintain springflow. The baseline for consideration of effects on streamflow reflects the baseline for the Edwards Aquifer, full utilization of existing water rights, and treated effluent discharge representative of current conditions. Cumulative effects of plan implementation on Carrizo and Simsboro 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 5.2-26 for a 56-year historical simulation period. Springflows would increase much of the time and particularly in the summer due to Edwards Recharge – Type 2 Projects (L-18a) and SAWS Aquifer Storage & Recovery (ASR) Program in southern Bexar County (SCTN-1a), respectively. However, springflow increases would be offset to some degree by increased pumpage closer to the springs associated with Edwards Irrigation Transfers (L-15) and Irrigation Demand Reduction (Conservation) with Transfer (L-10 Irr.). As shown in Figure 5.2-27, simulated San Marcos Springs discharges would increase substantially because the Edwards Recharge – Type 2 Projects (L-18a) include a recharge enhancement dam on the Blanco River with pumped diversions to the outcrop in the Upper San Marcos River watershed. Overall pumpage from the Edwards Aquifer would increase (Figure 5.2-28) due to potential EAA authorizations for recharge recovery (see Appendix C in Volume III) pursuant to development of the Edwards Recharge – Type 2 Projects (L-18a). Figure 5.2-29 shows

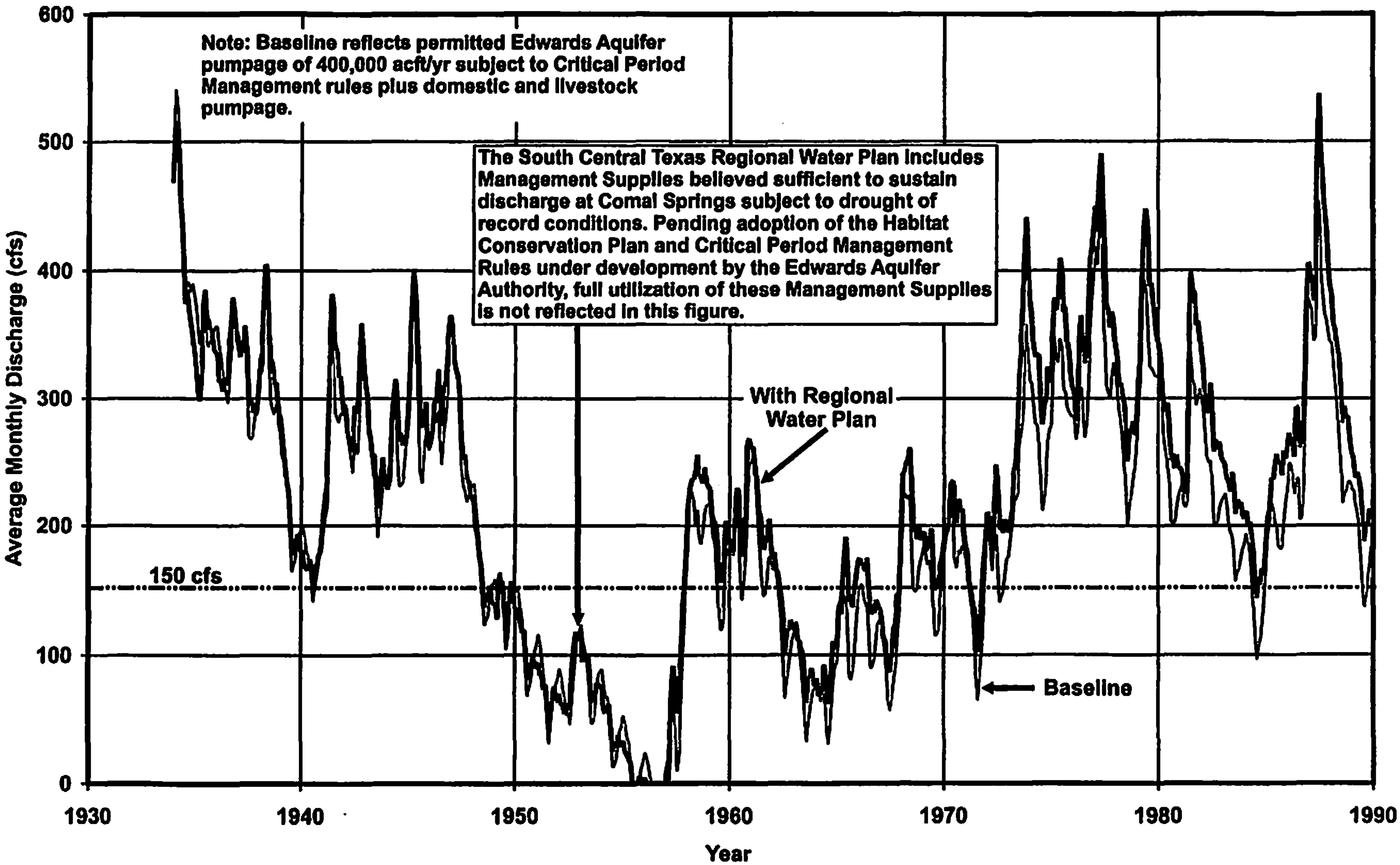


Figure 5.2-26. Regional Water Plan — Simulated Comal Springs Discharge

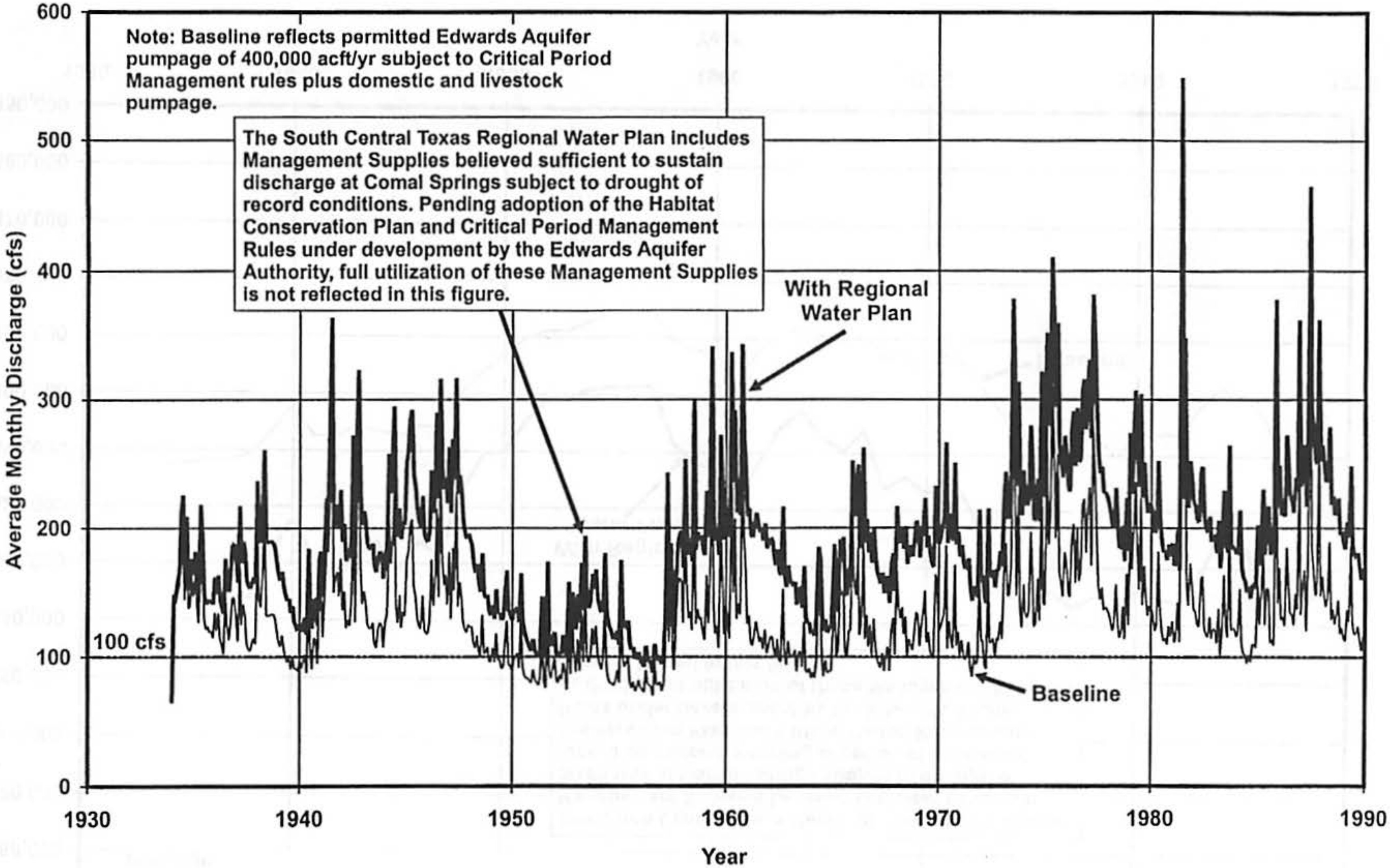


Figure 5.2-27. Regional Water Plan — Simulated San Marcos Springs Discharge

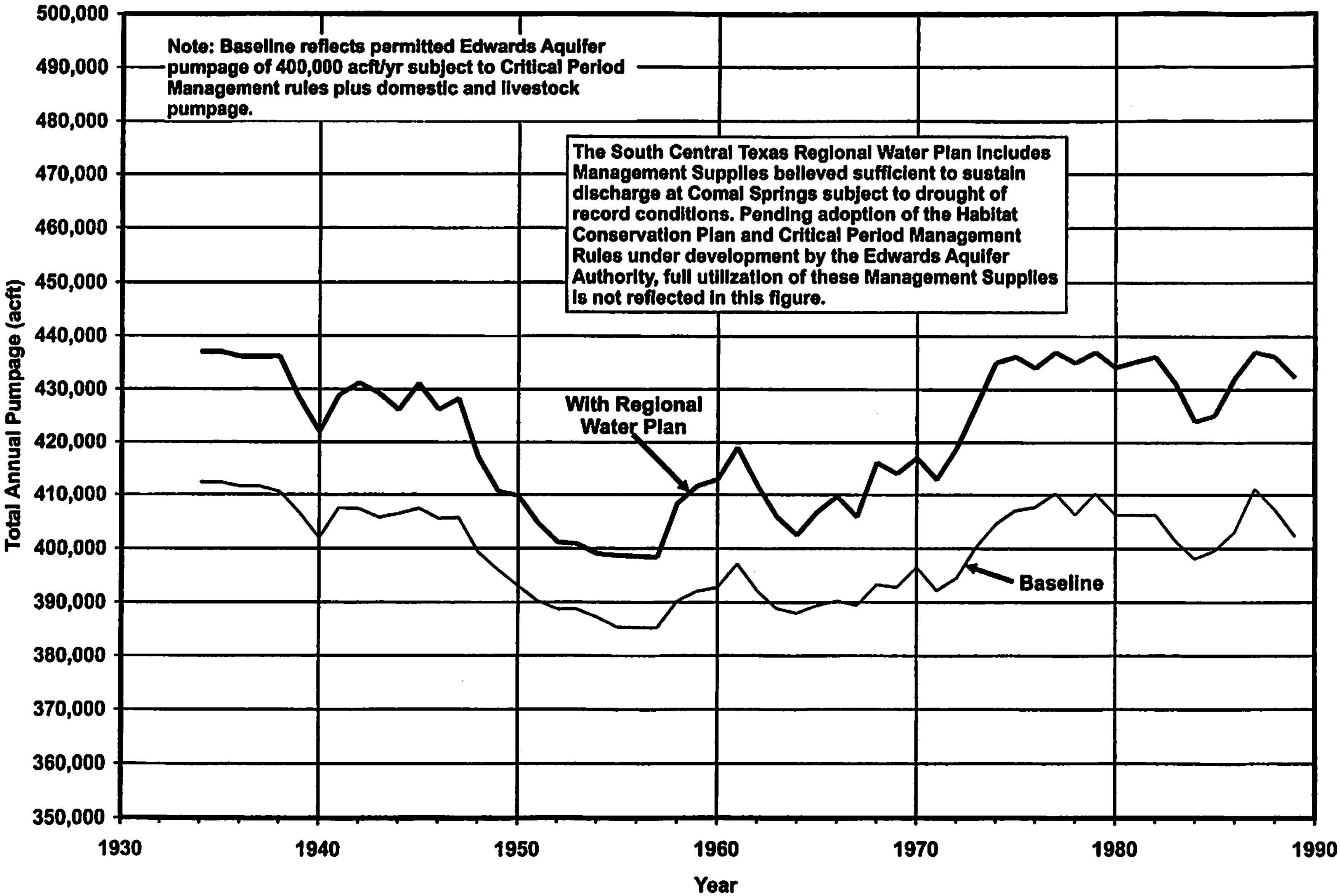


Figure 5.2-28. Regional Water Plan — Simulated Edwards Aquifer Pumpage

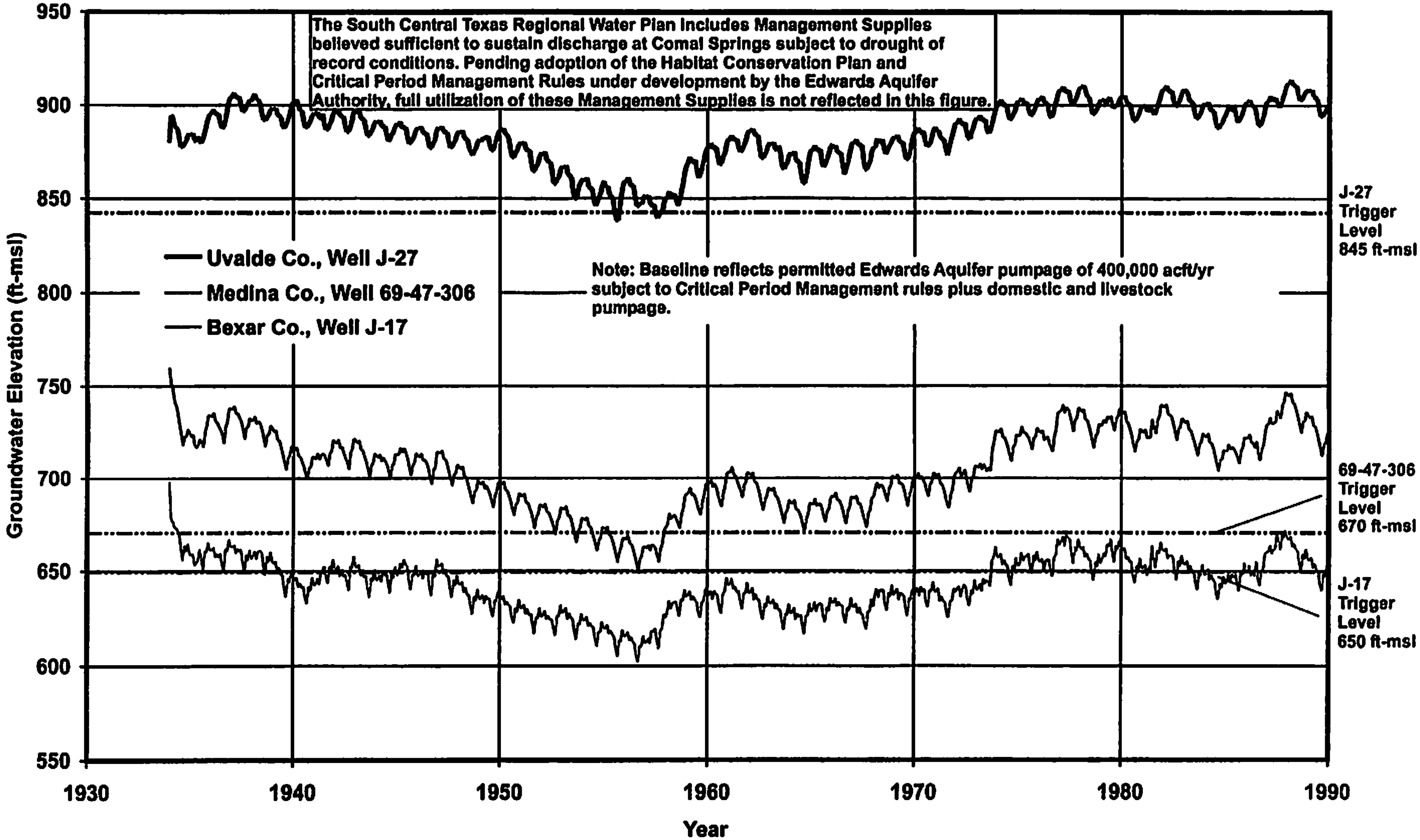


Figure 5.2-29. Regional Water Plan — Simulated Edwards Aquifer Levels

simulated water levels at key monitoring wells in Uvalde, Medina, and Bexar Counties with implementation of the Plan. Percentages of time under Critical Period Management in Uvalde and Medina Counties would be less with the Plan than for baseline conditions.

The potential cumulative effects of phased implementation of water management strategies involving pumpage from the Carrizo Aquifer are summarized in Figures 5.2-30 through 5.2-36. Figure 5.2-30 shows the projected pumpage from Wilson, Gonzales, and Bastrop Counties associated with the following water management strategies: Carrizo Aquifer–Wilson & Gonzales (CZ-10C); Carrizo Aquifer – Gonzales & Bastrop (CZ-10D); and Schertz-Seguin Water Supply Project (SSWSP). Projected drawdown associated with CZ-10C and SSWSP is referenced to simulated 1994 aquifer levels and shown in plan view in Figure 5.2-31 along with monitoring well locations for the simulated well hydrographs presented in Figures 5.2-32 through 5.2-35. Note that projected drawdown shown in these figures is a result of both projected local demands and the development of two water management strategies in the Plan. Drawdown associated with CZ-10D in northern Gonzales County and southern Bastrop County, in addition to that associated with projected local demands, is shown in Figure 5.2-36.

Simulated cumulative effects of implementation of the Simsboro Aquifer (SCTN-3c) strategy in Milam, Lee, and Bastrop Counties are summarized in Figures 5.2-37 through 5.2-39. Projected drawdown associated with SCTN-3c between years 2000 and 2050 is shown in plan view in Figure 5.2-37. Figures 5.2-38 and 5.2-39 illustrate the simulated incremental effects on Simsboro Aquifer levels associated with local demands and mining operations (baseline) and the implementation of the Plan for the Aluminum Company of America (Alcoa) and San Antonio City Public Service (CPS) well fields.

Potential cumulative effects of implementation of the South Central Texas Regional Water Plan on streamflows at selected locations in the Guadalupe – San Antonio River Basin are summarized in Figures 5.2-40 through 5.2-42. Streamflow comparisons for the Guadalupe River at Cuero (Figure 5.2-40) and the San Antonio River at Falls City (Figure 5.2-41) indicate that streamflows are expected to increase with full implementation of the Plan. Increased streamflow at Cuero will be primarily due to Edwards Recharge – Type 2 Projects (L-18a) and the associated increases in Comal and San Marcos springflow. Note that average annual freshwater inflows to the Nueces Estuary will be reduced by approximately three percent due to enhanced recharge

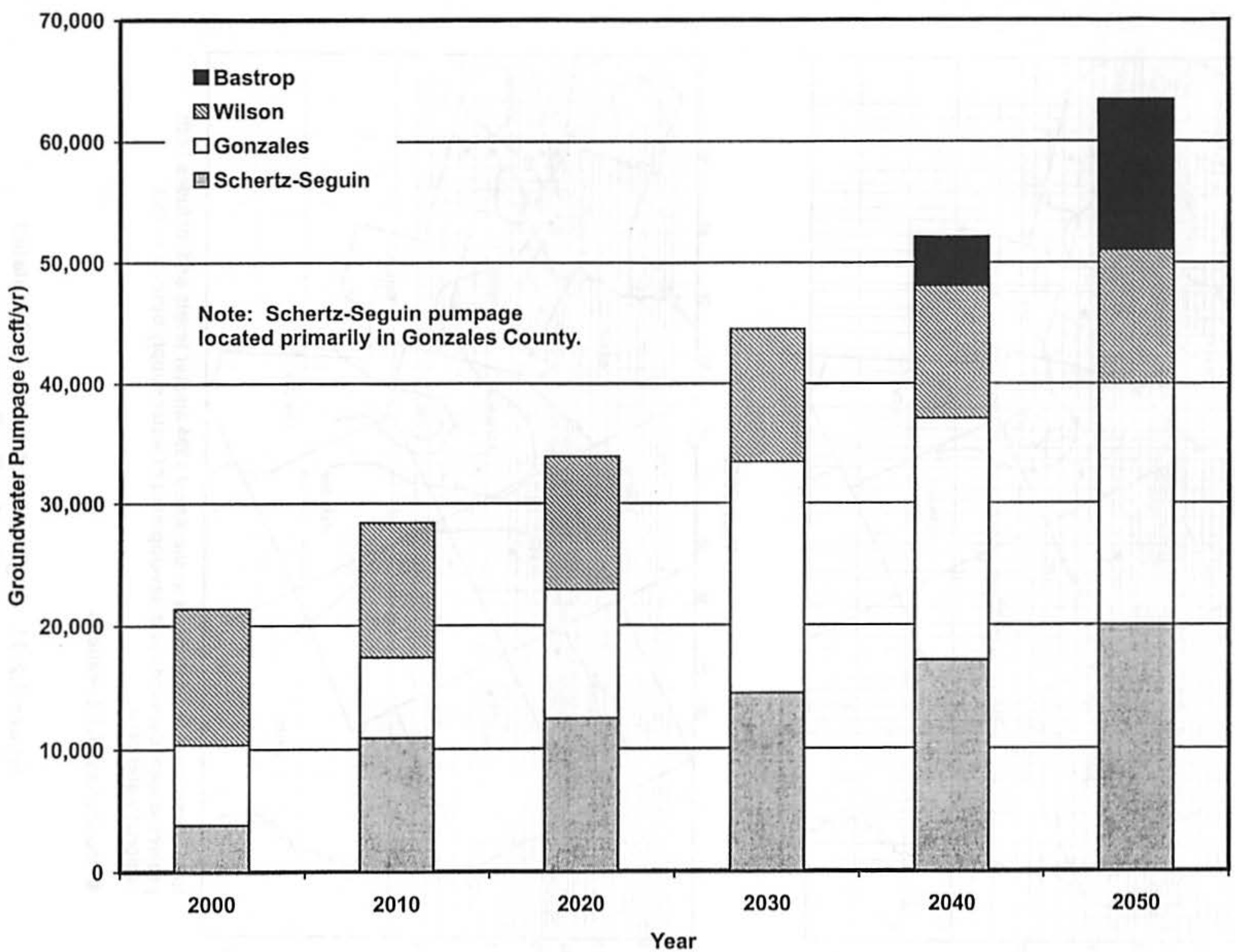
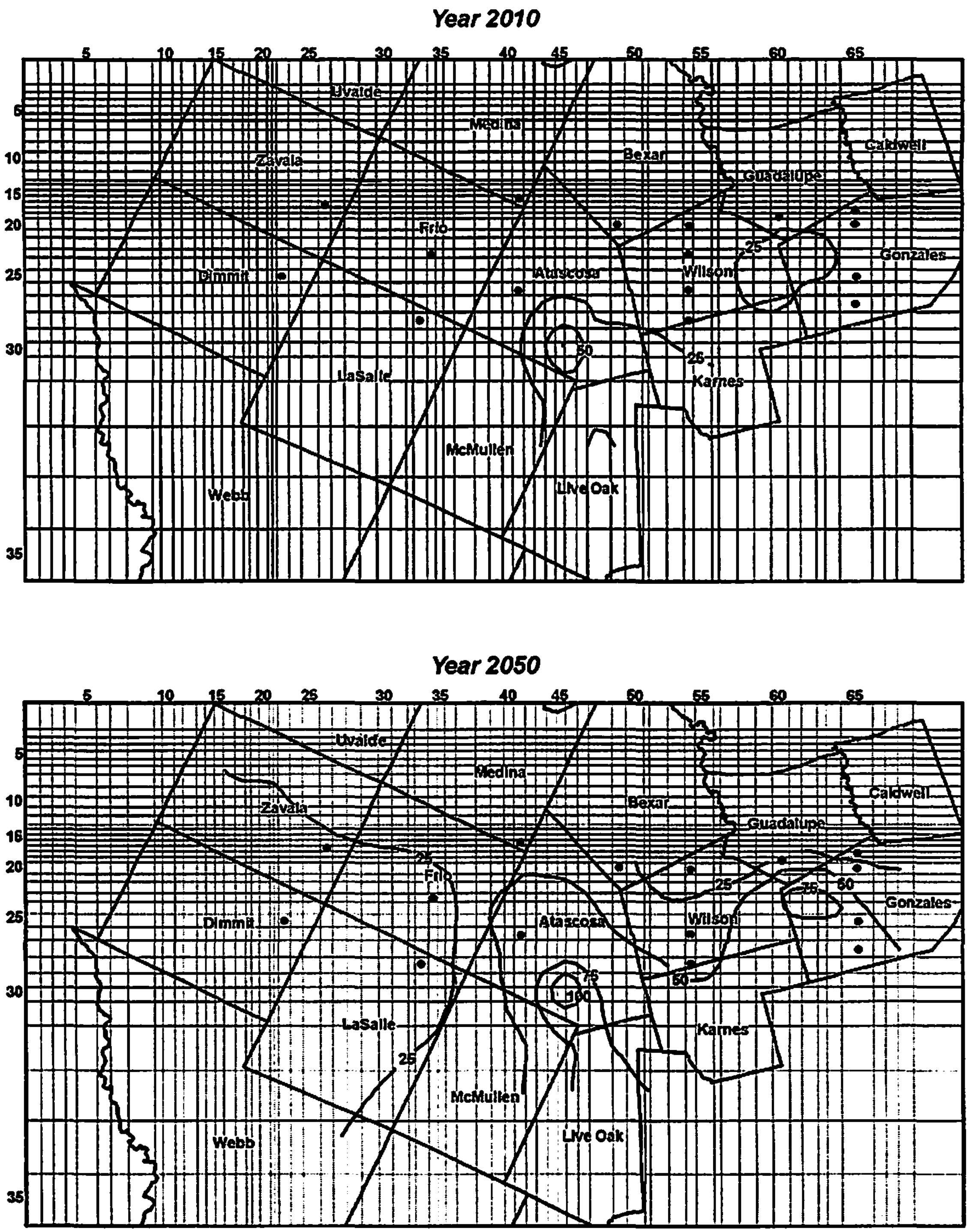


Figure 5.2-30. Regional Water Plan — Additional Carrizo Groundwater Pumpage



Note: Drawdown is referenced to simulated 1994 aquifer levels and includes both projected local demands and development of water supply options in this regional water plan.

● **Monitoring Well Locations**

Figure 5.2-31. Regional Water Plan — Simulated Carrizo Aquifer Drawdown

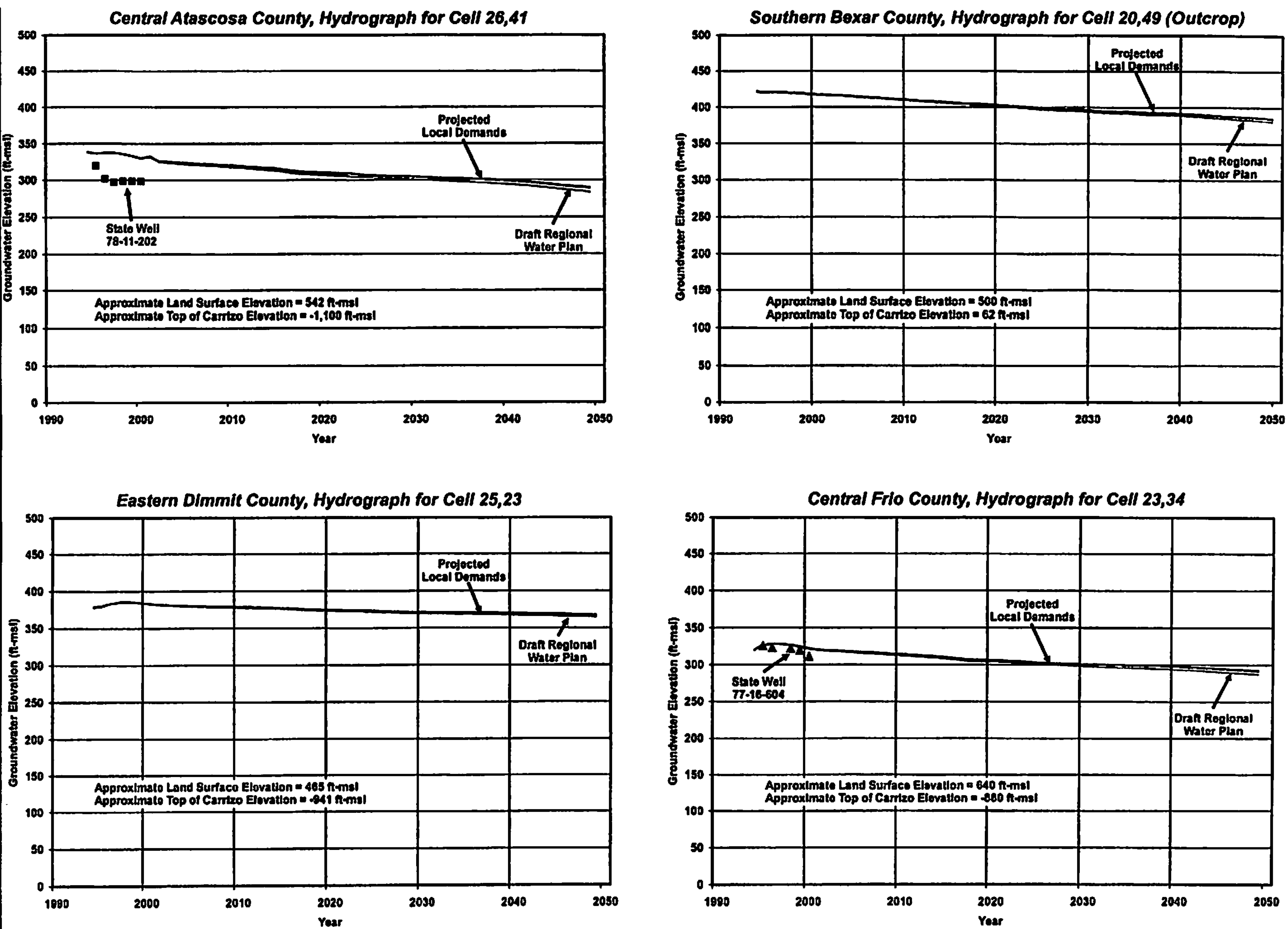


Figure 5.2-32. Regional Water Plan — Carrizo Aquifer

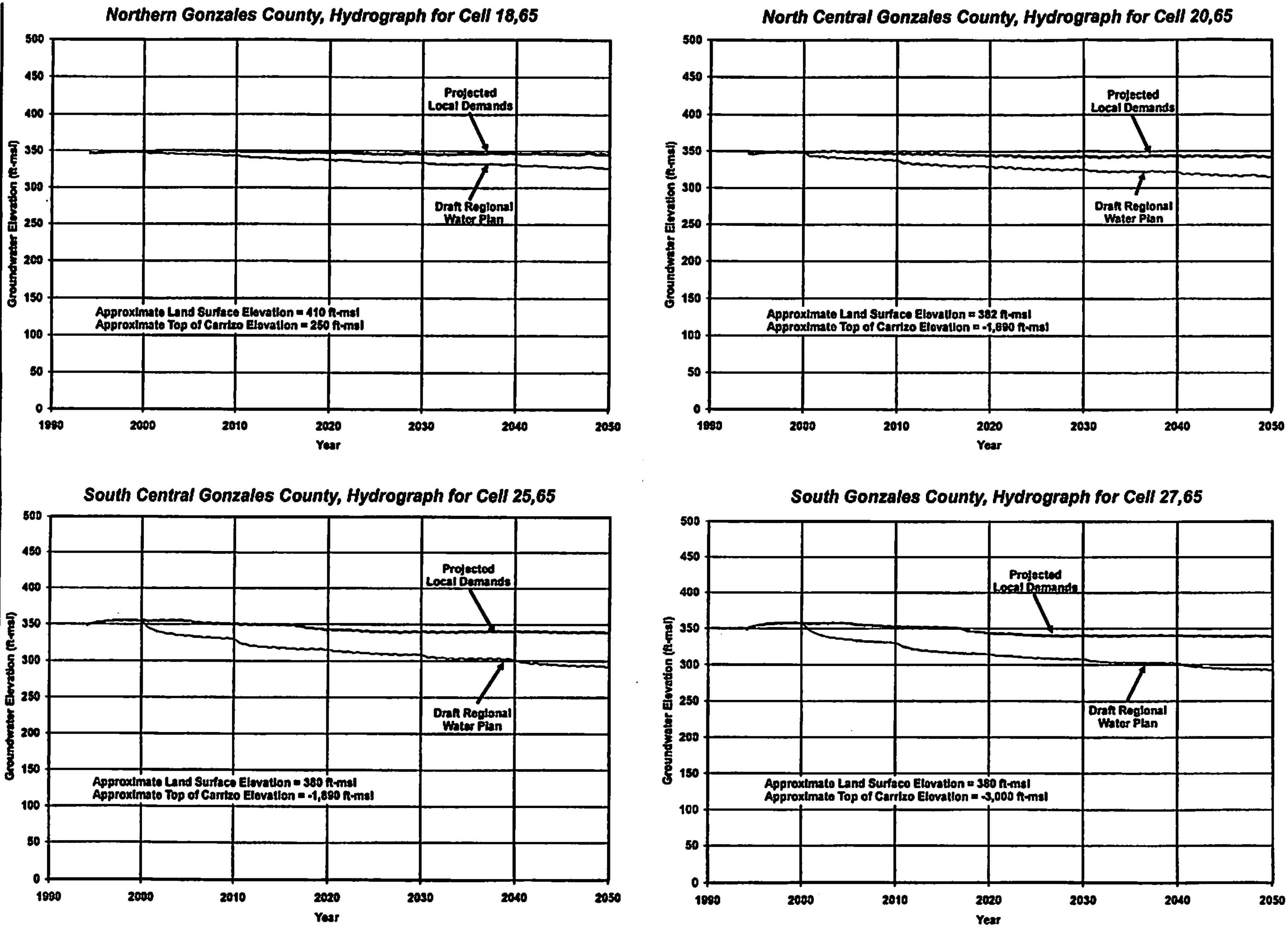


Figure 5.2-33. Regional Water Plan — Carrizo Aquifer

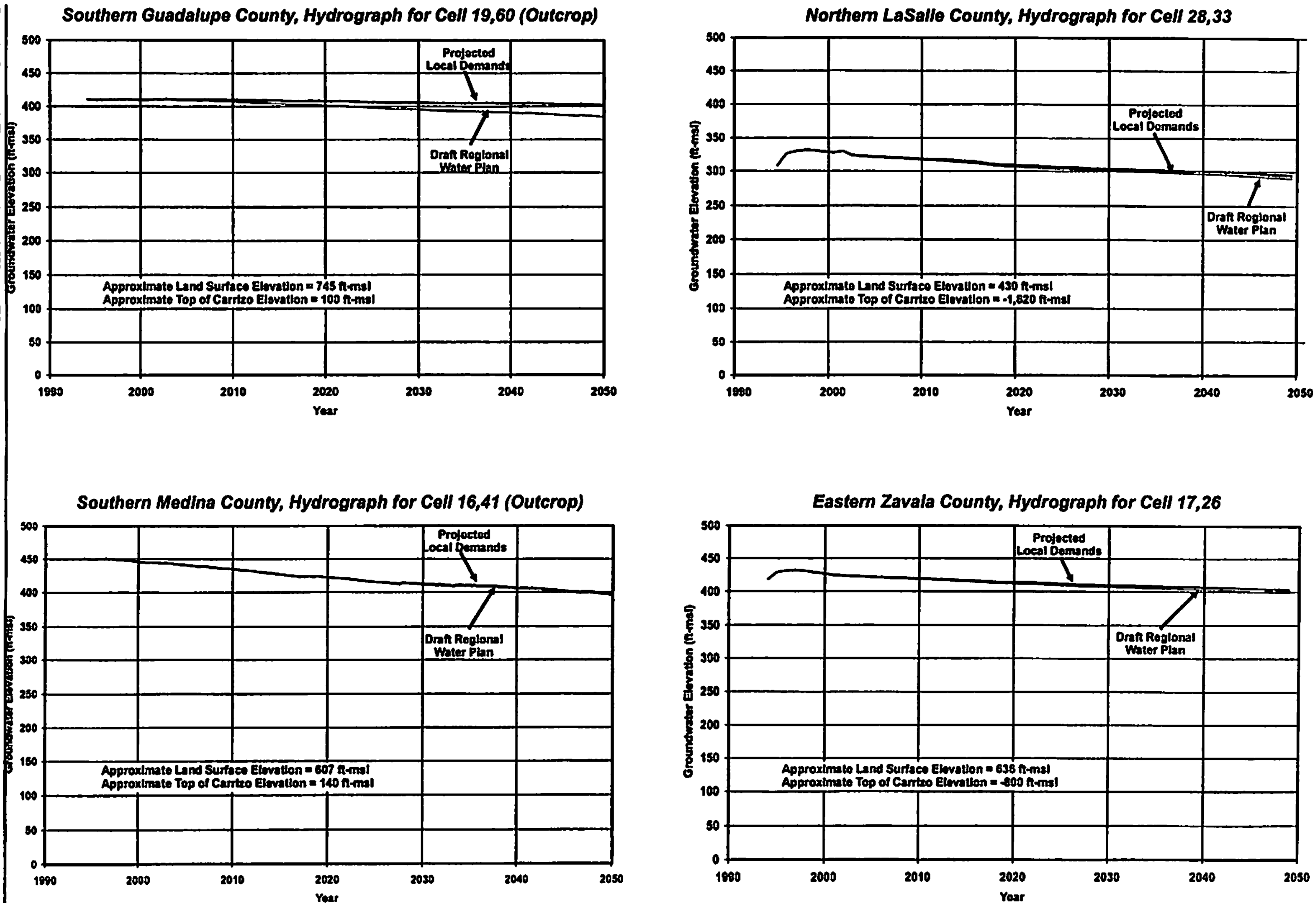


Figure 5.2-34. Regional Water Plan — Carrizo Aquifer

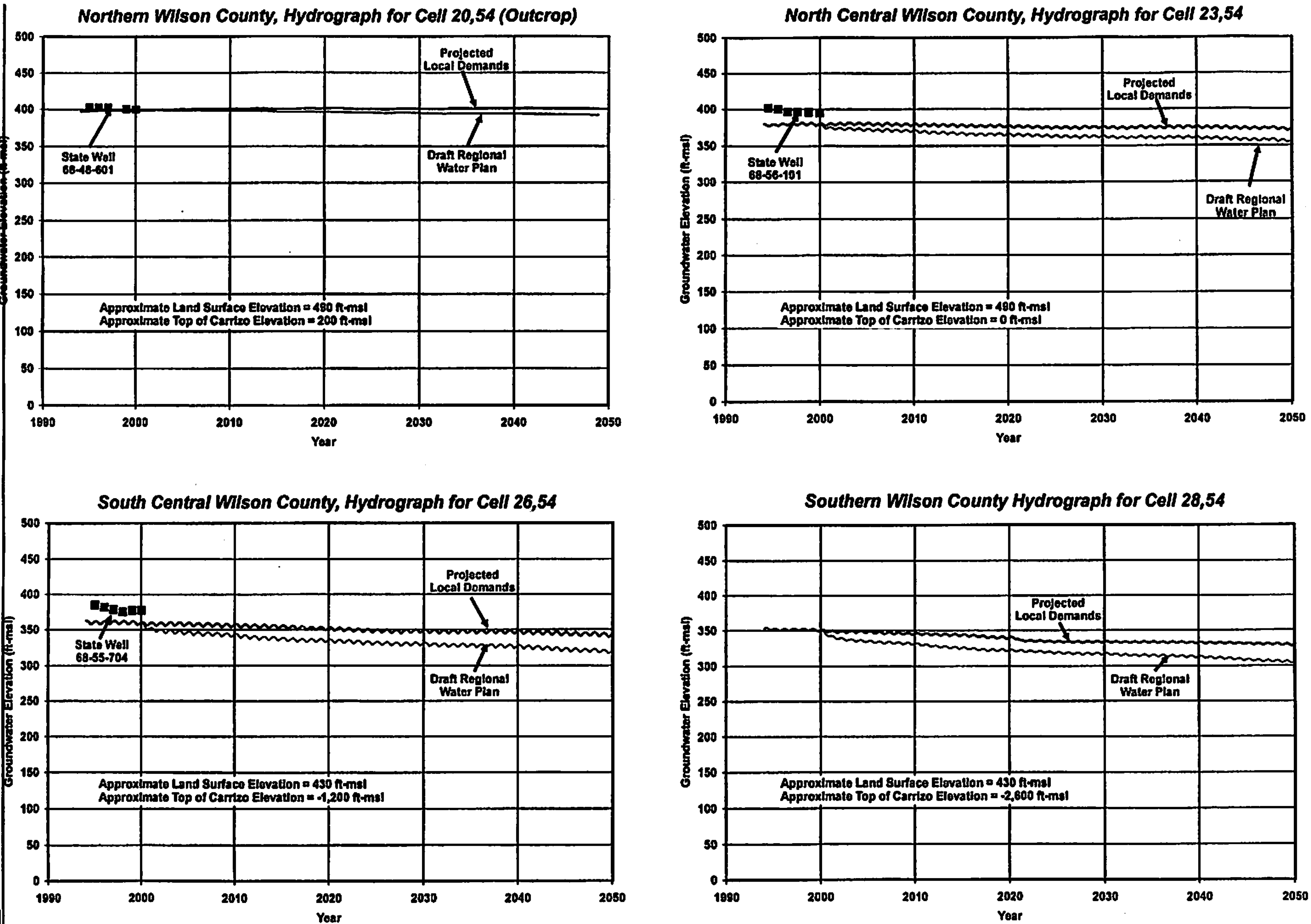
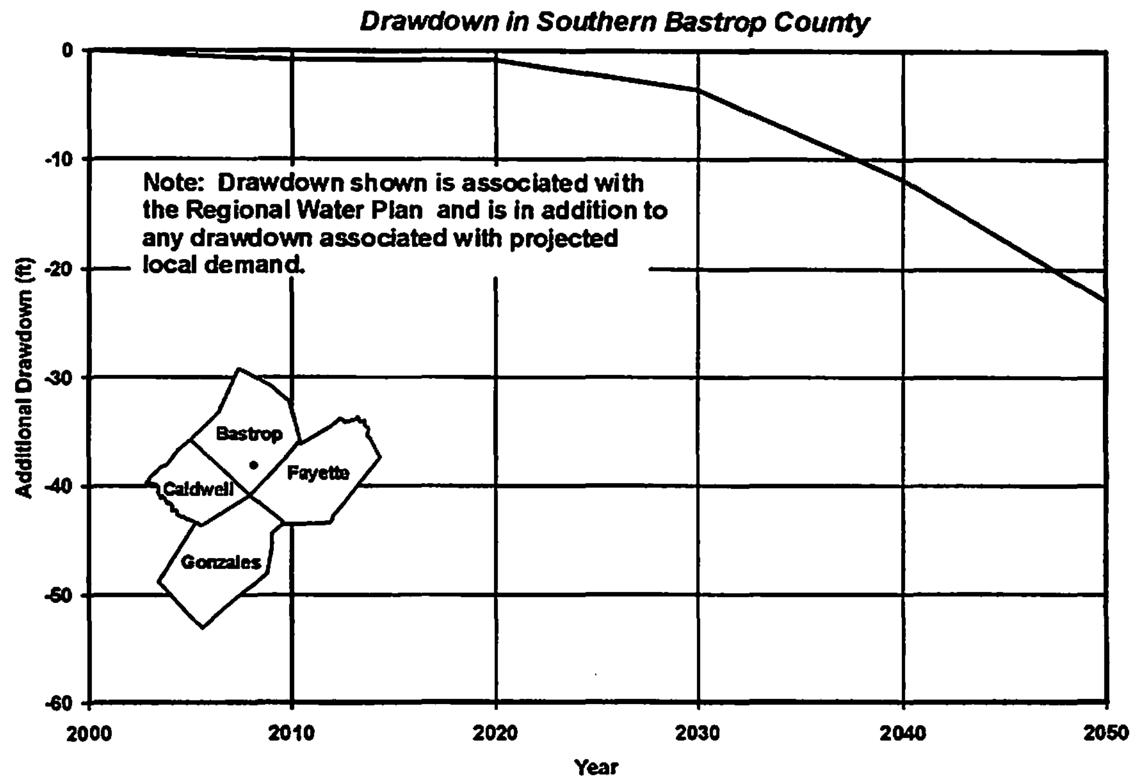


Figure 5.2-35. Regional Water Plan — Carrizo Aquifer



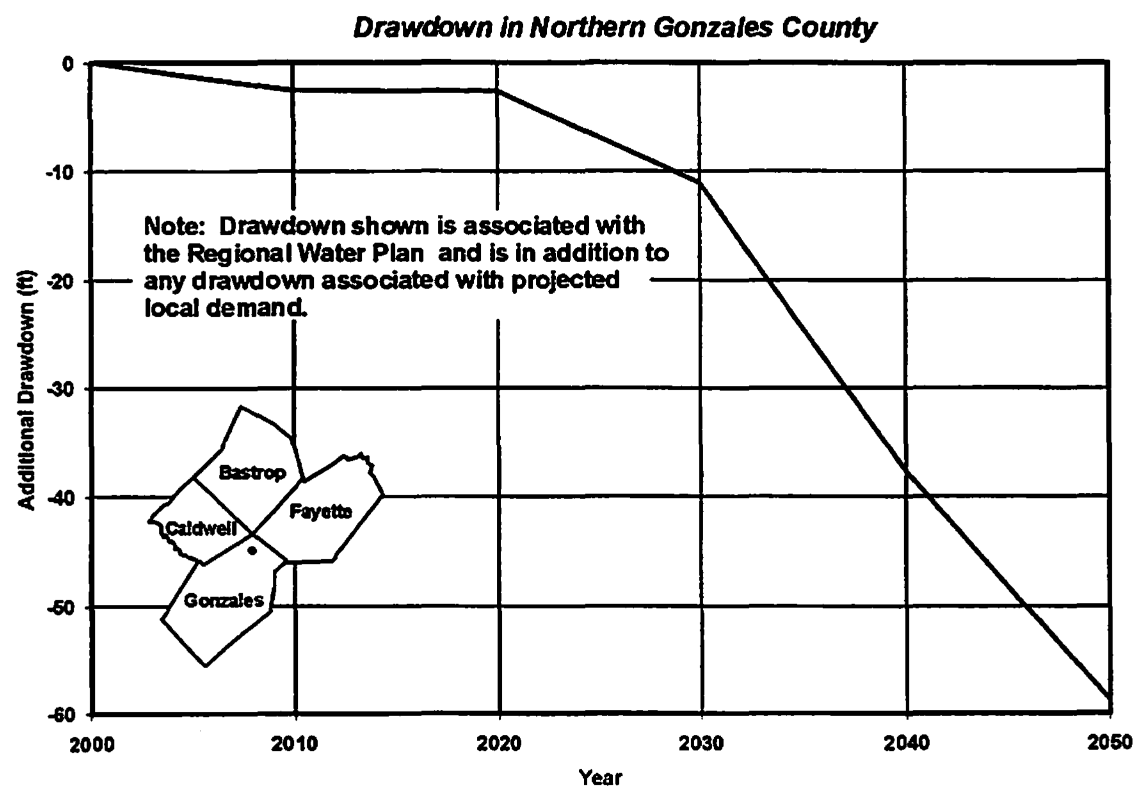
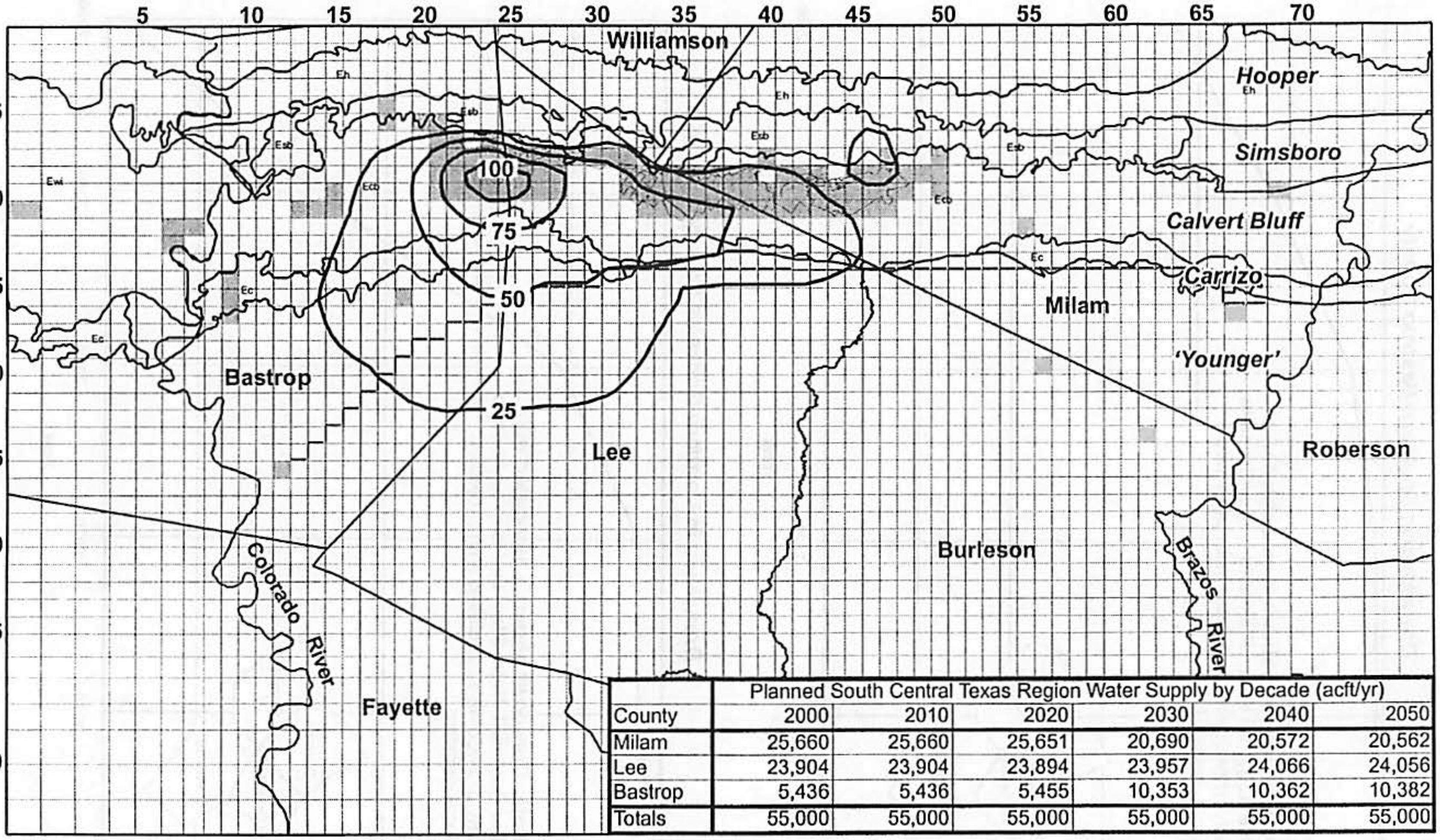


Figure 5.2-36. Regional Water Plan — Carrizo Aquifer



County	Planned South Central Texas Region Water Supply by Decade (acft/yr) 2000	2010	2020	2030	2040	2050
Milam	25,660	25,660	25,651	20,690	20,572	20,562
Lee	23,904	23,904	23,894	23,957	24,066	24,056
Bastrop	5,436	5,436	5,455	10,353	10,362	10,382
Totals	55,000	55,000	55,000	55,000	55,000	55,000

Figure 5.2-37. Simsboro Aquifer in CPS-ALCOA Area Drawdown between Years 2000 and 2050 for 55,000 acft/yr Water Supply

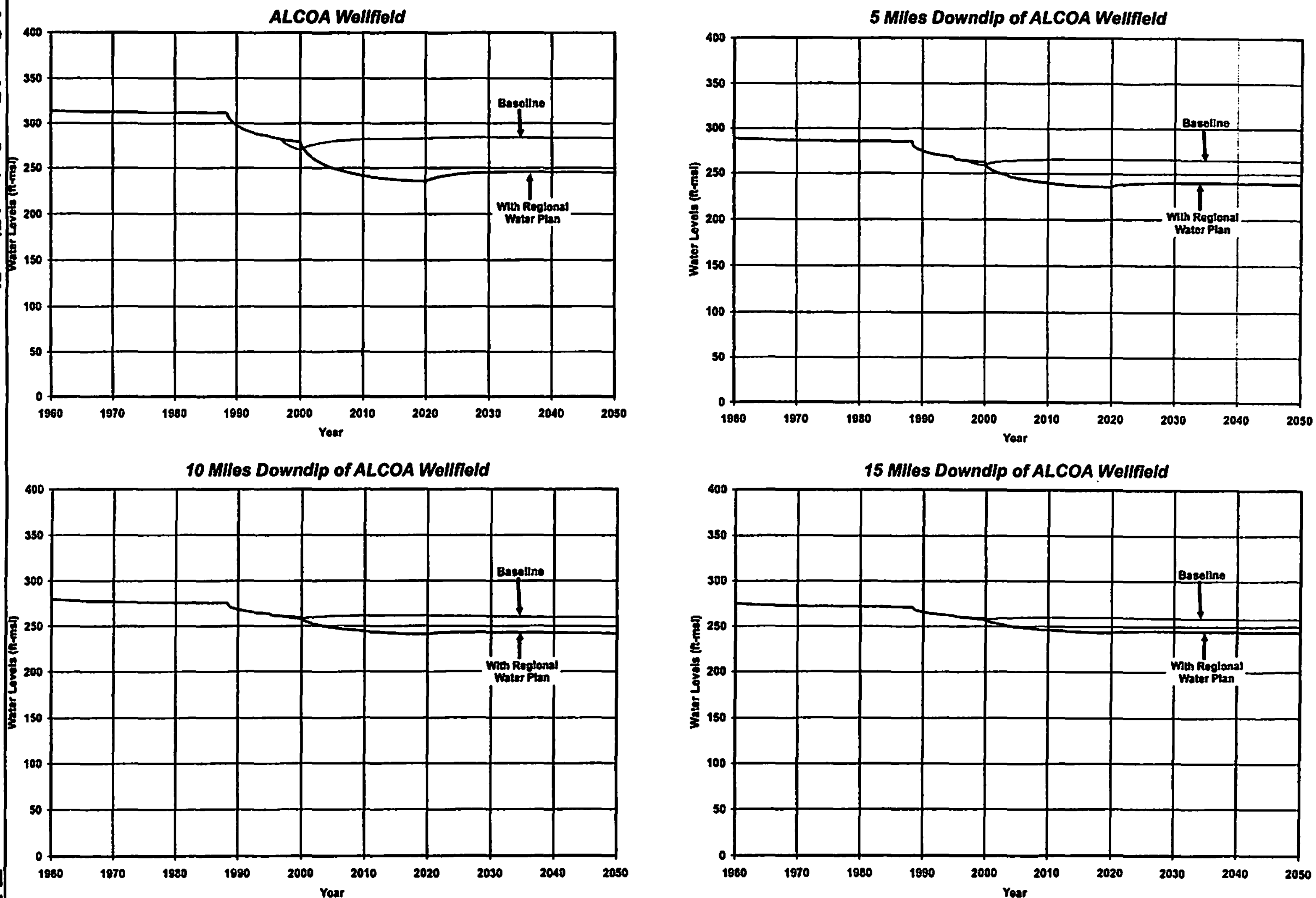


Figure 5.2-38. Regional Water Plan — Simsboro Aquifer

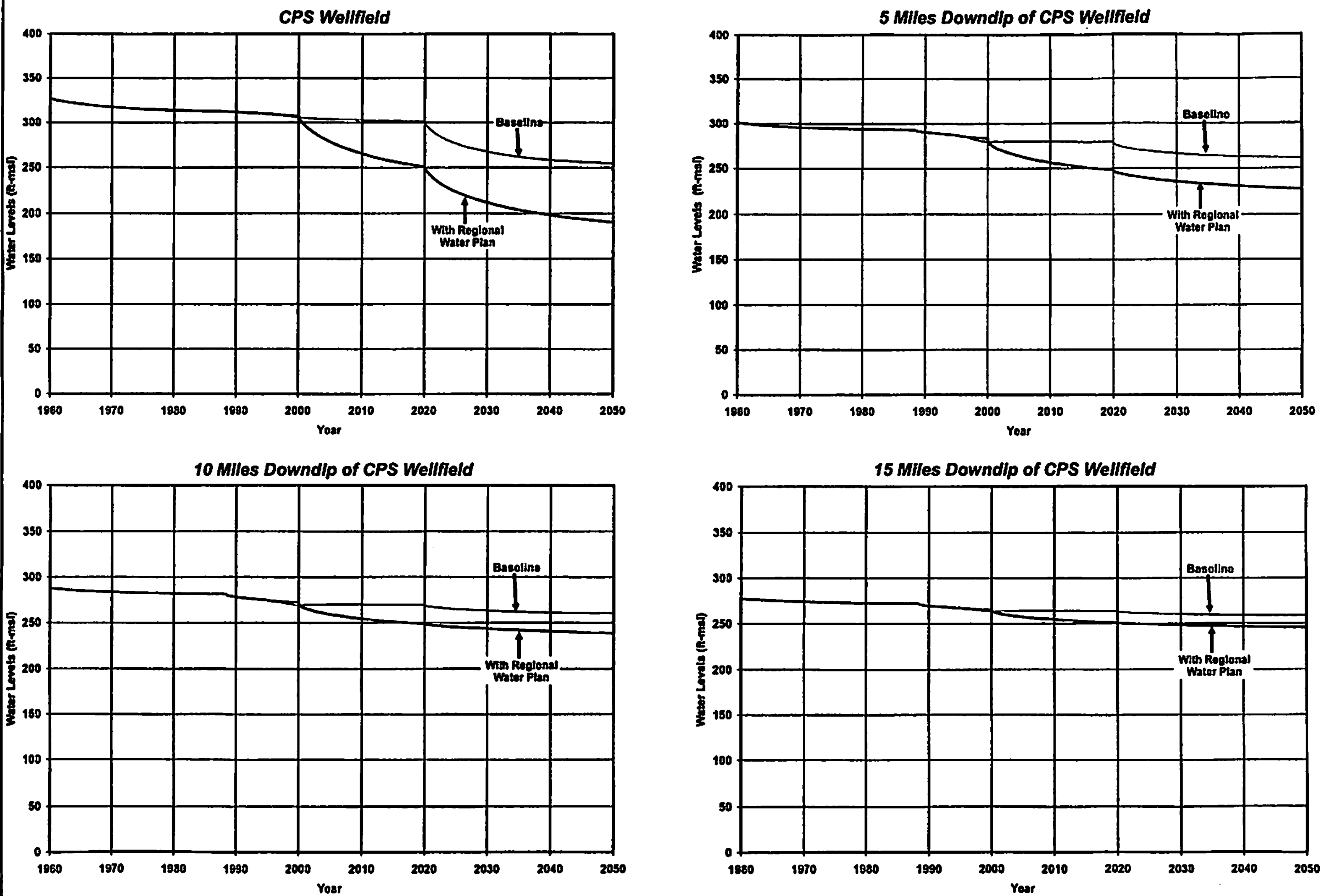
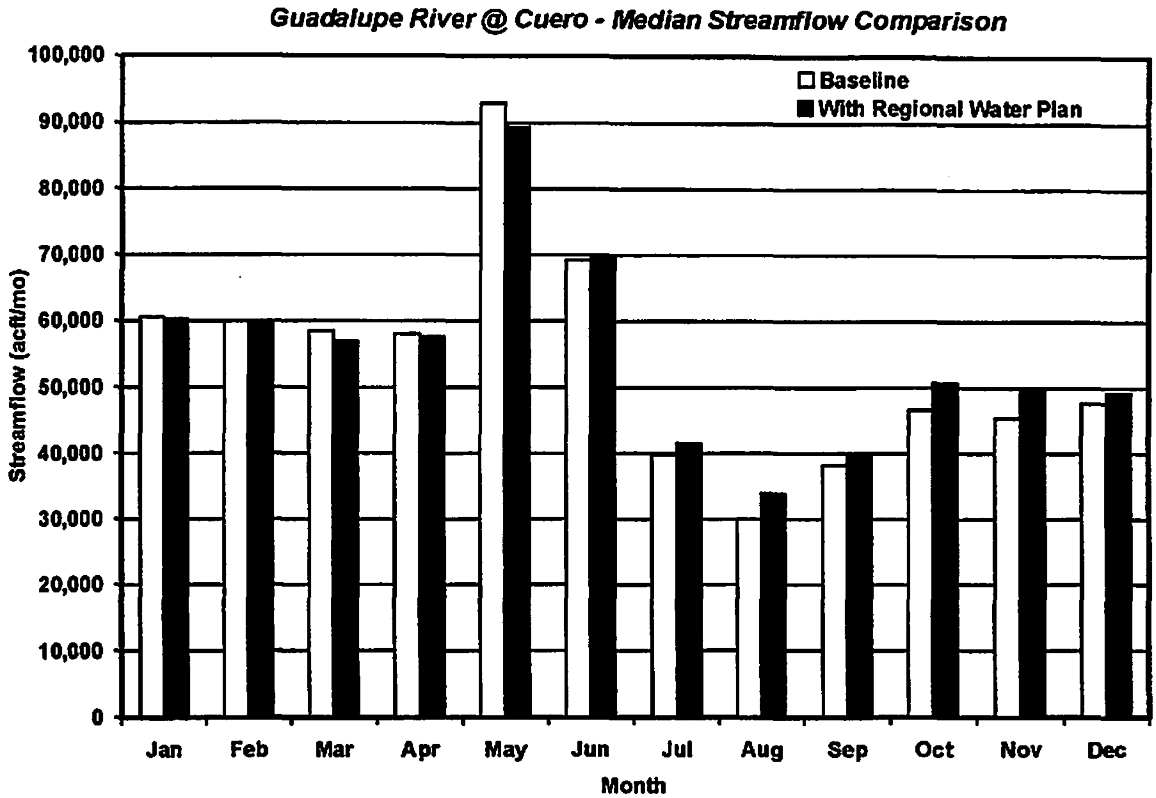


Figure 5.2-39. Regional Water Plan — Simsboro Aquifer



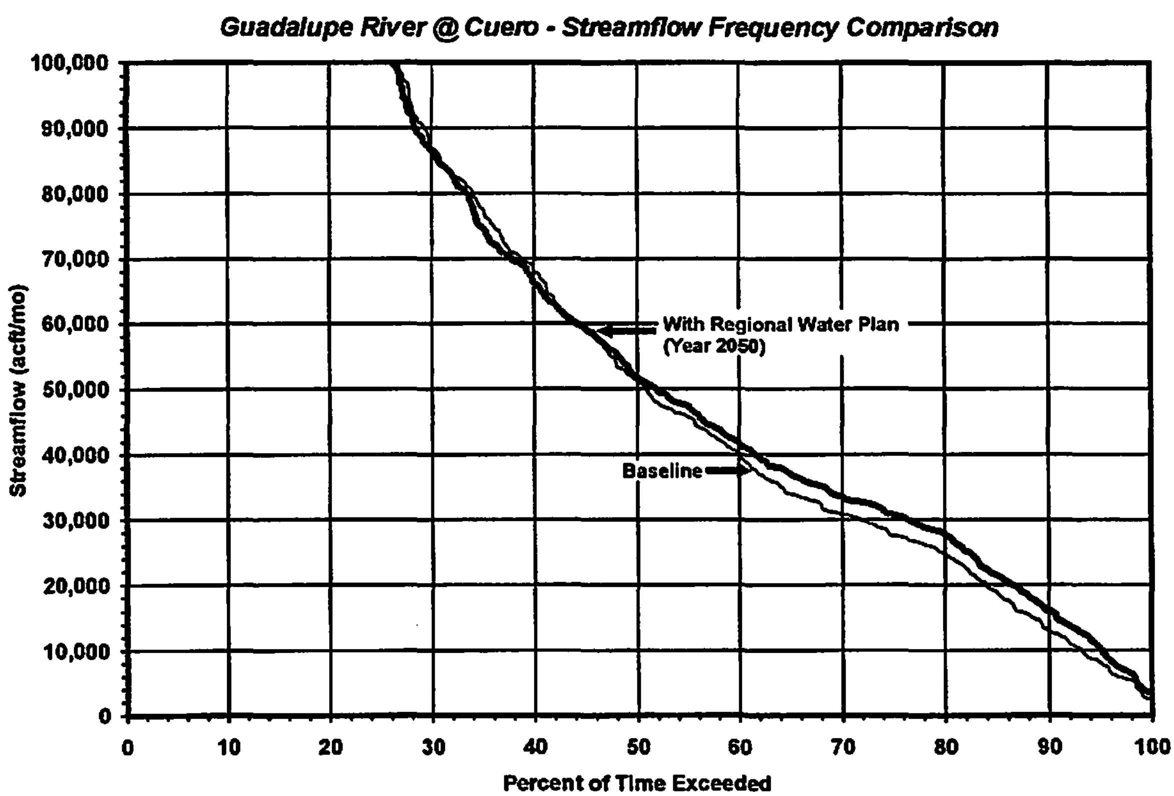
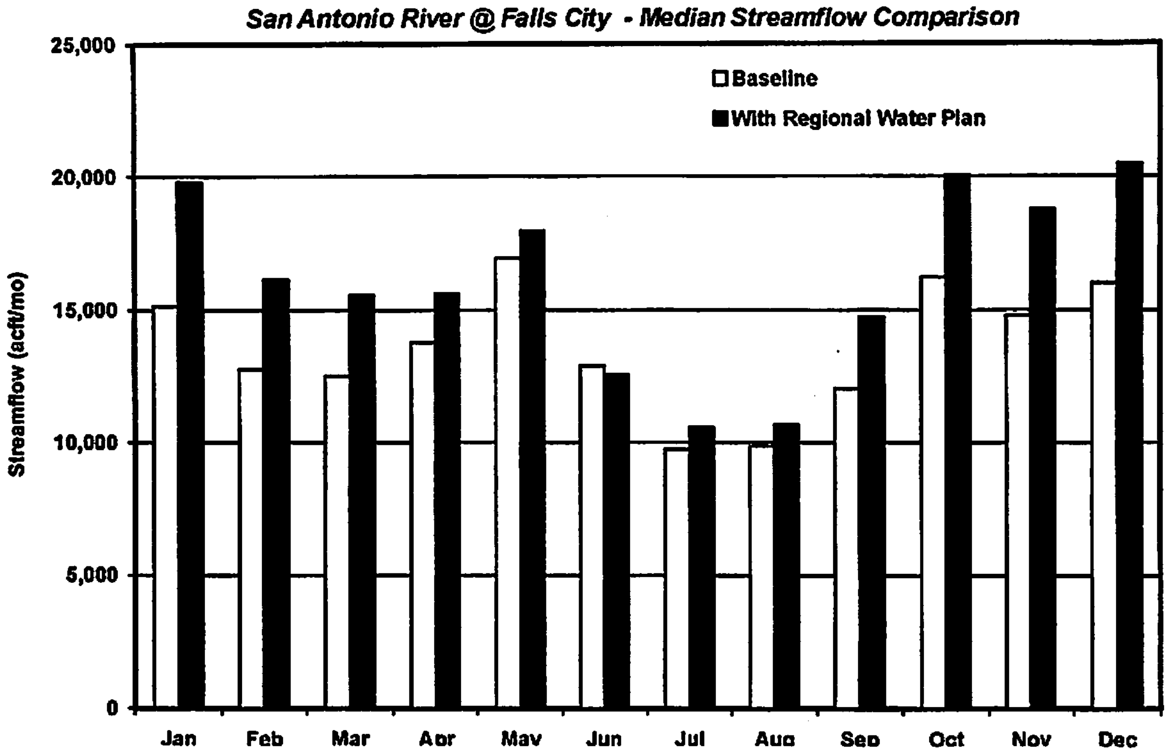


Figure 5.2-40 Regional Water Plan — Streamflow Comparisons



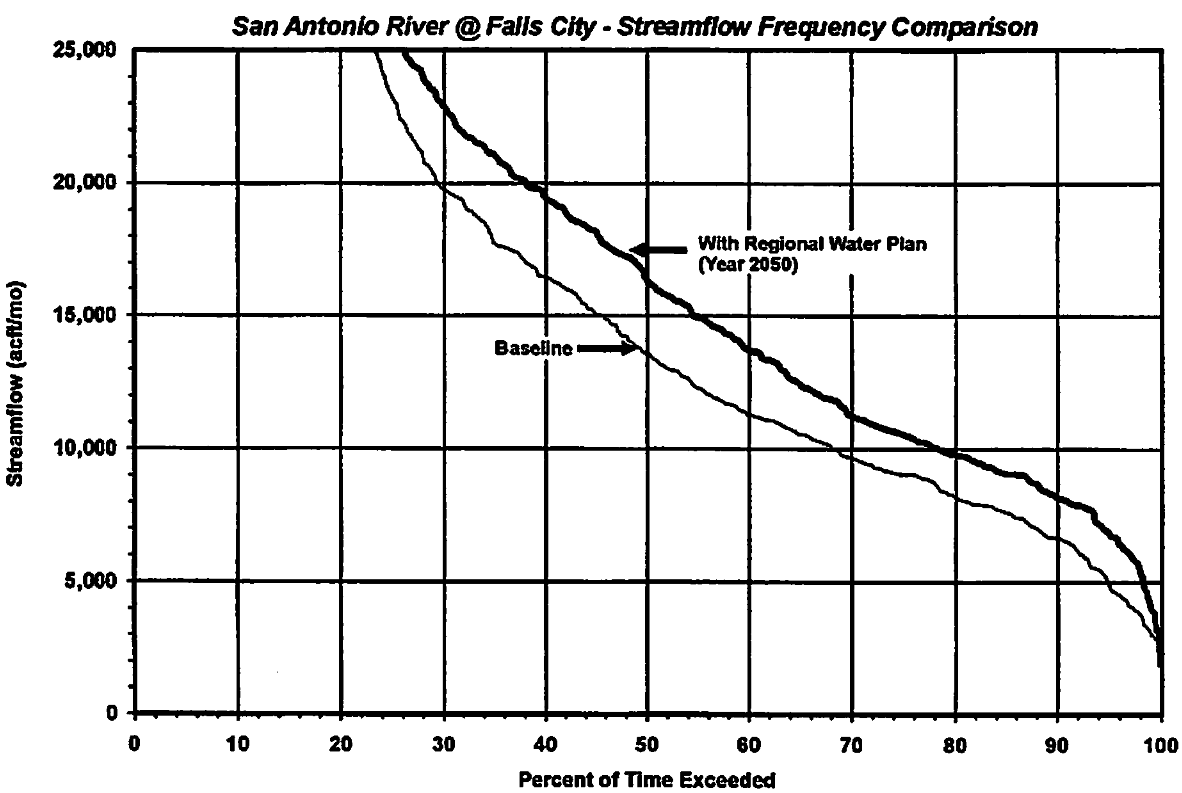
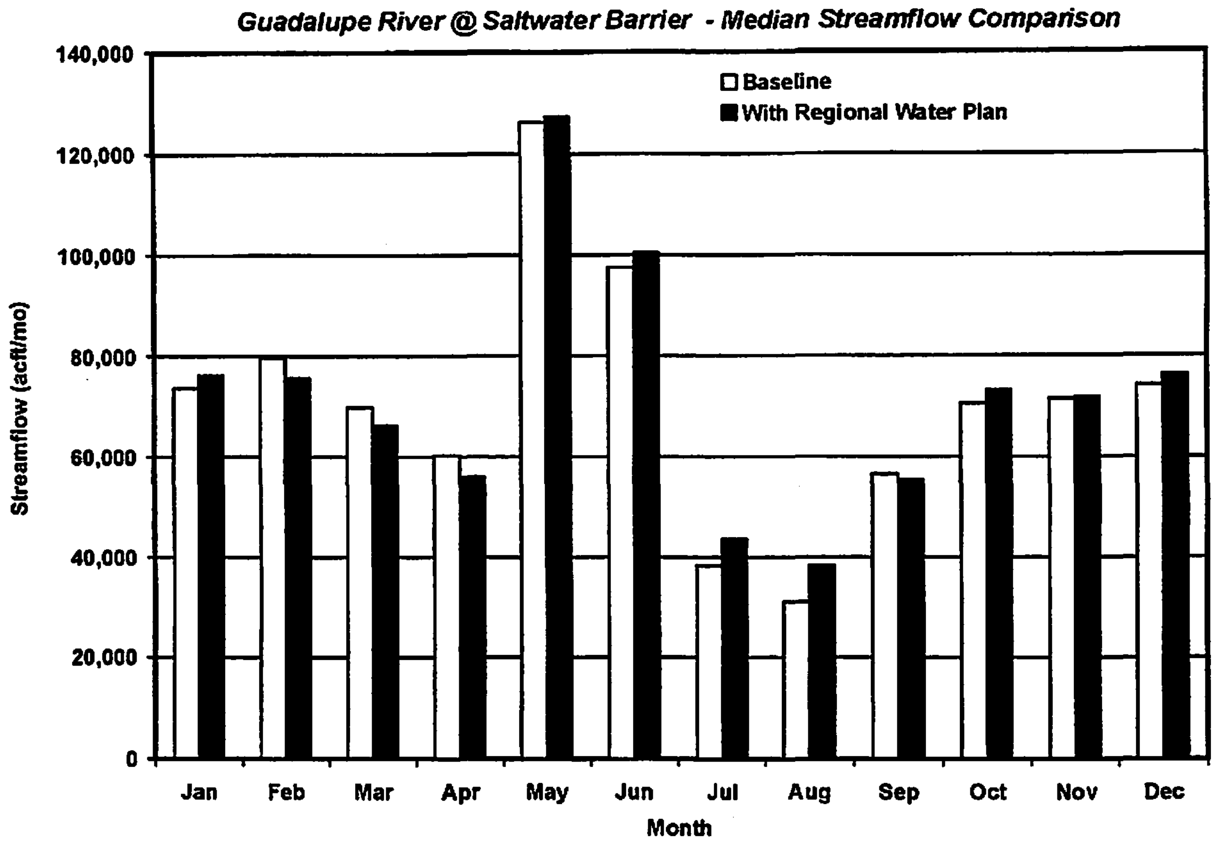


Figure 5.2-41. Regional Water Plan - Streamflow Comparisons

associated with Edwards Recharge – Type 2 Projects (L-18a). Increased streamflow at Falls City will be a direct result of net projected increases in treated effluent discharge associated with increasing water use and expansion of SAWS Recycled Water Program in Bexar County. Figure 5.2-42 shows increased streamflows (as compared to the baseline) in the Guadalupe River at the Saltwater Barrier in 2050. This is particularly evident during low streamflow periods.

Potential effects of implementation of the South Central Texas Regional Water Plan on streamflows in the Colorado River at Bay City are summarized in Figure 5.2-43. Results of statistical analyses of simulated streamflows from each of two potential Regional Water Sharing Alternatives proposed by the LCRA are presented in Figure 5.2-43. The Plan includes diversions from both Bastrop and Bay City totaling 150,000 acft/yr, which is the same annual diversion from the Colorado River as simulated by LCRA. Median streamflow in months during which irrigation use is limited or non-existent (October through March) may be reduced by more than 300 cfs once this management strategy is fully implemented in 2050.



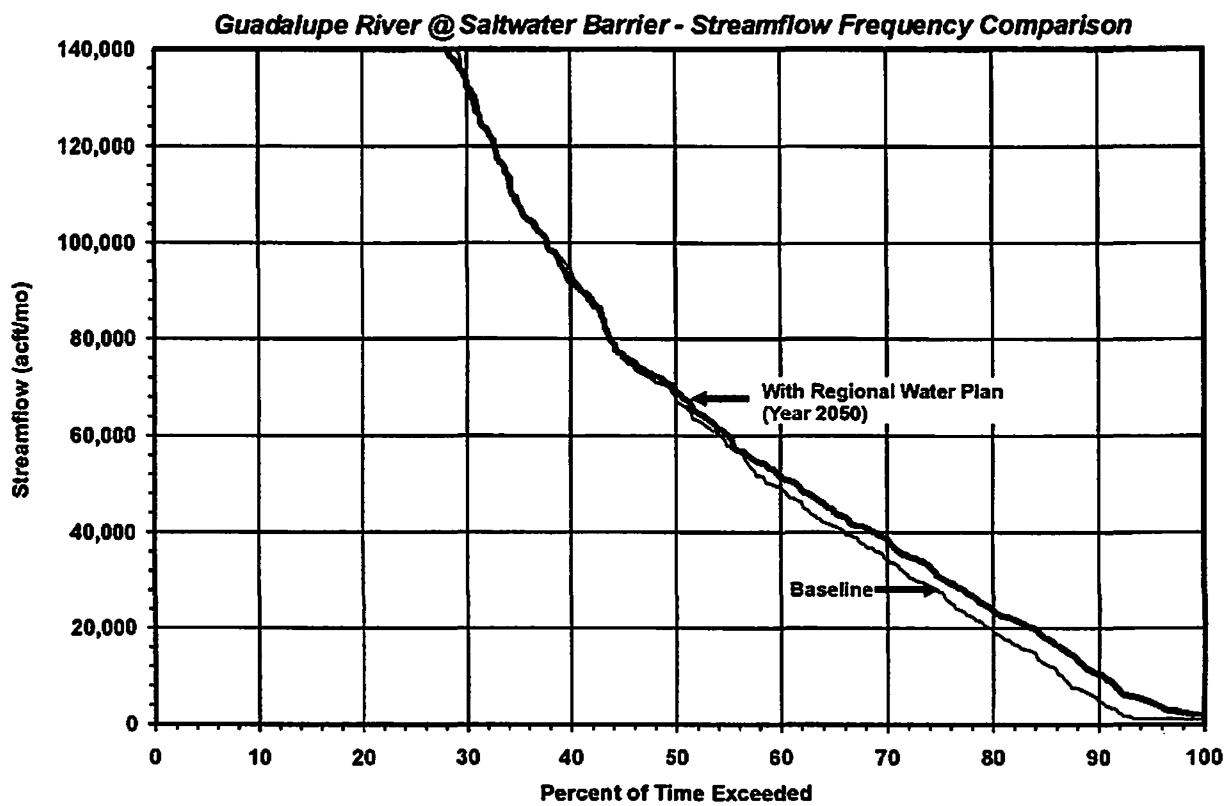
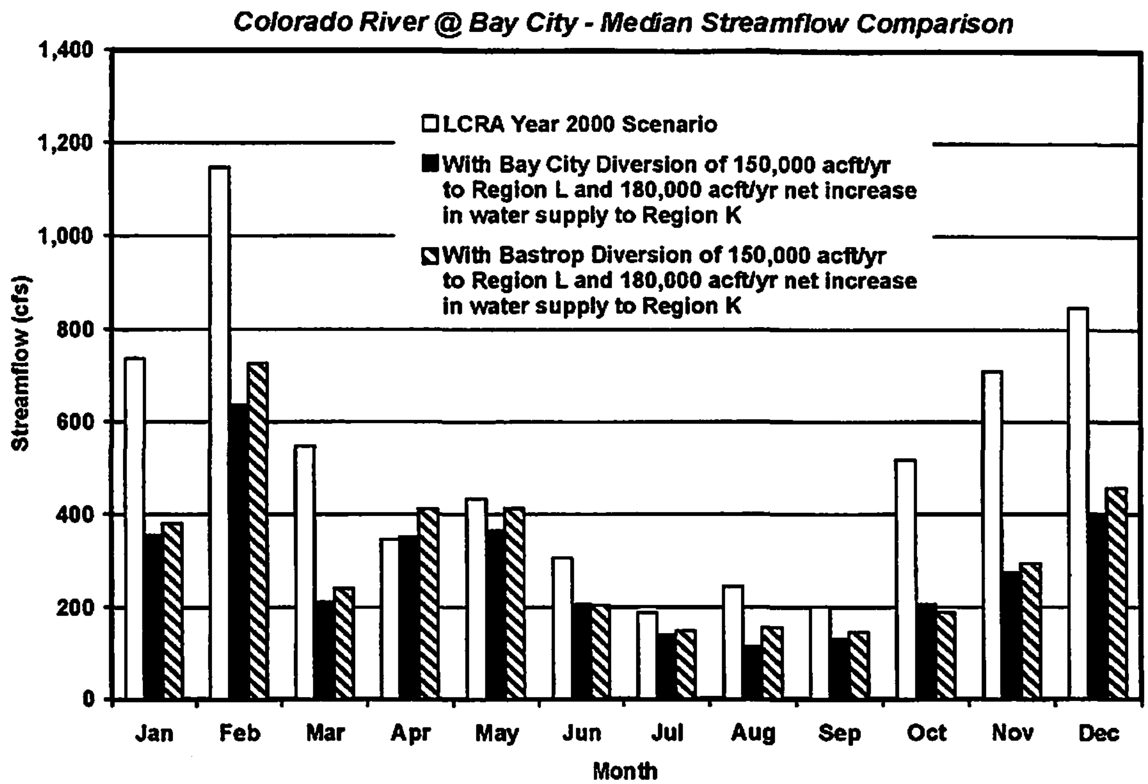


Figure 5.2-42. Regional Water Plan - Streamflow Comparisons



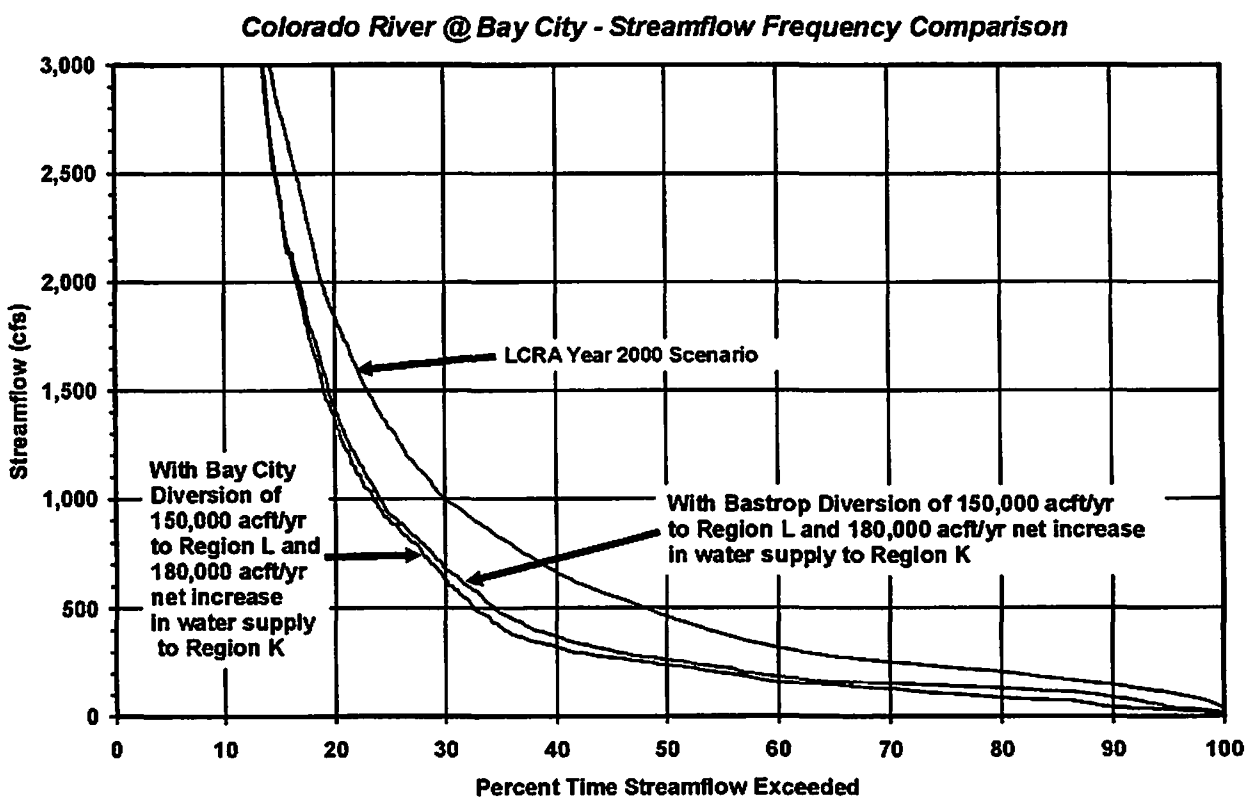


Figure 5.2-43. Regional Water Plan - Streamflow Comparisons

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5.2.5 Environmental Assessment

5.2.5.1 Environmental Setting

Brief discussions of the predominant land uses, vegetation, topography, habitats, and important species are included in the descriptions and environmental effects assessments of the individual water management strategies in Volume III of this document. The South Central Texas Regional Water Plan must meet the municipal, industrial, mining, and steam-electric power water needs of a region that spans southern Texas from Hays and Caldwell Counties in the north to the Colorado and Guadalupe Estuaries on the Gulf Coast, to the headwaters of the Nueces River in Uvalde County. The South Central Texas Region (Region L) 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 Tamaulipan), 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 eastern and southern margins of the Edwards Plateau are incised by a series of rugged, wooded canyons traversed by a series of streams where clear, spring fed waters intimately associated with a cavernous limestone aquifer provide the present primary water supply for Region L.

The Edwards Aquifer itself, together with the karst geology of its recharge zone and the major perennial springs, constitute a unique set of habitats in which a significant concentration of isolated, endemic species have developed. The porous to cavernous formation making up the Edwards and associated limestones constitute the Edwards Aquifer, the ground water source that presently supplies the City of San Antonio, and numerous other users, and which is critical to maintenance of spring habitats containing several endemic, endangered species. The Edwards Aquifer is the only important aquifer habitat in Texas in which vertebrate species live[9] 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

[9] 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.

rainfall over the watershed and recharge occurs primarily in the beds of streams crossing the recharge zone, which consist of a band of fractured and cavernous limestone (Karst geology) that harbors a growing number of endemic, terrestrial cave species. Where rivers flowing across the plateau have carved deep canyons and exposed the base of the Edwards Limestone, spring fed streams arise and flow south and eastward over the impermeable older formations to the recharge zone, at the base of which a set of larger springs (e.g., Leona, San Antonio, San Pedro, Comal, Hueco, and San Marcos Springs) emerge that support still more species of limited distribution.

Omernik[10] 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 (Figure 5.2-44). Focusing specifically on Texas and excluding explicit land use criteria, Gould[11] delineated 10 vegetational areas, which generally correspond with 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 5.2-45).

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 glandulosa*), various species of 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.), Indian grass (*Sorghastrum nutans*), Canadian wild rye (*Elymus canadensis*), buffalo grass (*Buchloe dactyloides*) and curly mesquite (*Hilaria belangeri*).[12]

[10] Omernik, James M., "Ecoregions of the Conterminous United States," Annals of the Association of American Geographers, 77(1) pp. 118-125, 1987.
[11] Gould, F.W., "The Grasses of Texas," Texas A&M University Press, College Station, Texas, 1975.
[12] Correll, D.S., and M.C. Johnston, "Manual of Vascular Plants of Texas," Texas Research Foundation, Renner, Texas, 1979.

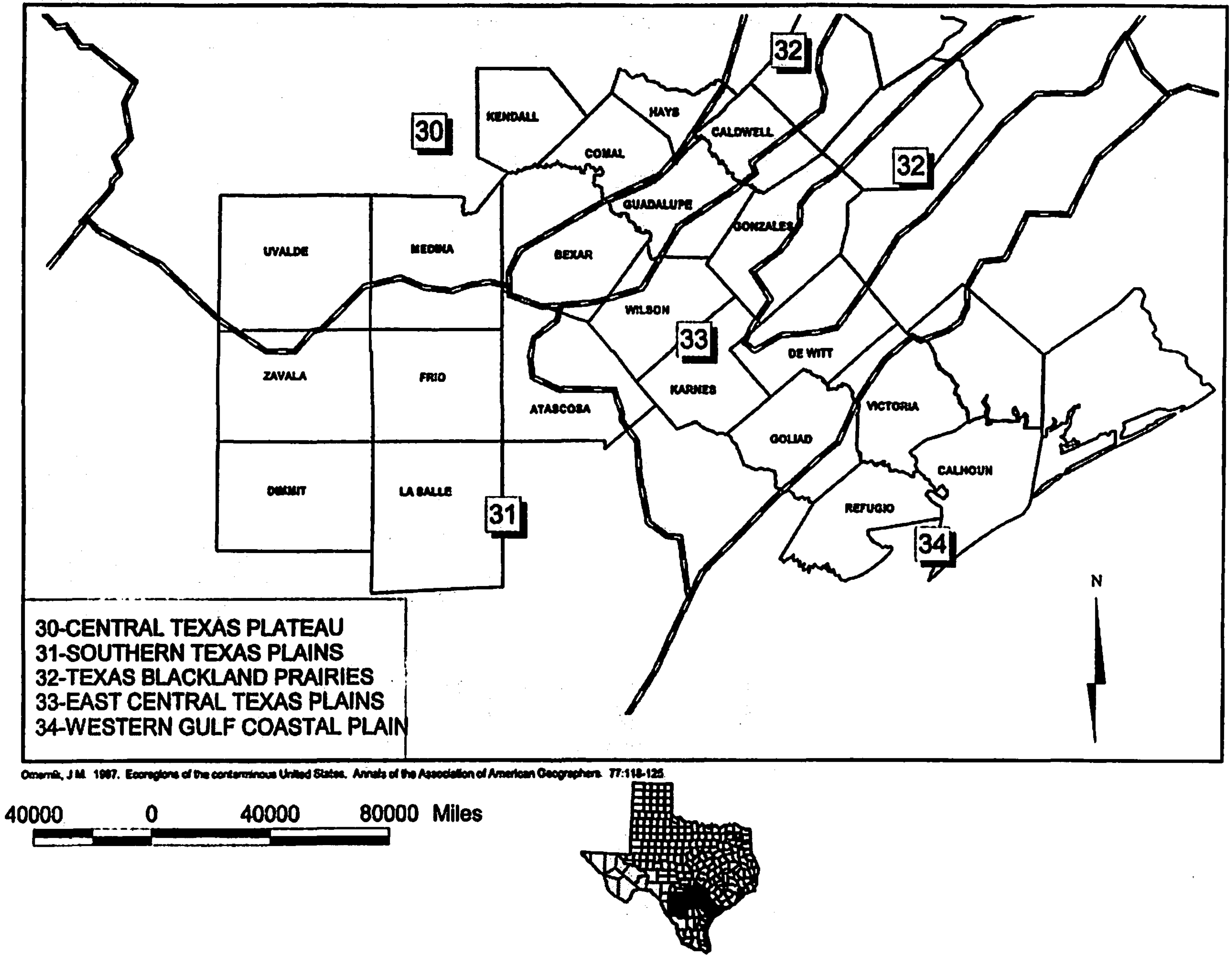

Figure 5.2-44. Omernick's Ecoregions for the Regional Water Plan within Region L

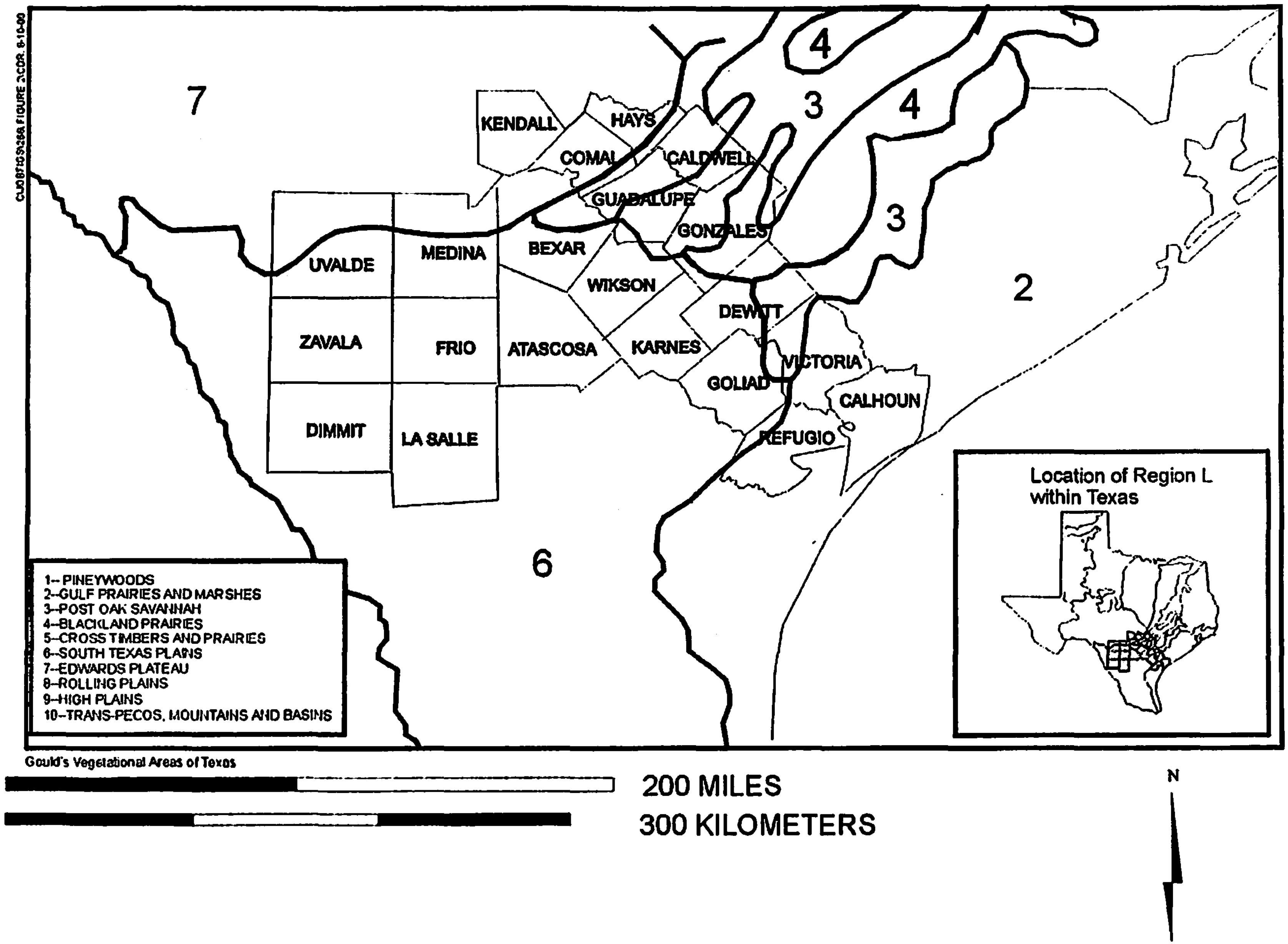

Figure 5.2-45. Gould's Vegetational Areas for the Regional Water Plan within Region L

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 illinoiensis*), 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 stream valleys where deeper soils have accumulated.[13] 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.[14] 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.[15,16,17,18] 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.

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[13] Ibid.
[14] Correll, D.S., and M.C. Johnston, Op. Cit., 1979.
[15] Tharp, B.C., "The Vegetation of Texas," Texas Acad. Sci., Anson Jones Press, Houston, 1939.
[16] Braun, E.L., "Deciduous Forests of Eastern North America," Hafner Publ. Co., Inc., New York, 1950.
[17] Weaver, J.E. and F.E. Clements, "Plant Ecology," 2nd Ed., McGraw-Hill Book Co., New York, 1938.
[18] Daubenmire, Rexford, "Plant Geography with Special Reference to North America," Academic Press, New York, 1978.

The Blackland Prairies is considered true prairie because of its native vegetation, which includes little bluestem as the climax dominant of the region. Elevations for the region as a whole 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 under cultivation, although there are some excellent native hay meadows and a few ranches remaining.[19] Big bluestem, Indiangrass, switchgrass (*Panicum virgatum*), sideoats grama (*Bouteloua curtipendula*), hairy grama(*Bouteloua hirsuta*), tall dropseed (*Sporobolus asper*), silver bluestem (*Bothriochloa saccharoides*), and Texas wintergrass (*Stipa leucotricha*) are other important grasses in the region.[20] If heavy grazing is allowed, Texas wintergrass, buffalo grass (*Buchloe dactyloides*), Texas grama (*Bouteloua rigidiseta*), smutgrass (*Sporobolus indicus*) and many annuals may increase or invade the prairies, causing deterioration of the native community.[21] Other invasive species are mesquite (*Prosopis sp.*) 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 (corresponding to the Southern Texas Plains Ecoregion) encompasses approximately 20 million acres of level to rolling topography, with elevations ranging from 1,000 feet 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.[22] 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 (*Quercus virginiana*), 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.

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[19] 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.
[20] Correll, D.S., and M.C. Johnston, Op. Cit., 1979.
[21] Ibid.
[22] Thomas, G.W., OP. Cit., 1975.

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 feet in elevation and is cut by sluggish rivers, creeks, bayous, and sloughs. Habitats include coastal salt marshes, dunes, prairies, riverbottoms, and fresh water 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.[23] Principal grasses are big bluestem (*Andropogon gerardi*), little bluestem (*Schizachyrium scoparium*), seacoast bluestem (*S. scoparium* var. *litoralis*), indiangrass (*Sorghastrum nutans*), eastern gamma grass (*Tripsacum dactyloides*), Texas wintergrass (*Stipa leucotricha*) and switchgrass (*Panicum virgatum*) and gulf cordgrass (*Spartina spp.*). Seashore saltgrass (*Distichlis spicata*) occurs on moist saline sites. Since the region is heavily used for ranching and agriculture, extensive disturbance has allowed invader species, such as mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*), prickly pear (*Opuntia* spp.), Acacia (*Acacia* spp.), ragweed (*Ambrosia psilostachya*), broomweed (*Xanthocephalum* spp.) and others to become well established.[24,25] Heavy grazing and/or abandoned farmland has changed the predominant grasses to species such as broomsedge (*Andropogon virginicus*), smutgrass (*Sporobolus indicus*), threeawns (*Aristida* spp.) and introduced bermudagrass (*Cynodon dactylon*), fesque (*Vulpia* spp.) and dallisgrass (*Paspalum dilatatum*).

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 (*Quercus virginiana*), post oak (*Q. stellata*),

[23] Correll, D.S., and M.C. Johnston, "Manual of the Vascular Plants of Texas," Texas Research Foundation, Renner, Texas, Second printing, 1979.
[24] Johnston, M.C., "The Vascular Plants of Texas, A List Updating the Manual of the Vascular Plants of Texas," Austin, Texas, 1988.
[25] Thomas, G.W., Op. Cit., 1975.

cedar elm (*Ulmus crassifolia*), hackberry (*Celtis laevigata*), honey mesquite, huisache, and yaupon (*Ilex vomitoria*).[26,27,28]

Species listed by the Federal and state governments as Endangered or Threatened (see Volume III, Appendices D and E for lists by county), 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 III. Stream segments nominated by Texas Parks and Wildlife Department for designation as Ecologically Unique River and Stream Segments in Region L are listed, along with the listing criteria employed in the nomination process, in Table 8-7 in Volume II. Tables 8-4 and 8-4a list the potential effects on the nominated segments for each water management strategy, and Table 8-8 presents additional information on potential impacts by nominated segment.

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 spring 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.

5.2.5.2 Environmental Effects

A number of the Water Management Strategies included in the Regional Water Plan are expected to involve little potential impact to environmental or cultural resources, except with respect to changes in land use practices that may affect wildlife habitats and uses in both rural and urban areas. These include the conservation options (L-10), transfer of Edwards irrigation water to municipal uses (L-15), rainwater harvesting (SCTN-9), and aquifer storage and recovery in the Carrizo-Wilcox Aquifer (SCTN-1). Some concern has been expressed that implementation of L-15 might adversely affect Comal springflows when a portion of the water

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[26] Bureau of Reclamation, "Palmetto Bend Project – Texas Final Environmental Impact Statement," Bureau of Reclamation, U.S. Department of the Interior, 1974.
[27] Soil Conservation Service (SCS), "Soil survey of Calhoun County, Texas," SCS, Temple, Texas, 1978.
[28] Texas Department of Water Resources, " Land Use/Land Cover Maps of Texas," Austin, Texas, LP-62, Reprinted 1978, 1977.

that has been pumped from the aquifer for irrigation in Uvalde and Medina Counties is withdrawn instead from Bexar County wells.

Potential adverse environmental and cultural resources impacts are minimized in the Regional Water Plan by the inclusion of options which maximize the efficient use of existing surface water resources (G-15C and G-24), or which develop groundwater supplies (SCTN-2a, SCTN-3c, CZ-10C, CZ-10D), thereby avoiding the extensive habitat conversions and streamflow changes that can accompany comparable surface water development.

Construction of pipelines and well fields, and similarly dispersed facilities that typically have substantial flexibility in terms of alignment or site selection, will generally result in relatively localized disturbances of vegetation and habitats. 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 addition, field studies conducted prior to design and easement procurement can substantially reduce the potential to adversely affect individual members of Endangered and Threatened species populations, historic and prehistoric sites, and other resources that are present only at particular locations. 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.

Pipeline or well field construction are features of water management strategies that are present in all the Ecoregions. Recharge reservoir or pipeline construction associated with water management strategies L-18a and G-24 (and other facilities located in northern Bexar, Comal, and Hays Counties) have the potential to encounter a number of Endangered and Threatened species occurring in association with the margin of the Edwards Plateau (e.g., golden-cheeked warbler, *Dendroica chrysoparia*) and the Edwards Aquifer or its associated Karst recharge zone and springs. Many of these species are currently being affected by the urban and suburban development of the City of San Antonio and the Interstate Highway 35 corridor, and pipeline construction in these areas should be preceded by consultation with U.S. Fish and Wildlife Service.

The species mapped by the Texas Parks and Wildlife Texas Biological and Conservation Data System maintained by the Texas Parks and Wildlife Department Wildlife Diversity Branch and designated Endangered, and which inhabit extensive areas (or more correctly inhabit fragments of habitat dispersed over a large area) along pipeline alignments in the Coastal Plain, Blackland Prairies, and Central Texas Plains Ecoregions include Attwater's Prairie Chicken (*Tympanuchus cupido attwateri*), Houston Toad (*Bufo houstonensis*), Two-Flower Stickpea (*Calliandra biflora*), and Welder Machaeranthera (*Psilactis heterocarpa*). The relatively large number of protected species mapped within the one mile pipeline corridors associated with water management strategies SCTN-16, SCTN-17, and LCRA Colorado River Diversions include a number of marine species, some of which may be affected by changes in estuarine inflows as a result of diversions from the Guadalupe and Colorado Rivers, or by discharge of reject water (brine) from a desalination facility. Pipeline construction by itself is unlikely to significantly affect any marine species.

The water management strategies that include development of groundwater (CZ-10C, CZ10D, SCTN-3c, SCTN-16, and LCRA Colorado River Diversions) 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. Hydrogeological studies have indicated that substantial aquifer drawdowns will be largely limited to the vicinity of the well fields and effects on nearby wells can be mitigated. With respect to effects on the flow of springs, and streams crossing the aquifer outcrops, existing information indicates that most of the springs in the vicinity of the Simsboro Aquifer well fields (SCTN-3c) originate in local alluvial aquifers and are presently being impacted by local groundwater users. None have been identified that would be adversely affected by a drawdown in the Simsboro Aquifer. Likewise, hydrogeological and surface water modeling shows that streamflows in the Brazos and Colorado Rivers, and in the intervening streams crossing the Simsboro outcrop, would not be significantly affected by this strategy.

In contrast to the Simsboro Aquifer project, development of groundwater from the Carrizo-Wilcox Aquifer (CZ-10C, CZ-10D) is projected to result in reductions in streamflow in both the San Antonio and Guadalupe Rivers, and in inflows to the Guadalupe Estuary. Proportionally, reductions in flow would be greatest in the middle San Antonio River and least at the Saltwater Barrier (estuary inflows). Unlike the river diversions discussed below, flow reductions resulting from implementation of these options are most pronounced during dry weather to drought conditions, when aquatic communities are most stressed. Potential reductions in Guadalupe and San Antonio River streamflow as a result of groundwater pumpage will be largely offset by enhanced Edwards springflow (L-18a) and increasing treated effluent discharge, respectively.

The large river diversion water management strategies, the Lower Guadalupe River Diversion (SCTN-16) and the LCRA Colorado River Diversion, include diversion of water under existing water rights. SCTN-16 includes unappropriated streamflow for which rights have to be obtained through the state permitting process. Under both strategies, water supplies from off-channel and upstream reservoirs and from newly developed groundwater may be used to insure firm supplies throughout a drought comparable to the most severe on record. The additional water is necessary because the unused water rights and the unappropriated water are either not physically present during low flow periods, are unavailable due to senior water rights demands, or are assigned to environmental streamflow needs. The bulk of these 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 were less than the median, and half the time flows were greater than the median), and low flow regimes will be affected to a much lesser degree. Operations of both water management strategies are consistent with the inflow needs outlined in the Inflow Needs Reports for the two estuaries.[29,30]

Water management strategy L-18a includes 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 and contributes 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 zone are usually well below maximum recharge amounts. Slowing the flow of water in order to increase the amount of time water remains over the recharge zone would 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 aquatic communities in the recharge and downstream reaches. Because these projects involve natural recharge, no changes in water

[29] Martin, Q., D. Mosier, J. Patek, C. Gorham-Test. 1997. Freshwater Inflow Needs of the Matagorda Bay System. Lower Colorado River Authority, Austin, Texas.
[30] TPWD and TWDB, "Freshwater Inflow Recommendation for the Guadalupe Estuary of Texas," Coastal Studies Technical Report No. 98-1, TPWD and TWDB, Austin, Texas, 1998.

quality are expected. The brief retention times for the impounded water are not expected to significantly alter the types and amounts of suspended and dissolved materials entering the recharge zone.

Major exceptions include the Nueces and Blanco River sites that do ordinarily exhibit surface water and aquatic communities at the proposed recharge sites. However, permanent aquatic habitats are not generally maintained in the Nueces River between US 90 and the "braided reach" of the Nueces River, while the Blanco River 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 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 may be near caves in which reside populations of endemic invertebrates that may be listed by U.S. Fish and Wildlife Service as Endangered or Threatened, and one site is in Government Canyon State Park.

As a result of diverting flood flows in the upper Nueces River basin into the Edwards Aquifer, thence to the Guadalupe-San Antonio River Basin through enhanced springflows and wastewater discharges, implementation of L-18a 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.

Several stream segments that contain proposed recharge project sites have been nominated by Texas Parks and Wildlife Department for designation as Ecologically Unique Segments. Table 5.2-23 lists the nominated streams in Region L together with the criteria that were used to select these segments. All of the streams having segments that would have recharge projects (Blanco, Frio, Nueces, and Sabinal) have Edwards Aquifer recharge as a hydrologic criterion. The other criteria tabulated include nomination for inclusion in Texas Natural River Systems, the presence of Garner State Park, overall use, and aesthetics. As the recharge projects are all located at the downstream end of perennial flow, none of the criteria used to nominate these stream segments will be affected adversely. Table 5.2-24 summarizes the potential effects on Ecologically Unique Segments of all the water management strategies included in the Regional Water Plan.

Table 5.2-23.
Criteria Used by TPWD to Nominate Ecologically Unique River and Stream Segments In and Adjacent to the Region L Planning Area

	Biological Function	Hydrologic Function	Riparian Conservation	Water Quality Aquatic Life/Uses	Threatened and Endangered Species.
Arenosa Cr.				ecoregion stream	
Blanco R.		Edwards Aquifer Recharge		overall use	
Carpers Cr.				ecoregion stream	
Comal R.		Edwards Aquifer Recharge	Landa Park		multiple spring-dependent species
Cypress Cr.		Edwards Aquifer Recharge		overall use	
Frio R.	Texas Natural River Systems Nominee	Edwards Aquifer Recharge	Garner State Park	overall use, aesthetic	
Garcitas Cr.	Estuarine wetlands			ecoregion stream	diamondback terrapin*
Geronimo Cr.				ecoregion stream	
Guadalupe R., Upper		Edwards Aquifer Recharge	Guadalupe River Park	overall use, #2 scenic river in Texas	
Guadalupe R., Middle					golden orb*
Guadalupe R., Lower	Freshwater and marine wetlands		Victoria Municipal Park Guadalupe Delta WMA	overall use	whooping crane
Honey Cr.			Honey Creek Natural Area		
Mission R.	Freshwater and marine wetlands				
Upper Nueces R.	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic	
Sabinal R.	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic	
Upper San Marcos R.			multiple university and city parks	overall use	multiple spring- dependent species
Lower San Marcos R.			Palmetto State Park		
San Miguel Cr.				ecoregion stream	
West Nueces R.		Edwards Aquifer Recharge			
West Verde Cr.			Hill Country Natural Area		
West Carancahua Cr.				ecoregion stream	
Colorado R.-Bastrop				overall use	blue sucker
Tidal Colorado R.	Freshwater and marine wetlands				
Onion Creek				ecoregion stream	

* Not listed as Threatened or Endangered by the State of Texas or U.S. Fish and Wildlife Service

Table 5.2-24
Construction or Operational Activities of Water Management Strategies Potentially Affecting Ecologically Unique River and Stream Segments

Option	Unique Segments Affected	Types of Impacts
SCTN-1a	No impact	
SCTN-2a	No impact	
SCTN-3c	Comal and Colorado Rivers	xing, xing
SCTN-4	No impact	
SCTN-5	No impact	
SCTN-16	Lower Guadalupe River	rdsxu
G-15C	Geronimo Creek and Guadalupe River	xing, lds
G-24	Blanco River	xing
L-10	No impact	
L-15	No impact	
L-18a	Blanco, Frio, Sabinal, and Nueces Rivers	rcp, rci, rci, rcp
CZ-10C	Guadalupe River	gw
CZ-10D	Geronimo Creek, Guadalupe River	Xing, gw
LCRA Colorado River Diversions	Colorado River in Bastrop Co.	cdrdsx
LCRA Colorado River Diversions	Colorado River in Matagorda Co.	cdrdsx
SAWS Recycle	No impact	
Trinity Aquifer Bexar	No impact	
LCRA Colorado River Diversions	West Caranchahua and Garcitas Creeks, Lower Guadalupe and Colorado Rivers	Rd, xing, xing, xing

** Key to Table Entries
rci - recharge dam; median daily flow <0, intermittent impoundment
rcp - recharge dam; median daily flow >0, perennial impoundment
cd – channel dam; diversion pool only
ld – reservoir diversion
rd – river diversion
s=stored water, x=existing run of river rights, u=unappropriated flow, ( )=tributary impoundments
xing-Pipeline crossing
gw – groundwater withdrawals with a significant effect on streamflow
rfp – reduced flood peaks from upstream dam operation
[1] Diversion at Lake Dunlap
[2] Diversion at Gonzales

The cultural resources of Region L include historical markers designated by the Texas Historical Commission. One concentration of markers is located in central Bexar County within the City of San Antonio. Other areas where substantial numbers of historical markers are found within the mile-wide pipeline corridors discussed and assessed in the presentation of individual water management strategies CZ-10C, SCTN-17, LCRA Colorado River Diversions, SCTN-3c, and SCTN-16 in Volume III of this document. Stream terraces, particularly where they are in proximity to a tributary confluence, are thought to have substantially higher probabilities of holding significant archaeological sites than do either floodplains or more upland areas. In addition, terrace and floodplain (riparian) areas are likely to include deep, geologically recent sediments in which archaeological sites may be buried. Finding and investigating such sites can be a lengthy and difficult process, and may significantly affect implementation of options that include reservoir construction or substantial lengths of pipeline in such settings.

Potential environmental and cultural resources impacts associated with water management strategy SCTN-17, desalination of seawater, would result primarily from construction of the facility and its intake, discharge and water delivery pipelines. Field studies conducted prior to design and easement procurement can substantially reduce the potential to adversely affect individual members of Endangered and Threatened species populations, historic and prehistoric sites, and other resources that may be present. Because the reject water (brine) can be 3 to 4 times more saline than seawater, and could amount to as much as 100 acft per day, the outfall will likely need to be sited in the Gulf of Mexico because of potential salinity impacts that may occur in an enclosed estuarine environment.

5.2.6 Implementation Issues

5.2.6.1 Summary of Key Information

Pursuant to 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 South Central Texas Regional Water Plan is summarized by subject area below. In addition, Table 5.2-25 provides a summary of key information, pursuant to TWDB evaluation criteria, for each water management strategy included in the Regional Water Plan.

Quantity, Reliability, and Cost

- Plan reflects substantial commitment to Municipal and Irrigation Demand Reduction (Conservation) (L-10) 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 2050.
- 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.
- Annual costs associated with new supplies delivered to each water user group range from about $120,000,000 dollars early in the planning period to about $420,000,000 in 2040. Unit costs range from $530 per acft to $737 per acft and average $617 per acft or $1.89 per 1,000 gallons over the 50-year planning period.
- During the more immediate planning period extending through 2030, the Regional Water Plan has the least average unit cost of the alternative plans considered.

Environmental Factors

- See Section 5.2.6.2 for summary of environmental benefits and concerns.

Impacts on Water Resources

- Plan implementation results in no unmitigated reductions in water available to existing rights.
- Generally modest long-term reductions in water levels in the Carrizo Aquifer as withdrawals associated with management strategies in the Plan are in conformance with the policies of the Evergreen and Gonzales County Underground Water Conservation Districts.

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 Demand Reduction

Table 5.2-25. South Central Texas Regional W ater Plan – TWDB Evaluation Criteria Summary

Management Strategy	Quantity (acft/yr)[1]	Reliability[2]	Unit Cost ($/acft)[3]	Environmental Factors	Impacts on Water Resources	Impacts on Agricultural and Natural Resources	Other Relevant Factors per SCTRWPG
Municipal Demand Reduction (Conservation) (L-10 Mun.)	44,566	Firm	$173	• None. Supply developed through dema nd reduction.	• Slight reductions in treated effluent discharge.	• Fewer water management strategies necessary to meet projected needs.	• Conservation is a central element of the Plan.
Irrigation Demand Reduction (Conservation) w/ Transfer (L-10 Irr.)	27,314	Firm	$36	• None. Supply developed through dema nd reduction.	• Reductions in springflow due to relocation of pumpage closer to springs.	• Installation of LEPA systems on 53 percent of applicable acreage in Uvalde, Medina, & Bexar.	• Consistent with conservation focus of Plan.
Irrigation Demand Reduction (Conservation) (L-10 Irr.)	28,903	Firm	$77	• None. Supply developed through cons rvation.	• More efficient use of limited water resources.	• Potential to irrigate more acres using less water.	• Recommended to offset projected irrigation needs (shortages) in six counties.
Edwards Irrigation Transfers (L-15)	42,686	Firm	$80	• None. Supply developed without new f acilities.	• Reductions in springflow due to relocation of pumpage closer to springs.	• Plan includes 53 percent of potential maximum voluntary transfer through lease or purchase.	• Encourages beneficial use of available rights.
Edwards Recharge – Type 2 Projects (L-18a)	21,577	Firm	$1,087	• Concerns with endangered & threatene l species, habitat, and TPWD Ecologicall y Unique Stream Segments at some sites. • Enhanced springflows help endangered species.	• Limited, as most projects are located on streams that are frequently dry. • Increased aquifer levels and springflows.	• Typically higher aquifer levels in Uvalde & Medina Counties.	• Positive effects on discharges from Comal and San Marcos Springs. • Mitigation of impacts on firm yield of Choke Canyon Res. / Lake Corpus Christi System.
Canyon Reservoir – River Diversion (G-15C)	15,700	Firm	$743	• Minimal. Canyon Reservoir is an exist ng resource.	• Increased instream flows associated with downstream deliveries of water supply.	• Not applicable.	• Encourages beneficial use of existing reservoir. • Recreational benefits with downstream delivery.
Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24)	1,348	Firm	$1,378	• Minimal. Pipeline could encounter end angered or threatened species habitat.	• Minimal, if any.	• Not applicable.	• Encourages beneficial use of existing reservoir.
Lower Guadalupe River Diversion (SCTN-16)	94,500	Firm	$819	• Concerns with endangered & threatene l species, habitat, cultural resources, and TPWD Ecologically Unique Stream Segment.	• Some reductions in freshwater inflows to the Guadalupe Estuary associated with greater utilization of existing water rights and diversion of unappropriated flow.	• Minimal, if any.	• Encourages beneficial use of available rights. • Protects instream flows and recreational opportunities through lower basin diversion.
Colorado River Diversions (LCRA)[4]	150,000	Firm	$1,017	• Concerns with endangered & threatene l species, habitat, cultural resources, and TPWD Ecologically Unique Stream Segments.	• Reductions in freshwater inflows to Matagorda Bay associated with greater utilization of existing water rights.	• Potential increases in reliable water supply for irrigation and improved irrigation efficiency in Region K.	• Encourages beneficial use of available rights and existing reservoirs. • Determination of equitable cost sharing for development of water supplies in Region K.
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	16,000	Firm	$781	• Minimal. Pipeline could encounter cult ural resource sites.	• Modest long-term reductions in aquifer levels. • Minimal reductions in instream flow at outcrop. • Potential effects on discharge of small springs.	• Minimal, if any.	• Conformance with policies of underground water conservation districts.
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)	27,500	Firm	$1,044	• Minimal. Pipeline could encounter cult ural resource sites.	• Modest long-term reductions in aquifer levels. • Minimal reductions in instream flow at outcrop. • Potential effects on discharge of small springs.	• Minimal, if any.	• Conformance with policies of Gonzales County Underground Water Conservation District. • Planned Bastrop Co. supply exceeds 2030 availability per Region K.
Carrizo Aquifer – Local Supply (SCTN-2a)	14,700	Firm	$386	• Minimal, if any.	• Modest long-term reductions in aquifer levels.	• Minimal, if any.	
Simsboro Aquifer (SCTN-3c)	55,000	Firm	$865	• Concerns with endangered & threatene l species, habitat, and cultural resources.	• Long-term reductions in aquifer levels. • Minimal reductions in instream flow at outcrop. • Potential effects on discharge of small springs.	• Minimal, if any.	• Beneficial use of groundwater now unused. • Planned Bastrop Co. supply for Region L exceeds 2030 availability per Region K.
SAWS Recycled Water Program (SAWS)	52,215	Firm	$395	• None. Water supply derived from incr ased volumes of treated wastewater.	• Minimal, if any.	• Not applicable.	• Encourages beneficial use of available resource.
Purchase of Water From Major Provider (PMP)	14,240	Firm	Variable	• Minimal, if any. Supply developed as p art of other water management strategies.	• Minimal, if any.	• Not applicable.	
Desalination of Seawater (SCTN-17)	84,012	Firm	$1,440	• Intake siting and brine discharge locati n(s). • Potential effects on marine habitat and pecies. • Pipeline could traverse important habit t.	• No apparent impacts on other water resources. • Potential benefit to demand centers due to increased reclaimed water supply	• Not applicable.	• Perceived to have fewer associated environmental effects than typical fresh surface water supplies.
Aquifer Storage & Recovery (ASR) (SCTN-1a)	Unquantified	Firm	Unquantified	• Minimal. Pipeline could encounter imp ortant habitat or encounter cultural resource si es.	• Reduced peak summer pumpage from Edwards Aquifer increases aquifer levels and springflow.	• Not applicable.	• SAWS South Bexar County ASR presently in implementation phase.
Schertz-Seguin Water Supply Project (SSWSP)[5]	20,000	Firm					
Western Canyon Rgnl. Water Supply Proj. (WCRWSP)[5]	10,527	Firm					
Hays/IH35 Water Supply Project (HIH35WSP)[5]	4,500	Firm					
Lake Dunalp WTP Exp. & Mid-Cities Proj. (CRWA)[5]	0	Firm					
Carrizo Aquifer – Bexar & Guadalupe (BMWD)[5]	4,000	Firm					
Trinity Aquifer – Bexar (BMWD)[5]	1,000	Firm					
GBRA Canyon Reservoir Contract Renewal (GBRA)[5]	13,765	Firm					
Brush Management (SCTN-4)	Unquantified	Unknown	Unquantified	• Concerns regarding endangered & thre tened species, vegetation & wildlife habitat, a d cultural resources.	• Potential benefit to Edwards Aquifer due to increased water for recharge.	• Potential improvement of pasture for grazing.	• Additional studies needed to determine quantity of dependable supply during drought
Weather Modification (SCTN-5)	Unquantified	Unknown	Unquantified	• Potential increases in water supply for ildlife habitat.	• Potential increases in rainfall, runoff, and aquifer recharge.	• Provides water for irrigated and dry-land agriculture (crops & ranching).	• Concerns regarding increased flood potential.
Rainwater Harvesting (SCTN-9)	Unquantified	Unknown	Unquantified	• Minimal, if any.	• Minimal, if any.	• Not applicable.	• Consistent with conservation focus of Plan.
Additional Municipal Reuse Programs	Unquantified	Unknown	Unquantified	• None. Water supply derived from incr ased volumes of treated wastewater.	• Minimal, if any.	• Not applicable.	• Encourages beneficial use of available resource.
Small Aquifer Recharge Dams	Unquantified	Unknown	Unquantified	• Small potential effects on habitat.	• Potential increases in local aquifer levels.	• Minimal, if any.	
Edwards Aquifer Recharge & Recirculation Systems	Unquantified	Unknown	Unquantified	• Unknown at this time.	• Unknown at this time.	• Unknown at this time.	• Additional feasibility studies necessary. • Implemented only with Plan amendment.
Cooperation w/ Corpus Christi for New Water Sources	Unquantified	Unknown	Unquantified	• Unknown at this time.	• Unknown at this time.	• Unknown at this time.	• Cooperation must be beneficial to both regions.
Additional Storage (ASR and/or Surface)	Unquantified	Unknown	Unquantified	• Unknown at this time.	• Unknown at this time.	• Unknown at this time.	• May be necessary to meet peak drought needs.
Lockhart Reservoir (G-21)	5,627	Firm	$764 @ Reservoir	• Concerns regarding habitat & cultural r sources.	• Reduced streamflow immediately below dam.	• Minimal.	• Questions regarding economic feasibility. • Strong local government support.
Total of New Supplies	744,053						

Table 5.2-25. South Central Texas Regional Water Plan – TWDB Evaluation Criteria Summary (Continued)

Management Strategy	Comparison of Strategies to Meet Needs	Interbasin Transfer Issues	Third-Party Impacts of Voluntary Transfers	Regional Efficiency	Effect on Navigation
Municipal Demand Reduction (Conservation) (L-10 Mun.)	• Low unit cost. • Inherent environmental benefits.	• Not applicable.	• Not applicable.	• Implementable throughout the region.	• None
Irrigation Demand Reduction (Conservation) w/ Transfer (L-10 Irr.)	• Low unit cost.	• Not applicable.	• Limited transfer allows irrigators to install high efficiency systems so irrigation can continue at present levels and avoid impact to local economy.	• Requires no new facilities other than LEPA equipment on farms.	• None
Irrigation Demand Reduction (Conservation) (L-10 Irr.)	• Potentially feasible management strategy to meet a portion of projected irrigation needs.	• Not applicable.	• Not applicable.	• Recommended specifically for counties having sufficient applicable acreage in irrigation.	• None
Edwards Irrigation Transfers (L-15)	• Low unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• Requires no new facilities.	• None
Edwards Recharge – Type 2 Projects (L-18a)	• Project unit costs range from low to high.	• Not applicable.	• Not applicable.	• Requires no new transmission/treatment facilities.	• None
Canyon Reservoir – River Diversion (G-15C)	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• Significant additional surface water supply without construction of a new reservoir.	• None
Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24)	• High unit cost, but options to meet needs are limited.	• Not applicable.	• Not applicable.	• Additional surface water supply without construction of a new reservoir.	• None
Lower Guadalupe River Diversion (SCTN-16)	• Moderate unit cost.	• Not applicable with diversion facilities located in San Antonio River Basin.	• Not applicable.	• Shared pipeline alignment with other strategies. • Shared water treatment and balancing storage facilities in Bexar County.	• None
Colorado River Diversions (LCRA)[4]	• Moderate to high unit cost.	• TNRCC Interbasin Transfer permit required. • Applicability of Consensus Environmental Criteria to diversions under existing water rights.	• Potential benefits to Lower Colorado River Basin irrigation interests in Region K.	• Shared pipeline alignment with other strategies. • Shared water treatment and balancing storage facilities in Bexar County.	• None
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	• Moderate unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• New supply proximate to Bexar County.	• None
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)	• Moderate to high unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• New supply reasonably proximate to Comal and Guadalupe Counties.	• None
Carrizo Aquifer – Local Supply (SCTN-2a)	• Low unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to points of need.	• None
Simsboro Aquifer (SCTN-3c)	• Moderate unit cost.	• Not applicable.	• Limited transfer to avoid potential socio-economic impacts to third parties.	• Beneficial use of groundwater presently produced, but unused.	• None
SAWS Recycled Water Program (SAWS)	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to points of need.	• None
Purchase of Water From Major Provider (PMP)	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• Economy of participation in regional projects.	• None
Desalination of Seawater (SCTN-17)	• High unit cost based on present technology.	• TNRCC Interbasin Transfer permit required.	• Not applicable.	• Shared pipeline alignment with other strategies.	• None
Aquifer Storage & Recovery (ASR) (SCTN-1a)	• Effective means of reducing peak summer pumpage from the Edwards Aquifer.	• Not applicable.	• Not applicable.	• Increases reliability of current supply from the Edwards Aquifer.	• None
Schertz-Seguin Water Supply Project (SSWSP)[5]					
Western Canyon Rgnl. Water Supply Proj. (WCRWSP)[5]					
Hays/IH35 Water Supply Project (HIH35WSP)[5]					
Lake Dunlap WTP Exp. & Mid-Cities Proj. (CRWA)[5]					
Carrizo Aquifer – Bexar & Guadalupe (BMWD)[5]					
Trinity Aquifer – Bexar (BMWD)[5]					
GBRA Canyon Reservoir Contract Renewal (GBRA)[5]					
Brush Management (SCTN-4)	• Insufficient information at this time.	• Not applicable.	• Not applicable.	• May contribute positively to storage and system management of supplies.	• None
Weather Modification (SCTN-5)	• Potentially feasible management strategy to meet a portion of projected irrigation needs.	• Not applicable.	• Not applicable.	• May contribute positively to storage and system management of supplies.	• None
Rainwater Harvesting (SCTN-9)	• High unit cost.	• Not applicable.	• Not applicable.	• Implementable throughout the region.	• None
Additional Municipal Reuse Programs	• Low to moderate unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to points of need.	• None
Small Aquifer Recharge Dams	• High unit cost.	• Not applicable.	• Not applicable.	• Implementable throughout the region.	• None
Edwards Aquifer Recharge & Recirculation Systems	• Insufficient information at this time.	• TNRCC Interbasin Transfer permit required.	• Not applicable.	• Insufficient information at this time.	• None
Cooperation w/ Corpus Christi for New Water Sources	• Insufficient information at this time.	• Unknown at this time.	• Not applicable.	• Multi-regional efficiency is basis for cooperation.	• None
Additional Storage (ASR and/or Surface)	• Effective means of meeting peak needs.	• Unknown at this time.	• Not applicable.	• Potential contribution to regional efficiency.	• None
Lockhart Reservoir (G-21)	• High unit cost.	• Not applicable.	• Not applicable.	• New supply proximate to Lockhart.	• None

Notes:

1) Quantity based on full implementation and utilization of new supplies in year 2050. Total excludes Lockhart Reservoir.
2) Firm reliability indicates that new supply is dependable in a drought of record with full implementation of the Regional Water Plan.
3) Unit cost based on full utilization of supply at ultimate capacity of planned facilities and includes treatment and distribution facilities necessary to meet peak daily needs.
4) On December 14, 2000, late in the planning cycle, additional analysis by Region K of the Colorado River Diversion option with the full application of consensus environmental flow criteria indicated the yield of the project could be reduced by 19,000 acft/yr, resulting in an estimated 131,000 acft/yr of water available for transfer to Region L (Bexar and Hays Counties). The SCTRWPG acknowledges the different yield amounts for this project contained in the Regional Water Plans for Region L and Region K, and acknowledges that the yield of this project may be reduced to 131,000 acft/yr, and that the unit cost could be increased somewhat. This change could affect supplies to Hays County and Bexar County and may necessitate supplying Hays County needs from other sources. However, due to this information being discovered late in the planning cycle, the SCTRWPG decided to retain the project in the Region L Plan with a yield of 150,000 acft/yr; however, this discrepancy between the two regional plans will be addressed early in the next planning cycle. There are adequate "contingency" supplies available within the Region L Plan to compensate for the proposed reduction in yield of the project.
5) Management strategies are in implementation phase.

(Conservation) (L-10 Irr.) through the installation of Low Energy Precision Application (LEPA) systems is recommended to offset a portion of projected irrigation needs (shortages) in six counties.

- Plan includes Brush Management (SCTN-4) and Weather Modification (SCTN-5) which are expected to contribute positively to storage and system management of diverse water management strategies. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching) and increases water supply for wildlife habitat.
- Plan includes about 53 percent of potential maximum voluntary transfer of Edwards Aquifer irrigation permits to municipal use through lease or purchase.
- Plan includes installation of LEPA systems on about 53 percent of applicable acreage in Uvalde, Medina, and Bexar Counties with conserved water being transferred to municipal use.

Other Relevant Factors per SCTRWPG

- Potential effects of Plan implementation on Edwards Aquifer springflows has been identified as a relevant factor by the South Central Texas Regional Water Planning Group (SCTRWPG). As shown in Section 5.2.3, implementation of Plan is expected to increase 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. Major Water Providers 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 Regional Water Plan was based upon guiding principles and assumptions of the SCTRWPG as discussed in Section 6.3.

Interbasin Transfer Issues

- Plan includes at least three potential interbasin transfers: (a) from the Lower Colorado River near Bastrop to Hays County; (b) from the Lower Colorado River near Bay City to Bexar County; and (c) from San Antonio Bay near Seadrift to Bexar County. Interbasin transfer(s) may also be associated with Edwards Aquifer Recharge & Recirculation Systems once this management strategy is more completely defined.
- Projected needs (shortages) in basin(s) of origin are met throughout the planning period.

Third-Party Impacts of Voluntary Redistribution of Water

- Positive effects for municipal water user groups and potentially negative effects upon rural economies associated with Edwards Irrigation Transfers (L-15) and Irrigation Demand Reduction (Conservation) (L-10 Irr.) with 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 Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining 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.
- San Antonio Water System Regional Aquifer Storage & Recovery System (SCTN-1a) substantially reduces peak summer pumpage from the Edwards Aquifer.

Effect on Navigation

- Not applicable.

5.2.6.2 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 Regional Water Plan.

Environmental Benefits

- Substantial commitment to water conservation through adoption of Texas Water Development Board (TWDB) advanced conservation water demand projections results in fewer water management strategies necessary to meet projected water needs. The South Central Texas Region is the only planning region in the state to adopt the advanced conservation water demand projections.
- Additional commitment to accelerated conservation (above and beyond that in the TWDB's advanced conservation water demand projections) through Demand Reduction (L-10) results in fewer water management strategies necessary to meet projected water needs. Demand Reduction (L-10) accounts for more than 22 percent of the total new water supplies for municipal, industrial, steam-electric, and mining uses in 2010. Even in 2050, Demand Reduction (L-10) accounts for more than 10 percent of the total new water supplies for the referenced uses.
- 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 develop a Habitat Conservation Plan and implement Critical Period Management rules which will help to define the requirements for maintenance of springflow and protection of endangered species.
- Phased implementation of the Regional Water Plan (including timely utilization of Management Supplies) results in increased instream flows in the Guadalupe and San Antonio Rivers and increased freshwater inflows to the Guadalupe Estuary, particularly during the drier months and more extended drought periods.
- 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, 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 (SCTN-16) 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 more than one third of the total new water supplies for municipal, industrial, steam-electric, and mining uses by 2050.
- 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 (L-15) and development of conserved water through installation of LEPA irrigation systems (L-10 Irr.) 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 resulting in fewer water management strategies necessary to meet projected water needs.
- Inclusion of modest Carrizo Aquifer groundwater development (CZ-10C, CZ-10D, and SCTN-2a) has minimal associated environmental effects as compared to those typically associated with development of new surface water supplies.
- Inclusion of Desalination of Seawater (SCTN-17) 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 New Colorado River Diversion Option (LCRA) on freshwater inflows to Matagorda Bay. Secondary concerns are identified for the Nueces Estuary as a result of implementation of Edwards Recharge—Type 2 Projects (L-18a).
- Concentration of Edwards Aquifer pumpage closer to Comal Springs as a result of implementation of Edwards Irrigation Transfers (L-15) and additional transfers of conserved water developed by installation of LEPA irrigation systems (L-10 Irr.) tends to reduce discharge from Comal Springs.
- Potential conflicts with stream segments identified by TPWD as ecologically significant are associated with the New Lower Colorado River Diversion Option (LCRA), Lower Guadalupe River Diversions (SCTN-16), and Edwards Recharge—Type 2 Projects (L-18a).

- Potential effects on small springs may be associated with the development of groundwater supplies from the Carrizo Aquifer (CZ-10C, CZ-10D, and SCTN-2a) and from the Simsboro Aquifer (SCTN-3c).
- Intake siting, brine discharge location(s), and potential effects on marine habitat and species are environmental concerns associated with Desalination of Seawater (SCTN-17).

5.2.7 Special Water Resources

The Texas Water Development Board has designated Canyon Reservoir and the Medina Lake System as special water resources located within the South Central Texas Regional Water Planning Area (Region L). This designation is pursuant to TAC 357.5 (g) & (h) as surface water supplies from these reservoirs may be obligated to meet demands outside of Region L. Water rights to Canyon Reservoir are held by the Guadalupe-Blanco River Authority (GBRA) which is headquartered in Guadalupe County. Water rights to the Medina Lake System are held by the Bexar-Medina-Atascosa Counties Water Control & Improvement District #1 (BMA) which is headquartered in Medina County. TAC 357.5 (h) requires that "the regional water planning group for the regional water planning area which contains the special water resource shall protect the water rights, water supply contracts, and water supply option agreements associated with the special water resource(s) so that supplies obligated to meet demands outside the regional water planning area shall not be impacted." Present and potential obligations of supplies from these special water resources to meet demands outside Region L are summarized in the following paragraphs.

5.2.7.1 Canyon Reservoir

There is only one current contractural obligation with an entity located outside of Region L for water supply from Canyon Reservoir. This upstream diversion contract is between GBRA and the City of Kerrville and represents a commitment of up to 26 acft/yr from the firm yield of Canyon Reservoir for irrigation use in Kerr County. The South Central Texas Regional Water Plan includes approximately 300 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). Pursuant to a Memorandum of Understanding (MOU) between GBRA and the Commissioners' Court of Kerr County, the South Central Texas Regional Water Planning Group (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. Subject to and conditioned upon the Texas Natural Resource Conservation Commission (TNRCC) granting, in whole, GBRA's application to amend the Canyon water right, this MOU states:

> *Upon request from Kerr County, at any time after January 1, 2021 and prior to December 31, 2050, GBRA will support and assist Kerr County in obtaining from*

the TNRCC permits to divert water from the Guadalupe River or its tributaries at one or more diversion points within Kerr County for use within the County, up to a total diversion of not to exceed 6,000 acft/yr, pursuant to GBRA's then-standard agreement for "upstream sales of water from storage."

GBRA's hydrology studies have indicated that a commitment of 2,000 acft/yr is necessary to allow permits for 6,000 acft/yr to be issued by TNRCC 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.

5.2.7.2 Medina Lake System

The South Central Texas Regional Water Plan does not specifically include any supplies from the Medina Lake System to meet present or projected needs for water user groups within Region L or any adjacent planning regions. Simulations using the Guadalupe—San Antonio River Basin Water Availability Model (GSA WAM) indicate that there would be no dependable surface water supply from the Medina Lake System in a repeat of the drought of record if operated in accordance with its current Certificate of Adjudication (19-2130C). It is recognized, however, that the Medina Lake System may supply up to an authorized 66,750 acft for municipal (20,144 acft), irrigation (45,856 acft), and domestic and livestock (750 acft) uses in many years. Most of these supplies are contractually committed to irrigators in Region L and to the Bexar Metropolitan Water District (BMWD). The South Central Texas Regional Water Planning Group (SCTRWPG) recognizes that some supplies from the Medina Lake System may be committed to Region J pursuant to a March 1997 Memorandum of Understanding (MOU) between BMA, BMWD, Bandera County, and the Springhills Water Management District.[32] This MOU indicates that BMA will make up to 5,000 acft/yr available to Bandera County when Medina Lake exceeds 1,035 ft-msl (BMA datum) and up to 1,000 acft/yr when Medina Lake falls below this level. It is 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.

[32] Memoram of Understanding to Facilitate Regional Cooperation for the Maximization of Beneficial Development of the Water Resources Available from Medina Lake Pursuant to BMA's Certificate of Adjudication No. 19-2130 and to Settle and Compromise Issues and Disputes Among the Parties, March 19, 1997.

5.3 Water User Group Plans and Costs

In Section 1, the South Central Texas Region was described. In Section 2 projections of population and water demand were presented. In Section 3, existing water supplies were tabulated, and in Section 4, the projected water demands of Section 2 were compared with the existing water supplies of Section 3, and shortages or needs for additional supplies were calculated. It is very important to note that the water needs (shortages) were calculated on the basis of water demands for below average precipitation conditions, with advanced water conservation efforts, and water supplies that can be expected for the drought of record conditions (i.e., dry weather water demands to be met with the worst weather water supply conditions). The case for which the water plan is being developed is, therefore, the "worst case" water demand/supply scenario.

In Sections 5.1 and 5.2, more than 75 water management strategies were identified, described, and evaluated as to quantity of water; total and unit costs of water; environmental effects; effects on state water resources; threats to agricultural and natural resources; recreation; comparison and consistency; interbasin transfers, where appropriate; third party social and economic impacts of voluntary transfers; efficient use of existing supplies; regional opportunities; and effects on navigation. The information from Sections 1, 2, 3, 4, and 5 mentioned above is used in the development of a water plan for the region.

Water management strategies included in the plan to meet the needs of specific water user groups that are projected to have water needs (shortages) include water conservation, aquifer recharge, local groundwater development, and river diversions, while strategies that are not specific to a particular water user group, but instead are strategies for large areas include weather modification and brush management.

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 were exhausted, water management strategies located at greater distances from the water users had to be selected, as has been explained earlier.

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), Low Pressure Spray (LESA), 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" 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 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. In the case of cities that have been incorporated subsequent to 1996, the date the population and water demand projections were made, no specific plans are included. Instead, the needs of these cities remain in the "Rural Area Residential and Commercial" category, where water supplies have been included for them, but no specific plan has been developed.

The detailed plans for each of the 21 counties of the South Central Texas Planning Region are presented in alphabetic order below. In each county plan, each water user group of the county is listed, and demand reduction 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, a water management strategy to meet the need is included, except in the case of irrigated agriculture, for which it has been determined that it is not economically feasible to meet all of the projected needs, as was explained above.

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 Carrizo Springs, total and unit costs in Second Quarter 1999 prices are presented for additional wells to be added at the time of the projected need. Costs were calculated in accordance with TWDB Rules and are presented in Volume III and the county tables that follow in Volume I. In this case, and in all cases described below, 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 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 cities of Comal and Hays counties, large scale water management strategies to meet regional needs involving two or more water user groups were selected by the RWPG for inclusion in the regional water plan. In the latter cases, total and unit costs (Second Quarter 1999 prices) were 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 were computed according to TWDB Rules and are reported in Volume III and are tabulated in the respective county tables of Volume I. However, it was necessary to allocate the costs of these 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 for debt service to each water user group to be supplied from a water management strategy as is the water user group's proportion or share of quantity obtained from that strategy in 2050, or if a user group takes a larger share of the total capacity of a strategy than is needed by 2050, the total annual share of debt service is based on this larger share or fraction. The water user groups would begin paying their prorata share of annual debt service at the time the strategy is implemented whether or not they begin taking water at that time. The reason for using this principal of dividing debt service among water user groups of a water management strategy 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, most water user groups will need, or in many cases, already 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.

Operation and maintenance costs as well as treatment and distribution costs are based solely on the quantity obtained from the water management strategy at the time water is obtained. In the regional plan, operation and maintenance costs are in terms of second quarter 1999 prices, and in accordance with TWDB Rules.

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 regional providers will implement the large scale, distantly located water management strategies included 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 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.

The plan recognizes and includes several projects that at this time are in various stages of implementation. An illustration of those included is the Western Canyon regional plan to supply areas of Comal and North Bexar County, including quantities to SAWS and BMWD, Schertz-Seguin, and Canyon Regional Water Authority projects. In the plan, quantities these projects will supply to the water user group(s) that are implementing them are shown, but no costs are shown for these quantities, since the sponsoring user groups have already calculated costs and decided to implement.

5.3.1 Atascosa County Water Supply Plan

Table 5.3.1-1 lists each water user group in Atascosa County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.1-1.
Atascosa County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Charlotte	958	900	Projected surplus
City of Jourdanton	1,069	933	Projected surplus
City of Lytle	-514	-628	Projected shortage – see plan below
City of Pleasanton	450	1	Projected surplus
City of Poteet	529	379	Projected surplus
Rural Area Residential and Commercial	764	-10	Projected shortage (2050) – see plan below
Industrial	0	0	No projected demand
Steam-Electric Power	1,496	-8,504	Projected shortage (2040 and 2050) – see plan below
Mining	-995	-1,239	Projected shortage (2030 through 2050) – see plan below
Irrigation	-43,726	-40,713	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-1, Section 4.1 – Water Needs Projections by Water User Group.

5.3.1.1 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 demand 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 5.3.1-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 30 acft/yr beginning in year 2000, decreasing to 24 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-2.
Recommended Water Supply Plan for the City of Charlotte

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	30	32	34	22	23	24
Total New Supply	30	32	34	22	23	24

The costs of the recommended plan for the City of Charlotte are shown in Table 5.3.1-3.

Table 5.3.1-3.
Recommended Plan Costs by Decade for the City of Charlotte

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,845	$7,758	$7,720	$2,284	$2,062	$2,023
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.2 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 demand 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 5.3.1-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 63 acft/yr beginning in year 2000, decreasing to 52 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-4.
Recommended Water Supply Plan for the City of Jourdanton

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	63	68	72	45	48	52
Total New Supply	63	68	72	45	48	52

The costs of the recommended plan for the City of Jourdanton are shown in Table 5.3.1-5.

Table 5.3.1-5.
Recommended Plan Costs by Decade for the City of Jourdanton

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$16,474	$16,485	$16,348	$4,672	$4,303	$4,384
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.3 City of Lytle

The City of Lytle's current water supply is obtained from the Edwards Aquifer. The City of Lytle is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)
- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Lytle implement the following water supply plan to meet the projected need for the city (Table 5.3.1-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 41 acft/yr beginning in year 2000, increasing to 55 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 500 acft/yr from 2000 to 2030 and 700 acft/yr in 2040 and 2050.

Table 5.3.1-6.
Recommended Water Supply Plan for the City of Lytle

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	376	414	447	514	569	628
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	41	44	47	28	53	55
Edwards Irrigation Transfers (L-15)	500	500	500	500	700	700
Total New Supply	541	544	547	528	753	755

The costs of the recommended plan to meet the City of Lytle's projected need are shown in Table 5.3.1-7.

Table 5.3.1-7.
Recommended Plan Costs by Decade for the City of Lytle

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$10,721	$10,667	$10,671	$2,907	$4,751	$4,637
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$47,059	$47,059	$47,059	$47,059	$65,882	$65,882
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.1.4 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 5.3.1-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 158 acft/yr beginning in year 2000, decreasing to 140 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-8.
Recommended Water Supply Plan for the City of Pleasanton

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	158	172	185	121	130	140
Total New Supply	158	172	185	121	130	140

The costs of the recommended plan for the City of Pleasanton are shown in Table 5.3.1-9.

Table 5.3.1-9.
Recommended Plan Costs by Decade for the City of Pleasanton

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$41,315	$41,697	$42,004	$12,563	$11,653	$11,802
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.5 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 5.3.1-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 64 acft/yr beginning in year 2000, decreasing to 48 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.1-10.
Recommended Water Supply Plan for the City of Poteet

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	64	68	72	43	46	48
Total New Supply	64	68	72	43	46	48

The costs of the recommended plan for the City of Poteet are shown in Table 5.3.1-11.

Table 5.3.1-11.
Recommended Plan Costs by Decade for the City of Poteet

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$16,735	$16,485	$16,348	$4,465	$4,123	$4,046
Unit Cost ($/acft)	$261	$242	$227	$104	$90	$84

5.3.1.6 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, and the Queen City Aquifer. Rural areas are projected to need additional water supplies beginning in the planning year 2030 (San Antonio River Basin). The following options were considered to meet the projected need for rural areas:

- Carrizo Aquifer – Local Supply (SCTN-2a)

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 need for rural areas (Table 5.3.1-12).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2030. This project can provide an additional 5 acft/yr of supply in 2030 and 10 acft/yr of supply in 2040 and 2050.

Table 5.3.1-12.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	1	10	10
Recommended Plan						
Carrizo Aquifer – Local Supply (SCTN-2a)				5	10	10
Total New Supply				5	10	10

The costs of the recommended plan to meet the projected need of rural areas are shown in Table 5.3.1-13.

Table 5.3.1-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)				$3,055	$3,240	$3,240
Unit Cost ($/acft)				$611	$324	$324

5.3.1.7 Industrial

There is no projected industrial water demand in Atascosa County, therefore no water management strategies are recommended for this water user group.

5.3.1.8 Steam-Electric Power

Steam-electric power's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, and the Queen City Aquifer. Steam-electric power is projected to need additional water supplies in the planning year 2040. The following options were considered to meet the steam-electric power projected need:

- Carrizo Aquifer – Local Supply (SCTN-2a)

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 need for steam-electric power (Table 5.3.1-14).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2040. This project can provide an additional 1,600 acft/yr of supply in 2040 and 8,600 acft/yr in 2050.

Table 5.3.1-14.
Recommended Water Supply Plan for Steam-Electric Power

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	1,504	8,504
Recommended Plan						
Carrizo Aquifer – Local Supply (SCTN-2a)					1,600	8,600
Total New Supply					1,600	8,600

The costs of the recommended plan to meet the steam-electric power projected need are shown in Table 5.3.1-15.

Table 5.3.1-15.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)					$518,400	$2,786,400
Unit Cost ($/acft)					$324	$324

5.3.1.9 Mining

Mining's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, and the Queen City Aquifer. Mining is projected to need additional water supplies in the planning year 2030. The following options were considered to meet the mining projected need:

- Carrizo Aquifer – Local Supply (SCTN-2a)

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 need for mining (Table 5.3.1-16).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2030 which will provide in additional 995 acft/yr of supply in 2030 and 1,390 acft/yr of additional supply in 2040 and 2050.

Table 5.3.1-16.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	995	1,109	1,239
Recommended Plan						
Carrizo Aquifer – Local Supply (SCTN-2a)				995	1,390	1,390
Total New Supply				995	1,390	1,390

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.1-17.

Table 5.3.1-17.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)				$332,380	$450,360	$450,360
Unit Cost ($/acft)				$324	$324	$324

5.3.1.10 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Atascosa County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.1-18).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 3,692 acft/yr of supply.

Table 5.3.1-18.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	38,418	36,719	35,170	43,726	42,190	40,713
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	3,692	3,692	3,692	3,692	3,692	3,692
Total New Supply	3,692	3,692	3,692	3,692	3,692	3,692

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.1-19.

Table 5.3.1-19.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$509,754	$509,754	$509,754	$0	$0	$0
Unit Cost ($/acft)	$138	$138	$138	$0	$0	$0

5.3.1.11 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.

5.3.2 Bexar County Water Supply Plan

Table 5.3.2-1 lists each water user group in Bexar County and its corresponding surplus or shortage in years 2030 and 2050. 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 5.3.2-1.
Bexar County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Alamo Heights	-1,206	-1,242	Projected shortage – see plan below
City of Balcones Heights	-486	-573	Projected shortage – see plan below
City of China Grove	-240	-312	Projected shortage – see plan below
City of Converse	-3,931	-5,889	Projected shortage – see plan below
City of Elmendorf	-44	-63	Projected shortage – see plan below
City of Fair Oaks Ranch	-1,384	-1,406	Projected shortage – see plan below
City of Helotes	-286	-369	Projected shortage – see plan below
City of Kirby	-1,476	-1,991	Projected shortage – see plan below
City of Leon Valley	-238	-322	Projected shortage – see plan below
Live Oak Water Public Utility	-255	-604	Projected shortage – see plan below
City of Lytle			See Atascosa County
City of Olmos Park	-345	-395	Projected shortage – see plan below
City of San Antonio (SAWS)	-194,684	-273,629	Projected shortage – see plan below
Schertz (Outside City)	-1,310	-1,735	Projected shortage – see plan below
City of Schertz			See Guadalupe County
City of Shavano Park	-819	-929	Projected shortage – see plan below
City of St. Hedwig	129	37	Projected surplus
City of Terrell Hills	-520	-500	Projected shortage – see plan below
City of Universal City	-3,490	-4,826	Projected shortage – see plan below
Windcrest (WC&ID No. 10)	217	173	Projected surplus
BMWD (Castle Hills)	-1,281	-1,246	Projected shortage – see plan below
BMWD (Somerset)	-91	-79	Projected shortage – see plan below
BMWD (Hill Ctry/HollywPk)	-2,606	-3,378	Projected shortage – see plan below
BMWD (Other Subdivisions)	-28,031	-38,617	Projected shortage – see plan below
Fort Sam Houston	-929	-888	Projected shortage – see plan below
Lackland AFB	-729	-698	Projected shortage – see plan below

Table 5.3.2-1 (continued)

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
Randolph AFB	-678	-664	Projected shortage – see plan below
Rural Area Residential and Commercial	-26,686	-23,074	Projected shortage – see plan below
Industrial	-1,428	-8,190	Projected shortage – see plan below
Steam-Electric Power	14,428	3,428	Projected surplus
Mining	-5,406	-5,962	Projected shortage – see plan below
Irrigation	-7,883	-5,082	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-2, Section 4.1 – Water Needs Projections by Water User Group.

5.3.2.1 Regional Water Provider(s) 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 more 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(s) for Bexar County is employed. Designation of Regional Water Provider(s) 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 major water providers (Section 5.4), 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 beginning in the year 2000. The management strategies listed in Table 5.3.2-2, as well as several variations of these options, were considered to meet the county's projected need.

Table 5.3.2-2
Water Management Strategies Considered for Bexar County

Local/Conservation/Reuse/Exchange
Demand Reduction (Water Conservation) (L-10)
Exchange Reclaimed Water for Edwards Irrigation Water (L-11)
Edwards Irrigation Transfers (L-15)
Exchange SAWS Reclaimed Water for CP&L Rights and GBRA Canyon Contract (L-20)
Brush Management (SCTN-4)
Weather Modification (SCTN-5)
Rainwater Harvesting (SCTN-9)
Gulf Coast Aquifer Exchange for Surface Water Rights (SCTN-12)
Desalination of Seawater (SCTN-17)
Off-Channel Local Storage (SCTN-10)
Edwards Aquifer Recharge
Edwards Recharge – Type 1 Projects (L-17)
Edwards Recharge – Type 2 Projects (L-18)
Medina Lake Recharge Enhancement (S-13B)
Guadalupe River Diversion to Recharge Zone Via Medina Lake (G-30)
Diversion of Canyon Reservoir Flood Storage to Recharge Zone (G-32)
Edwards Aquifer Recharge Enhancement with Guadalupe River Diversions (SCTN-6)
River Diversions with Storage
Guadalupe River Diversions at Gonzales (G-38C)
Lower Guadalupe River Diversions (SCTN-16)
Colorado River in Colorado County (C-17A)
Colorado River in Wharton County (C-17B)
Purchase/Lease Surface Water Irrigation Rights (SCTN-11)
Colorado River Diversion Option (LCRA)
Existing Reservoirs
Joint Development of Water Supply with Corpus Christi (SCTN-14)
Colorado River at Bastrop – Purchase of Stored Water (C-13C)
Potential New Reservoirs
Cibolo Reservoir (S-15)
Goliad Reservoir (S-16C)
Applewhite Reservoir (S-14D)
Sandies Creek Reservoir (G-17C1)
Cuero Reservoir (G-16C1)
Shaws Bend Reservoir (C-18)
Cummins Creek Reservoir (SCTN-15)
Allens Creek Reservoir (B-10C)
Carrizo and Other Aquifers
Carrizo Aquifer – Wilson & Gonzales Counties (CZ-10C)
Carrizo Aquifer – Gonzales & Bastrop Counties (CZ-10D)
Simsboro Aquifer (SCTN-3)
Local Groundwater Supply (SCTN-2)
Aquifer Storage & Recovery (SCTN-1)
Additional Management Strategies
Small Aquifer Recharge Dams
Edwards Aquifer Recharge & Recirculation Systems
Cooperation w/ Corpus Christi for New Water Sources
Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Regional Water Provider(s) for Bexar County implement the following water supply plan to meet the projected need for the portions of the county (Table 5.3.2-3).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 25,000 acft/yr of supply in 2000, increasing to 32,986 acft/yr of additional supply in 2050.
- Demand Reduction (Conservation) (L-10 Irr.) w/Transfer to be implemented in 2000. This project can provide an additional 27,314 acft/yr of additional supply from 2000 through 2050.
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C) to be implemented in 2000. This project can provide an additional 16,000 acft/yr of supply from 2000 through 2050.
- Lower Guadalupe River Diversion (SCTN-16) to be implemented in 2010. This project can provide an additional 94,500 acft/yr of supply.
- Edwards Recharge – Type 2 Projects (L-18a) to be implemented in 2010. This project can provide an additional 13,451 acft/yr of supply in 2010, increasing to 21,577 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2020. This project can provide an additional 66,000 acft/yr of supply in 2020, increasing to 132,000 acft/yr of additional supply in 2050.
- Desalination of Seawater – 75 MGD (SCTN-17) to be implemented in 2040. This project can provide an additional 56,008 acft/yr in 2040 and 84,012 acft/yr of additional supply in 2050.
- Brush Management
- Weather Modification
- Rainwater Harvesting
- Additional Municipal Recycling (Reuse) Programs
- Small Aquifer Recharge Dams
- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.3.2-3.
Recommended Water Supply Plan for the Regional Water Provider(s) for Bexar County

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Recommended Plan						
Edwards Irrigation Transfers (L-15)	25,000	32,986	32,986	32,986	32,986	32,986
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.	27,314	27,314	27,314	27,314	27,314	27,314
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	16,000	16,000	16,000	16,000	16,000	16,000
Lower Guadalupe River Diversions (SCTN-16)		94,500	94,500	94,500	94,500	94,500
Edwards Recharge – Type 2 Projects (L-18a)		13,451	21,577	21,577	21,577	21,577
Colorado River Diversion Option (LCRA)			66,000	132,000	132,000	132,000
Desalination of Seawater – 75 MGD (SCTN-17)					56,008	84,012
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						
Total New Supply	68,314	184,251	258,377	324,377	380,385	408,389

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan for the Regional Water Provider(s) for Bexar County are shown in Table 5.3.2-4.

**Table 5.3.2-4.
Recommended Plan Costs by Decade for the
Regional Water Provider(s) for Bexar County**

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$2,353,000	$3,104,642	$3,104,642	$3,104,642	$3,104,642	$3,104,642
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.						
Annual Cost ($/yr)	$992,318	$992,318	$992,318	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Annual Cost ($/yr)	$12,496,000	$12,496,000	$12,496,000	$6,608,000	$6,608,000	$6,608,000
Unit Cost ($/acft)	$781	$781	$781	$413	$413	$413
Lower Guadalupe River Diversions (SCTN-16)						
Annual Cost ($/yr)		$75,925,080	$77,059,080	$77,437,080	$50,902,425	$47,504,205
Unit Cost ($/acft)		$805	$815	$819	$539	$503
Edwards Recharge – Type 2 Projects (L-18a)						
Annual Cost ($/yr)		$21,893,245	$23,455,062	$23,455,062	$20,843,166	$4,147,099
Unit Cost ($/acft)		$1,628	$1,087	$1,087	$966	$192
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)			$88,859,760	$134,163,480	$134,163,480	$96,476,440
Unit Cost ($/acft)			$1,346	$1,016	$1,016	$735
Desalination of Seawater – 75 MGD (SCTN-17)						
Annual Cost ($/yr)					$102,214,600	$120,977,280
Unit Cost ($/acft)					$1,825	$1,440
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$6,207,500	$5,007,990	$5,007,990	$2,074,280	$92,270	$184,540
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[2] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.3.2.2 *City of Alamo Heights*

The City of Alamo Heights' current water supply is obtained from the Edwards Aquifer. The City of Alamo Heights is projected to need additional water supplies beginning in the year

2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Alamo Heights implement the following water supply plan to meet the projected need for the city (Table 5.3.2-5).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 122 acft/yr of supply in 2000, decreasing to 66 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,500 acft/yr by the year 2000.

Table 5.3.2-5.
Recommended Water Supply Plan for the City of Alamo Heights

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,299	1,232	1,186	1,206	1,228	1,242
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	122	124	127	64	65	66
Purchase/Participate with Regional Water Provider(s)	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,622	1,624	1,627	1,564	1,565	1,566

The costs of the recommended plan to meet the City of Alamo Heights' projected need are shown in Table 5.3.2-6.

Table 5.3.2-6.
Recommended Plan Costs by Decade for the City of Alamo Heights

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$30,813	$29,409	$29,781	$3,495	$3,339	$3,217
Unit Cost ($/acft)	$253	$237	$234	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$484,135	$972,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.3 City of Balcones Heights

The City of Balcones Heights' current water supply is obtained from the Edwards Aquifer. The City of Balcones Heights is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-7).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 58 acft/yr of supply in 2000, decreasing to 41 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000, increasing to 1,000 acft/yr by 2050.

Table 5.3.2-7.
Recommended Water Supply Plan for the City of Balcones Heights

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	419	427	447	486	531	573
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	58	61	64	36	39	41
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	1,000	1,000
Total New Supply	558	561	564	536	1,039	1,041

The costs of the recommended plan to meet the City of Balcones Heights' projected need are shown in Table 5.3.2-8.

Table 5.3.2-8.
Recommended Plan Costs by Decade for the City of Balcones Heights

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$14,518	$13,971	$14,261	$1,966	$2,003	$1,998
Unit Cost ($/acft)	$250	$229	$223	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.4 City of China Grove

The City of China Grove's current water supply is obtained from the Edwards Aquifer. The City of China Grove is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-9).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 20 acft/yr of supply in 2000, decreasing to 19 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1.)
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-9.
Recommended Water Supply Plan for the City of China Grove

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	155	172	189	240	289	312
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	20	22	23	16	18	19
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	520	522	523	516	518	519

The costs of the recommended plan to meet the City of China Grove's projected need are shown in Table 5.3.2-10.

Table 5.3.2-10.
Recommended Plan Costs by Decade for the City of China Grove

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$4,900	$4,765	$4,866	$874	$925	$926
Unit Cost ($/acft)	$245	$217	$212	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.5 City of Converse

The City of Converse's current water supply is obtained from the Edwards Aquifer. The City of Converse is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Converse implement the following water supply plan to meet the projected need for the city (Table 5.3.2-11).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 88 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,000 acft/yr by the year 2000, increasing to 6,000 acft/yr by 2050.

Table 5.3.2-11.
Recommended Water Supply Plan for the City of Converse

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,560	2,270	2,962	3,931	4,798	5,889
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	88	88	88	0	0	0
Purchase/Participate with Regional Water Provider(s)	2,000	2,500	3,000	4,000	5,000	6,000
Total New Supply	2,088	2,588	3,088	4,000	5,000	6,000

The costs of the recommended plan to meet the City of Converse's projected need are shown in Table 5.3.2-12.

Table 5.3.2-12.
Recommended Plan Costs by Decade for the City of Converse

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$35,112	$35,112	$35,112	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$645,514	$1,620,334	$2,449,616	$3,043,897	$4,174,037	$4,106,411
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.6 City of Elmendorf

The City of Elmendorf's current water supply is obtained from the Edwards Aquifer. The City of Elmendorf is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-13).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 6 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 100 acft/yr by the year 2000.

Table 5.3.2-13.
Recommended Water Supply Plan for the City of Elmendorf

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	33	34	34	44	54	63
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	6	6	6	0	0	0
Purchase/Participate with Regional Water Provider(s)	100	100	100	100	100	100
Total New Supply	106	106	106	100	100	100

The costs of the recommended plan to meet the City of Elmendorf's projected need are shown in Table 5.3.2-14.

Table 5.3.2-14.
Recommended Plan Costs by Decade for the City of Elmendorf

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$2,394	$2,394	$2,394	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$32,276	$64,813	$81,654	$76,097	$83,581	$68,440
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.7 City of Fair Oaks Ranch

The City of Fair Oaks Ranch's current water supply is obtained from the Trinity Aquifer. The City of Fair Oaks Ranch is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Western Canyon Regional Water Supply Project
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County

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 to meet the projected need for the city (Table 5.3.2-15).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 58 acft/yr in 2000, decreasing to 54 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,400 acft/yr of supply.
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-15.
Recommended Water Supply Plan for the City of Fair Oaks Ranch

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,442	1,572	1,372	1,384	1,397	1,406
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	58	67	68	52	52	54
Western Canyon Regional Water Supply Project	1,400	1,400	1,400	1,400	1,400	1,400
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	1,958	1,967	1,968	1,952	1,952	1,954

The costs of the recommended plan to meet the City of Fair Oaks Ranch's projected need are shown in Table 5.3.2-16.

Table 5.3.2-16.
Recommended Plan Costs by Decade for the City of Fair Oaks Ranch

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$9,485	$8,260	$8,681	$2,130	$2,003	$1,949
Unit Cost ($/acft)	$198	$156	$161	$55	$51	$49
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
Unit Cost ($/acft)	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

* This project is currently underway with existing funds, therefore no cost has been projected.

5.3.2.8 City of Helotes

The City of Helotes' current water supply is obtained from the Edwards Aquifer. The City of Helotes is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-17).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 15 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-17.
Recommended Water Supply Plan for the City of Helotes

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	152	179	207	286	326	369
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	15	15	15	0	0	0
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	515	515	515	500	500	500

The costs of the recommended plan to meet the City of Helotes' projected need are shown in Table 5.3.2-18.

Table 5.3.2-18.
Recommended Plan Costs by Decade for the City of Helotes

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,985	$5,985	$5,985	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.9 City of Kirby

The City of Kirby's current water supply is obtained from the Edwards Aquifer. The City of Kirby is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Kirby implement the following water supply plan to meet the projected need for the city (Table 5.3.2-19).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 82 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000, increasing to 2,000 acft/yr by 2050.

Table 5.3.2-19.
Recommended Water Supply Plan for the City of Kirby

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	963	1,070	1,216	1,476	1,720	1,991
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	82	82	82	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,000	1,500	1,500	1,500	2,000	2,000
Total New Supply	1,082	1,582	1,582	1,500	2,000	2,000

The costs of the recommended plan to meet the City of Kirby's projected need are shown in Table 5.3.2-20.

Table 5.3.2-20.
Recommended Plan Costs by Decade for the City of Kirby

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$32,718	$32,718	$32,718	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$972,200	$1,244,808	$1,141,461	$1,671,615	$1,368,804
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.10 City of Leon Valley

The City of Leon Valley's current water supply is obtained from the Edwards Aquifer. The City of Leon Valley is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-21).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 94 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 600 acft/yr by the year 2000.

Table 5.3.2-21.
Recommended Water Supply Plan for the City of Leon Valley

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	570	417	240	238	236	322
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	94	94	94	0	0	0
Purchase/Participate with Regional Water Provider(s)	600	600	600	600	600	600
Total New Supply	694	694	694	600	600	600

The costs of the recommended plan to meet the City of Leon Valley's projected need are shown in Table 5.3.2-22.

Table 5.3.2-22.
Recommended Plan Costs by Decade for the City of Leon Valley

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$37,506	$37,506	$37,506	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$193,654	$388,880	$489,923	$456,585	$501,484	$410,641
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.11 Live Oak Water Public Utility

The Live Oak Water Public Utility's current water supply is obtained from the Edwards Aquifer. The Live Oak Water Public Utility is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Live Oak Water Public Utility implement the following water supply plan to meet the projected need for the utility (Table 5.3.2-23).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 99 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 100 acft/yr by the year 2010, increasing to 1,000 acft/yr by 2050.

Table 5.3.2-23.
Recommended Water Supply Plan for the Live Oak Water Public Utility

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	7	84	255	420	604
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	99	99	99	0	0	0
Purchase/Participate with Regional Water Provider(s)	0	100	100	500	500	1,000
Total New Supply	99	199	199	500	500	1,000

The costs of the recommended plan to meet the Live Oak Water Public Utility's projected need are shown in Table 5.3.2-24.

Table 5.3.2-24.
Recommended Plan Costs by Decade for the Live Oak Water Public Utility

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$39,501	$39,501	$39,501	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)		$64,813	$81,654	$380,487	$417,904	$684,402
Unit Cost ($/acft)		$648	$817	$761	$836	$684

5.3.2.12 City of Lytle (See Atascosa County)

5.3.2.13 City of Olmos Park

The City of Olmos Park's current water supply is obtained from the Edwards Aquifer. The City of Olmos Park is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-25).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 41 acft/yr of supply in 2000, increasing to 49 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 500 acft/yr by the year 2000.

Table 5.3.2-25.
Recommended Water Supply Plan for the City of Olmos Park

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	311	312	322	345	371	395
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	41	43	45	25	48	49
Purchase/Participate with Regional Water Provider(s)	500	500	500	500	500	500
Total New Supply	541	543	545	525	548	549

The costs of the recommended plan to meet the City of Olmos Park's projected need are shown in Table 5.3.2-26.

Table 5.3.2-26.
Recommended Plan Costs by Decade for the City of Olmos Park

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$10,199	$9,799	$9,996	$1,365	$2,466	$2,388
Unit Cost ($/acft)	$249	$228	$222	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$161,378	$324,067	$408,269	$380,487	$417,904	$342,201
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.14 City of San Antonio (SAWS)

The City of San Antonio's current water supply is obtained from the Edwards Aquifer and direct reuse. The City of San Antonio is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of San Antonio implement the following water supply plan to meet the projected need for the city (Table 5.3.2-27).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 29,610 acft/yr of supply in 2000, increasing to 37,555 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,813 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Simsboro Aquifer (SCTN-3c) to be implemented in 2000. This project can provide an additional 55,000 acft/yr of supply.
- SAWS Recycled Water Program to be implemented in 2010. This project can provide an additional 19,826 acft/yr of supply in 2010, increasing to 52,215 acft/yr of additional supply in 2050.
- Aquifer Storage & Recovery – Regional (SCTN-1a)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 35,114 acft/yr by the year 2000, increasing to 295,189 acft/yr in 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams
  - Edwards Aquifer Recharge & Recirculation Systems

- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.3.2-27.
Recommended Water Supply Plan for the City of San Antonio

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	102,394	124,328	154,496	194,684	231,946	273,629
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	29,610	38,185	36,477	33,805	35,710	37,555
Western Canyon Regional Water Supply Project	1,813	1,813	1,813	1,813	0	0
Simsboro Aquifer (SCTN-3c)	55,000	55,000	55,000	55,000	55,000	55,000
SAWS Recycled Water Program		19,826	26,737	35,824	43,561	52,215
Aquifer Storage & Recovery – Regional (SCTN-1a)						
Regional Water Provider(s) (SAWS)*	35,114	140,951	199,577	241,677	277,185	295,189
Total New Supply	121,537	255,775	319,604	368,119	411,456	439,959
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of San Antonio's projected need are shown in Table 5.3.2-28.

Table 5.3.2-28.
Recommended Plan Costs by Decade for the City of San Antonio

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,850,787	$5,951,075	$5,864,082	$1,845,999	$1,834,483	$1,830,288
Unit Cost ($/acft)	$198	$156	$161	$55	$51	$49
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Simsboro Aquifer (SCTN-3c)						
Annual Cost ($/yr)	$47,590,400	$47,590,400	$47,590,400	$28,029,650	$28,029,650	$28,029,650
Unit Cost ($/acft)	$865	$865	$865	$510	$510	$510
SAWS Recycled Water Program						
Annual Cost ($/yr)		$17,264,566	$17,981,583	$18,924,359	$4,519,454	$5,417,306
Unit Cost ($/acft)		$871	$673	$528	$104	$104
Aquifer Storage & Recovery – Regional (SCTN-1a)						
Annual Cost ($/yr)	$11,762,100	$11,762,100	$11,762,100	$3,389,053	$3,389,053	$3,389,053
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Regional Water Provider(s) (SAWS)*						
Annual Cost ($/yr)	$11,333,287	$91,355,088	$162,962,369	$183,909,974	$231,673,263	$202,027,911
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (SAWS)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[3]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] The cost representing aquifer storage & recovery is not calculated on a unit cost basis because a supply quantity has not been assigned to this management strategy.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.15 Schertz (Outside City)

Schertz (Outside City's) current water supply is obtained from the Edwards Aquifer. Schertz (Outside City) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the water user group's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Schertz (Outside City) implement the following water supply plan to meet the projected need for the water user group (Table 5.3.2-29).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 77 acft/yr of supply in 2000, increasing to 84 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 2,404 acft/yr of supply.

Table 5.3.2-29.
Recommended Water Supply Plan for Schertz (Outside City)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	674	970	1,098	1,310	1,522	1,735
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	77	84	95	64	73	84
Schertz-Seguin Water Supply Project (Carrizo)*	2,404	2,404	2,404	2,404	2,404	2,404
Total New Supply	2,481	2,488	2,499	2,468	2,477	2,488

*Schertz's share of the Schertz-Seguin Water Supply Project is 10,000 acft/yr. See Table 5.3.11-8 for the remaining 7,596 acft/yr.

The costs of the recommended plan to meet Schertz (Outside City's) projected need are shown in Table 5.3.2-30.

Table 5.3.2-30.
Recommended Plan Costs by Decade for Schertz (Outside City)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$20,251	$19,804	$20,661	$3,495	$3,750	$4,094
Unit Cost ($/acft)	$263	$236	$217	$55	$51	$49
Schertz-Seguin Water Supply Project						
Annual Cost ($/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*

* This project is currently underway with existing funds, therefore no cost has been projected.

5.3.2.16 City of Schertz (See Guadalupe County)

5.3.2.17 City of Shavano Park

The City of Shavano Park's current water supply is obtained from the Edwards Aquifer. The City of Shavano Park is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Shavano Park implement the following water supply plan to meet the projected need for the city (Table 5.3.2-31).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 34 acft/yr of supply in 2000, decreasing to 25 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000.

Table 5.3.2-31.
Recommended Water Supply Plan for the City of Shavano Park

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	675	750	779	819	871	929
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	34	37	39	23	24	25
Purchase/Participate with Regional Water Provider(s)	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,034	1,037	1,039	1,023	1,024	1,025

The costs of the recommended plan to meet the City of Shavano Park's projected need are shown in Table 5.3.2-32.

Table 5.3.2-32.
Recommended Plan Costs by Decade for the City of Shavano Park

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$8,330	$8,074	$8,265	$1,256	$1,233	$1,218
Unit Cost ($/acft)	$245	$218	$212	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$648,134	$816,539	$760,974	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.18 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 demand 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 5.3.2-33).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 14 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.2-33.
Recommended Water Supply Plan for the City of St. Hedwig

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	14	14	14	0	0	0
Total New Supply	14	14	14	0	0	0

The costs of the recommended plan for the City of St. Hedwig are shown in Table 5.3.2-34.

Table 5.3.2-34.
Recommended Plan Costs by Decade for the City of St. Hedwig

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$5,586	$5,586	$5,586	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0

5.3.2.19 City of Terrell Hills

The City of Terrell Hills' current water supply is obtained from the Edwards Aquifer. The City of Terrell Hills is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 to meet the projected need for the city (Table 5.3.2-35).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 87 acft/yr of supply in 2000, decreasing to 49 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000.

Table 5.3.2-35.
Recommended Water Supply Plan for the City of Terrell Hills

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	540	506	504	520	513	500
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	87	89	93	49	49	49
Purchase/Participate with Regional Water Provider(s)	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,087	1,089	1,093	1,049	1,049	1,049

The costs of the recommended plan to meet the City of Terrell Hills' projected need are shown in Table 5.3.2-36.

Table 5.3.2-36.
Recommended Plan Costs by Decade for the City of Terrell Hills

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$21,777	$20,795	$21,190	$2,676	$2,517	$2,388
Unit Cost ($/acft)	$250	$234	$228	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$648,134	$816,539	$760,474	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.20 City of Universal City

The City of Universal City's current water supply is obtained from the Edwards Aquifer. The City of Universal City is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Universal City implement the following water supply plan to meet the projected need for the city (Table 5.3.2-37).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 260 acft/yr of supply in 2000, increasing to 292 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,500 acft/yr by the year 2000, increasing to 5,000 acft/yr by 2050.

Table 5.3.2-37.
Recommended Water Supply Plan for the City of Universal City

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	2,012	2,374	2,812	3,490	4,117	4,826
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	260	288	321	226	257	292
Purchase/Participate with Regional Water Provider(s)	2,500	2,500	3,000	3,500	4,500	5,000
Total New Supply	2,760	2,788	3,321	3,726	4,757	5,292

The costs of the recommended plan to meet the City of Universal City's projected need are shown in Table 5.3.2-38.

Table 5.3.2-38.
Recommended Plan Costs by Decade for the City of Universal City

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$63,391	$61,735	$64,409	$12,342	$13,202	$14,231
Unit Cost ($/acft)	$244	$214	$201	$55	$51	$49
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$806,842	$1,620,334	$2,449,616	$2,663,410	$3,761,133	$3,422,099
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.21 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 demand 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 5.3.2-39).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 101 acft/yr beginning in year 2000, decreasing to 57 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.2-39.
Recommended Water Supply Plan for the City of Windcrest

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	101	103	106	55	56	57
Total New Supply	101	103	106	55	56	57

The costs of the recommended plan for the City of Windcrest are shown in Table 5.3.2-40.

Table 5.3.2-40.
Recommended Plan Costs by Decade for the City of Windcrest

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$25,515	$24,375	$24,718	$3,003	$2,877	$2,778
Unit Cost ($/acft)	$253	$237	$233	$55	$51	$49

5.3.1.3 BMWD (Castle Hills)

BMWD's (Castle Hills) current water supply is obtained from the Edwards Aquifer. BMWD (Castle Hills) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Castle Hills) implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-41).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 82 acft/yr of supply in 2000, decreasing to 47 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 1,500 acft./yr by the year 2000.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10D)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams

- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.3.2-41.
Recommended Water Supply Plan for BMWD (Castle Hills)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,209	1,238	1,260	1,281	1,264	1,246
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	82	85	87	47	47	47
Regional Water Provider(s) (BMWD)*	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,582	1,585	1,587	1,547	1,547	1,547
**Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County*						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's (Castle Hills) projected need are shown in Table 5.3.2-42.

Table 5.3.2-42.
Recommended Plan Costs by Decade for BMWD (Castle Hills)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$20,090	$19,199	$19,459	$2,567	$2,414	$2,291
Unit Cost ($/acft)	$245	$226	$224	$55	$51	$49
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$484,135	$472,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.22 BMWD (Somerset)

BMWD's (Somerset) current water supply is obtained from the new Medina River Water Treatment Plant and/or the Edwards Aquifer. BMWD (Somerset) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Bexar & Guadalupe (BMWD)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Somerset) implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-43).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 21 acft/yr of supply in 2000, decreasing to 10 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Bexar & Guadalupe (BMWD) to be implemented in 2000. This project can provide an additional 300 acft/yr of supply.

Table 5.3.2-43.
Recommended Water Supply Plan for BMWD (Somerset)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	121	110	101	91	83	79
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	21	22	22	11	10	10
Carrizo Aquifer – Bexar & Guadalupe (BMWD)	300	300	300	300	300	300
Total New Supply	321	322	322	311	310	310

The costs of the recommended plan to meet BMWD's (Somerset) projected need are shown in Table 5.3.2-44.

Table 5.3.2-44.
Recommended Plan Costs by Decade for BMWD (Somerset)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,299	$5,099	$8,778	$601	$514	$487
Unit Cost ($/acft)	$252	$232	$399	$55	$51	$49
Carrizo Aquifer – Bexar & Guadalupe (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore no cost has been projected.

5.3.2.23 BMWD (Hill Country Village/Hollywood Park)

BMWD's (Hill Ctry/HollwPk) current water supply is obtained from the Edwards Aquifer. BMWD (Hill Ctry/HollwPk) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Trinity Aquifer – Bexar (BMWD)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Hill Ctry/HollwPk) implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-45).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 79 acft/yr of supply in 2000, increasing to 82 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Trinity Aquifer – Bexar (BMWD) to be implemented in 2000. This project can provide an additional 1,000 acft/yr of supply.
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 2,200 acft/yr by the year 2000, increasing to 2,700 acft/yr by 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10D)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams
  - Edwards Aquifer Recharge & Recirculation Systems
  - Cooperation with Corpus Christi for New Water Sources
  - Additional Storage (ASR and/or Surface)

Table 5.3.2-45.
Recommended Water Supply Plan for BMWD (Hill Ctry/HollwPk)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,694	1,932	2,200	2,606	2,963	3,378
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	79	86	95	65	73	82
Trinity Aquifer – Bexar (BMWD)	1,000	1,000	1,000	1,000	1,000	1,000
Regional Water Provider(s) (BMWD)*	2,200	2,200	2,200	2,200	2,200	2,700
Total New Supply	3,279	3,286	3,295	3,265	3,273	3,782
**Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County*						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's (Hill Ctry/HollwPk) projected need are shown in Table 5.3.2-46.

Table 5.3.2-46.
Recommended Plan Costs by Decade for BMWD (Hill Ctry/HollwPk)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$18,893	$18,260	$19,003	$3,550	$3,750	$3,996
Unit Cost ($/acft)	$239	$212	$200	$55	$51	$49
Trinity Aquifer – Bexar (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$710,065	$1,425,894	$1,796,385	$1,674,143	$1,838,776	$1,847,885
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[2]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.24 BMWD (Other Subdivisions)

BMWD's (Other Subdivisions) current water supply is obtained from the Edwards Aquifer, Trinity Aquifer, Carrizo Aquifer, Canyon Reservoir, and run-of-river rights. BMWD (Other Subdivisions) is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Bexar & Guadalupe (BMWD)

- Trinity Aquifer – Bexar (BMWD)
- Western Canyon Regional Water Supply Project
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that BMWD (Other Subdivisions) implement the following water supply plan to meet the projected need for this water user group (Table 5.3.2-47).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 2,102 acft/yr of additional supply in 2000, increasing to 2,518 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Bexar & Guadalupe (BMWD) to be implemented in 2000. This project can provide an additional 3,700 acft/yr of supply.
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 2,137 acft/yr of supply until 2040, at which time the supply become 0 acft/yr.
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System to be implemented in 2000. This project can provide an additional 4,000 acft/yr of supply through 2020.
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 6,300 acft/yr by the year 2000, increasing to 35,300 acft/yr by 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams
  - Edwards Aquifer Recharge & Recirculation Systems
  - Cooperation with Corpus Christi for New Water Sources
  - Additional Storage (ASR and/or Surface)

Table 5.3.2-47.
Recommended Water Supply Plan for BMWD (Other Subdivisions)

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	9,795	15,820	21,637	28,031	34,706	38,617
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	2,102	2,440	2,774	2,007	2,327	2,518
Carrizo Aquifer – Bexar & Guadalupe (BMWD)	3,700	3,700	3,700	3,700	3,700	3,700
Western Canyon Regional Water Supply Project	2,137	2,137	2,137	2,137	0	0
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)	4,000	4,000	0	0	0	0
Regional Water Provider(s) (BMWD)*	6,300	12,300	16,300	24,300	31,300	35,300
Total New Supply	18,239	24,577	24,911	32,144	37,327	41,518
**Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County*						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's (Other Subdivisions) projected need are shown in Table 5.3.2-48.

Table 5.3.2-48. Recommended Plan Costs by Decade for BMWD (Other Subdivisions)

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$522,064	$516,704	$543,083	$109,600	$119,539	$122,718
Unit Cost ($/acft)	$248	$212	$196	$55	$51	$49
Carrizo Aquifer – Bexar & Guadalupe (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$2,033,369	$7,972,044	$13,309,583	$18,491,674	$26,160,770	$24,159,387
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD)						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[2]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.3.2.25 Fort Sam Houston

Fort Sam Houston's current water supply is obtained from the Edwards Aquifer. Fort Sam Houston is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Fort Sam Houston implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-49).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 118 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,500 acft/yr by the year 2000.

Table 5.3.2-49.
Recommended Water Supply Plan for Fort Sam Houston

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	1,453	1,184	955	929	902	888
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	118	118	118	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,618	1,618	1,618	1,500	1,500	1,500

The costs of the recommended plan to meet Fort Sam Houston's projected need are shown in Table 5.3.2-50.

Table 5.3.2-50.
Recommended Plan Costs by Decade for Fort Sam Houston

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$47,082	$47,082	$47,082	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$484,135	$972,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.26 Lackland AFB

Lackland AFB's current water supply is obtained from the Edwards Aquifer. Lackland AFB is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

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 need for this entity (Table 5.3.2-51).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 92 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,500 acft/yr by the year 2000.

Table 5.3.2-51.
Recommended Water Supply Plan for Lackland AFB

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,222	970	750	729	708	698
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	92	92	92	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,500	1,500	1,500	1,500	1,500	1,500
Total New Supply	1,592	1,592	1,592	1,500	1,500	1,500

The costs of the recommended plan to meet Lackland AFB's projected need are shown in Table 5.3.2-52.

Table 5.3.2-52.
Recommended Plan Costs by Decade for Lackland AFB

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$36,708	$36,708	$36,708	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$484,135	$972,200	$1,224,808	$1,141,461	$1,253,711	$1,026,603
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.27 Randolph AFB

Randolph AFB's current water supply is obtained from the Edwards Aquifer. Randolph AFB is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the city's projected need (as a part of Bexar County's projected need).

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that Randolph AFB implement the following water supply plan to meet the projected need for this entity (Table 5.3.2-53).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 39 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 1,000 acft/yr by the year 2000.

Table 5.3.2-53.
Recommended Water Supply Plan for Randolph AFB

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	906	790	687	678	673	664
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	39	39	39	0	0	0
Purchase/Participate with Regional Water Provider(s)	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,039	1,039	1,039	1,000	1,000	1,000

The costs of the recommended plan to meet Randolph AFB's projected need are shown in Table 5.3.2-54.

Table 5.3.2-54.
Recommended Plan Costs by Decade for Randolph AFB

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$15,561	$15,561	$15,561	$0	$0	$0
Unit Cost ($/acft)	$399	$399	$399	$0	$0	$0
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$322,757	$648,134	$816,539	$760,474	$835,807	$684,402
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.28 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, and Canyon Reservoir. Rural areas are projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the water user group's projected need (as a part of Bexar County's projected need).

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 need for rural areas (Table 5.3.2-55).

- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 50 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,000 acft/yr by the year 2000, increasing to 34,000 acft/yr by 2050.
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System to be implemented in 2000. This project can provide an additional 1,200 acft/yr of supply until 2020, then decrease to 0 acft/yr in 2020.

Table 5.3.2-55.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	2,211	5,197	10,214	26,686	33,892	23,074
Recommended Plan						
Western Canyon Regional Water Supply Project	50	50	50	50	0	0
Purchase/Participate with Regional Water Provider(s)	2,000	5,000	15,000	27,000	34,000	34,000
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)	1,200	1,200	0	0	0	0
Total New Supply	3,250	6,250	15,050	27,050	34,000	34,000

The costs of the recommended plan to meet rural areas projected need are shown in Table 5.3.2-56.

Table 5.3.2-56.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$645,514	$3,240,668	$12,248,082	$20,546,305	$28,417,450	$23,269,664
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
[1] This project is currently underway with existing funds, therefore no cost has been projected.						

5.3.2.29 Industrial

Industrial's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, run-of-river rights, and direct reuse. Industrial is projected to need additional water supplies beginning in the planning year 2030. The following options were considered to meet industrial's projected need:

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County

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 need for industrial (Table 5.3.2-57).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 2,000 acft/yr by the year 2030, increasing to 8,500 acft/yr by 2050.

Table 5.3.2-57.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	1,428	4,757	8,190
Recommended Plan						
Purchase/Participate with Regional Water Provider(s)				2,000	5,000	8,500
Total New Supply				2,000	5,000	8,500

The costs of the recommended plan to meet industrial's projected need are shown in Table 5.3.2-58.

Table 5.3.2-58.
Recommended Plan Costs by Decade for Industrial

Plan Element	2000	2010	2020	2030	2040	2050
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)				$1,521,948	$4,179,037	$5,817,416
Unit Cost ($/acft)				$761	$836	$648

5.3.2.30 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.

5.3.2.31 Mining

Mining's current water supply is obtained from the Carrizo Aquifer and Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County

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 need for mining (Table 5.3.2-59).

- Cooperate with or purchase water from the Regional Water Provider(s) for Bexar County to obtain additional supplies of 5,000 acft/yr in 2000, increasing to 6,000 acft/yr in 2050.

Table 5.3.2-59.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	4,963	4,936	5,201	5,406	5,645	5,962
Recommended Plan						
Purchase/Participate with Regional Water Provider(s)	5,000	5,000	5,500	5,500	6,000	6,000
Total New Supply	5,000	5,000	5,500	5,500	6,000	6,000

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.2-60.

Table 5.3.2-60.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Purchase/Participate with Regional Water Provider(s)						
Annual Cost ($/yr)	$1,613,785	$3,240,668	$4,490,964	$4,185,358	$5,014,849	$4,106,411
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684

5.3.2.32 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Bexar County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.2-61).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 1,905 acft/yr of supply.

Table 5.3.2-61.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	14,059	10,935	9,376	7,883	6,453	5,082
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	1,905	1,905	1,905	1,905	1,905	1,905
Total New Supply	1,905	1,905	1,905	1,905	1,905	1,905

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.2-62.

Table 5.3.2-62.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$69,209	$69,209	$69,209	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0

5.3.2.33 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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5.3.3 Caldwell County Water Supply Plan

Table 5.3.3-1 lists each water user group in Caldwell County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.3-1.
Caldwell County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Lockhart	-668	-737	Projected shortage – see plan below
City of Luling	585	10	Projected surplus
City of Martindale	149	135	Projected surplus
Rural Area Residential and Commercial	383	1,173	Projected surplus
Industrial	10	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	72	68	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-3, Section 4.1 – Water Needs Projections by Water User Group.

5.3.3.1 City of Lockhart

The City of Lockhart's current water supply is obtained from the Carrizo Aquifer. The City of Lockhart is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Local Supply (SCTN-2a)
- Lockhart Reservoir (G-21) (See Section 6.2.2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Lockhart implement the following water supply plan to meet the projected need for the city (Table 5.3.3-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 91 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2010. This project can provide an additional 500 acft/yr of supply in 2010 and 2020 and an additional 1,000 acft/yr of supply from 2030 through 2050.

Table 5.3.3-2.
Recommended Water Supply Plan for the City of Lockhart

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	188	393	668	714	737
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	91	91	91	0	0	0
Carrizo Aquifer – Local Supply (SCTN-2a)		500	500	1,000	1,000	1,000
Total New Supply	91	591	591	1,000	1,000	1,000

The costs of the recommended plan to meet the City of Lockhart's projected need are shown in Table 5.3.3-3.

Table 5.3.3-3.
Recommended Plan Costs by Decade for the City of Lockhart

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$36,491	$36,491	$36,491	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)		$487,000	$487,000	$974,000	$938,500	$938,500
Unit Cost ($/acft)		$974	$974	$974	$939	$939

5.3.3.2 City of Luling

The City of Luling is projected to have adequate water supplies available from the Carrizo Aquifer and run-of-river rights to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Luling implement the following water supply plan (Table 5.3.3-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 94 acft/yr of supply in 2000, increasing to 104 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.3-4.
Recommended Water Supply Plan for the City of Luling

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	94	105	117	82	93	104
Total New Supply	94	105	117	82	93	104

The costs of the recommended plan for the City of Luling are shown in Table 5.3.3-5.

Table 5.3.3-5.
Recommended Plan Costs by Decade for the City of Luling

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$44,931	$44,931	$44,931	$26,485	$26,485	$26,485
Unit Cost ($/acft)	$478	$428	$384	$323	$285	$255

5.3.3.3 City of Martindale

The City of Martindale is projected to have adequate water supplies available from Canyon Reservoir and run-of-river rights to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Martindale implement the following water supply plan (Table 5.3.3-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.3-6.
Recommended Water Supply Plan for the City of Martindale

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	10	10	10	0	0	0
Total New Supply	10	10	10	0	0	0

The costs of the recommended plan for the City of Martindale are shown in Table 5.3.3-7.

Table 5.3.3-7.
Recommended Plan Costs by Decade for the City of Martindale

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,010	$4,010	$4,010	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0

5.3.3.4 Rural Area Residential and Commercial

The rural area of Caldwell County is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Queen City Aquifer, run-of-river rights, and Canyon Reservoir to meet the water user group's projected demand during the planning period.

5.3.3.5 Industrial

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

5.3.3.6 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.

5.3.3.7 Mining

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

5.3.3.8 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 demand during the planning period.

5.3.3.9 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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5.3.4 Calhoun County Water Supply Plan

Table 5.3.4-1 lists each water user group in Calhoun County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.4-1.
Calhoun County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Point Comfort	18	2	Projected surplus
City of Port Lavaca	-852	-1,093	Projected shortage – see plan below
City of Seadrift	169	127	Projected surplus
Rural Area Residential and Commercial	3,241	2,689	Projected surplus
Industrial	48,917	28,199	Projected surplus
Steam-Electric Power	0	0	No projected surplus/shortage
Mining	0	0	No projected surplus/shortage
Irrigation	13,849	16,494	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1]From Table 4-4, Section 4.1 – Water Needs Projections by Water User Group.

5.3.4.1 City of Point Comfort

The City of Point Comfort is projected to have adequate water supplies available from Lake Texana to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Point Comfort implement the following water supply plan (Table 5.3.4-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 9 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.4-2.
Recommended Water Supply Plan for the City of Point Comfort

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	9	9	9	0	0	0
Total New Supply	9	9	9	0	0	0

The costs of the recommended plan for the City of Point Comfort are shown in Table 5.3.4-3.

Table 5.3.4-3.
Recommended Plan Costs by Decade for the City of Point Comfort

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$3,724	$3,724	$3,724	$0	$0	$0
Unit Cost ($/acft)	$414	$414	$414	$0	$0	$0

5.3.4.2 City of Port Lavaca

The City of Port Lavaca's current water supply is obtained from Canyon Reservoir and run-of-river rights. The City of Port Lavaca is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the city's projected need:

- GBRA Canyon Reservoir Contract Renewal

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 to meet the projected need for the city (Table 5.3.4-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 107 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).
- GBRA Canyon Reservoir Contract Renewal to be implemented in 2008. This project can provide an additional 1,500 acft/yr of supply.

Table 5.3.4-4.
Recommended Water Supply Plan for the City of Port Lavaca

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	769	758	852	969	1,093
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	107	107	107	0	0	0
GBRA Canyon Reservoir Contract Renewal		1,500	1,500	1,500	1,500	1,500
Total New Supply	107	1,607	1,607	1,500	1,500	1,500

The costs of the recommended plan to meet the City of Port Lavaca's projected need are shown in Table 5.3.4-5.

Table 5.3.4-5.
Recommended Plan Costs by Decade for the City of Port Lavaca

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$44,278	$44,278	$44,278	$0	$0	$0
Unit Cost ($/acft)	$414	$414	$414	$0	$0	$0
GBRA Canyon Reservoir Contract Renewal						
Annual Cost ($/yr)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] As this is a renewal of an existing contract the cost to renew this contract was not included.

5.3.4.3 *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 demand 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 5.3.4-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 13 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.4-6.
Recommended Water Supply Plan for the City of Seadrift

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	13	13	13	0	0	0
Total New Supply	13	13	13	0	0	0

The costs of the recommended plan for the City of Seadrift are shown in Table 5.3.4-7.

Table 5.3.4-7.
Recommended Plan Costs by Decade for the City of Seadrift

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$5,380	$5,380	$5,380	$0	$0	$0
Unit Cost ($/acft)	$414	$414	$414	$0	$0	$0

5.3.4.4 Rural Area Residential and Commercial

The rural area of Calhoun County is projected to have adequate water supplies available from the Gulf Coast Aquifer, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.4.5 Industrial

Industrial is projected to have adequate water supplies available from Lake Texana, Canyon Reservoir, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.4.6 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 demand during the planning period.

5.3.4.7 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.

5.3.4.8 Irrigation

Irrigation is projected to have adequate water supplies available from run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.4.9 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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5.3.5 Comal County Water Supply Plan

Table 5.3.5-1 lists each water user group in Comal County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.5-1.
Comal County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Fair Oaks Ranch			See Bexar County
City of Garden Ridge	-562	-617	Projected shortage – see plan below
City of New Braunfels	-14,801	-21,051	Projected shortage – see plan below
City of Schertz			See Guadalupe County
Rural Area Residential and Commercial	-11,094	-19,601	Projected shortage – see plan below
Industrial	1	-551	Projected shortage – see plan below
Steam-Electric Power	0	0	No projected demand
Mining	-5,796	-2,224	Projected shortage – see plan below
Irrigation	631	665	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-5, Section 4.1 – Water Needs Projections by Water User Group.

5.3.5.1 City of Fair Oaks Ranch (See Bexar County)

5.3.5.2 City of Garden Ridge

The City of Garden Ridge's current water supply is obtained from the Edwards Aquifer. The City of Garden Ridge is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Garden Ridge implement the following water supply plan to meet the projected need for the city (Table 5.3.5-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 35 acft/yr of supply in 2000, increasing to 41 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 400 acft/yr of supply in 2000, increasing to 700 acft/yr of additional supply in 2050.

Table 5.3.5-2.
Recommended Water Supply Plan for the City of Garden Ridge

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	322	395	434	562	623	617
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	35	40	46	38	41	41
Canyon Reservoir – River Diversion (G-15C)	400	450	500	700	700	700
Total New Supply	435	490	546	738	741	741

The costs of the recommended plan to meet the City of Garden Ridge's projected need are shown in Table 5.3.5-3.

Table 5.3.5-3.
Recommended Plan Costs by Decade for the City of Garden Ridge

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$10,503	$10,271	$10,037	$3,951	$3,719	$3,249
Unit Cost ($/acft)	$300	$257	$218	$104	$91	$79
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$310,983	$349,856	$371,500	$440,300	$440,300	$440,300
Unit Cost ($/acft)	$777	$777	$743	$629	$629	$629

5.3.5.3 City of New Braunfels

The City of New Braunfels' current water supply is obtained from the Edwards Aquifer, Canyon Reservoir and run-of-river rights. The City of New Braunfels is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir – River Diversion (G-15C)
- GBRA Canyon Reservoir Contract Renewal
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of New Braunfels implement the following water supply plan to meet the projected need for the city (Table 5.3.5-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 583 acft/yr of supply in 2000, increasing to 904 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 580 acft/yr of supply in 2000, increasing to 10,000 acft/yr of additional supply in 2030 through 2050.
- GBRA Canyon Reservoir Contract Renewal to be implemented in 2001. This project can provide an additional 6,720 acft/yr of supply.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2040. This project can provide an additional 4,000 acft/yr of supply in 2040, increasing to 7,000 acft/yr of additional supply in 2050.
- Additional Storage (ASR and/or Surface)

Table 5.3.5-4.
Recommended Water Supply Plan for the City of New Braunfels

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	7,817	10,697	14,801	17,765	21,051
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	583	680	804	683	785	904
Canyon Reservoir – River Diversion (G-15C)	580	580	7,200	10,000	10,000	10,000
GBRA Canyon Reservoir Contract Renewal		6,720	6,720	6,720	6,720	6,720
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]					4,000	7,000
Additional Storage (ASR and/or Surface)[2]						
Total New Supply	1,163	7,980	14,724	17,403	21,505	24,624

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of New Braunfels' projected need are shown in Table 5.3.5-5.

Table 5.3.5-5.
Recommended Plan Costs by Decade for the City of New Braunfels

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$180,940	$181,223	$181,497	$70,491	$70,750	$71,163
Unit Cost ($/acft)	$312	$268	$227	$104	$91	$79
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$450,925	$450,925	$5,349,600	$6,290,000	$6,290,000	$6,290,000
Unit Cost ($/acft)	$777	$777	$743	$629	$629	$629
GBRA Canyon Reservoir Contract Renewal						
Annual Cost ($/yr)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)		N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$2,702,000	$2,702,000	$5,022,000	$4,069,000
Unit Cost ($/acft)			N/A[2]	N/A[2]	$1,256	$580
Additional Storage (ASR and/or Surface)[3]						
Annual Cost ($/yr)	$1,052,135	$1,081,868	$1,111,602	$590,341	$120,078	$150,002
Unit Cost ($/acft)	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]

[1] As this is a renewal of an existing contract, the cost to renew this contract was not included.
[2] Reflects early participation in a project to ensure future needs are met.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[4] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.3.5.4 City of Schertz (See Guadalupe County)

5.3.5.5 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Trinity Aquifer, Canyon Reservoir, and run-of-river rights. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the projected need for rural areas:

- Western Canyon Regional Water Supply Project
- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

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 need for rural area (Table 5.3.5-6).

- Western Canyon Regional Water Supply Project which is currently in the implementation phase. This project can provide an additional 3,266 acft/yr of supply starting in the year 2000.
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 2,500 acft/yr of supply in 2000, increasing to 5,000 acft/yr of additional supply in 2020 through 2050.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2030. This project can provide an additional 5,500 acft/yr of supply in 2030, increasing to 13,100 acft/yr of additional supply in 2050.

Table 5.3.5-6.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	3,362	4,957	7,490	11,094	15,008	19,601
Recommended Plan						
Western Canyon Regional Water Supply Project	3,266	3,266	3,266	3,266	7,266	7,266
Canyon Reservoir – River Diversion (G-15C)	2,500	4,000	5,000	5,000	5,000	5,000
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]				5,500	8,100	13,100
Total New Supply	5,766	7,266	8,266	13,766	20,366	25,366

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the rural area's projected need are shown in Table 5.3.5-7.

Table 5.3.5-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$1,943,643	$3,109,829	$3,715,000	$3,145,000	$3,145,000	$3,145,000
Unit Cost ($/acft)	$777	$777	$743	$629	$629	$629
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$5,056,600	$8,268,600	$9,754,600	$7,598,000
Unit Cost ($/acft)			N/A[2]	$1,503	$1,204	$580

[1] This project is currently under development with existing funds, therefore costs not included.
[2] Reflects early participation in a project to ensure future needs are met.

5.3.5.6 Industrial

Industrial's current water supply is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Industrial is projected to need additional water supplies in the planning year 2040. The following options were considered to meet the industrial projected need:

- Carrizo Aquifer – Gonzales and Bastrop (CZ-10D)

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 need for industrial (Table 5.3.5-8).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2040. This project can provide an additional 600 acft/yr of supply.

Table 5.3.5-8.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	271	551
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]					600	600
Total New Supply					600	600

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the industrial projected need are shown in Table 5.3.5-9.

Table 5.3.5-9.
Recommended Plan Costs by Decade for Industrial

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$231,600	$231,600	$579,600	$348,000
Unit Cost ($/acft)			N/A[1]	N/A[1]	$966	$580

[1] Reflects early participation in a project to ensure future needs are met.

5.3.5.7 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.

5.3.5.8 Mining

Mining's current water supply is obtained from the Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

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 need for mining (Table 5.3.5-10).

- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 7,020 acft/yr of supply in 2000, 5,470 acft/yr of additional supply in 2010, and 3,000 acft/yr of additional supply in 2020.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2020. This project can provide an additional 3,500 acft/yr of supply in 2020, 6,500 acft/yr of additional supply in 2030, 3,800 acft/yr of additional supply in 2040, and 2,300 acft/yr of additional supply in 2050.

Table 5.3.5-10. Recommended Water Supply Plan for Mining

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Projected Need (Shortage)	5,570	5,464	5,628	5,796	3,590	2,224
Recommended Plan						
Canyon Reservoir – River Diversion (G-15C)	7,020	5,470	3,000	0	0	0
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]			3,500	6,500	3,800	2,300
Total New Supply	7,020	5,470	6,500	6,500	3.800	2,300

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.5-11.

Table 5.3.5-11. Recommended Plan Costs by Decade for Mining

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Canyon Reservoir – River Diversion (G-15C))						
Annual Cost ($/yr)	$5,457,749	$4,252,641	$2,229,000	$0	$0	$0
Unit Cost ($/acft)	$777	$777	$743	$0	$0	$0
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$4,317,100	$6,305,000	$4,713,000	$1,334,000
Unit Cost ($/acft)			$1,371	$970	$1,240	$580

5.3.5.9 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.

5.3.5.10 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.

5.3.6 DeWitt County Water Supply Plan

Table 5.3.6-1 lists each water user group in DeWitt County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.6-1.
DeWitt County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Cuero	1,013	871	Projected surplus
City of Yoakum	214	72	Projected surplus
City of Yorktown	759	700	Projected surplus
Rural Area Residential and Commercial	172	209	Projected surplus
Industrial	5	5	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	57	93	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-6, Section 4.1 – Water Needs Projections by Water User Group.

5.3.6.1 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 5.3.6-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 125 acft/yr beginning in year 2000, decreasing to 74 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.6-2.
Recommended Water Supply Plan for the City of Cuero

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	125	127	130	68	71	74
Total New Supply	125	127	130	68	71	74

The costs of the recommended plan for the City of Cuero are shown in Table 5.3.6-3.

Table 5.3.6-3.
Recommended Plan Costs by Decade for the City of Cuero

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$40,580	$40,580	$40,580	$12,808	$12,808	$12,808
Unit Cost ($/acft)	$325	$320	$312	$188	$180	$173

5.3.6.2 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 5.3.6-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 21 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.6-4.
Recommended Water Supply Plan for the City of Yoakum

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	21	21	21	0	0	0
Total New Supply	21	21	21	0	0	0

The costs of the recommended plan for the City of Yoakum are shown in Table 5.3.6-5.

Table 5.3.6-5.
Recommended Plan Costs by Decade for the City of Yoakum

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,837	$8,837	$8,837	$0	$0	$0
Unit Cost ($/acft)	$421	$421	$421	$0	$0	$0

5.3.6.3 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 5.3.6-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 22 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.6-6.
Recommended Water Supply Plan for the City of Yorktown

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	22	22	22	0	0	0
Total New Supply	22	22	22	0	0	0

The costs of the recommended plan for the City of Yorktown are shown in Table 5.3.6-7.

Table 5.3.6-7.
Recommended Plan Costs by Decade for the City of Yorktown

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$9,257	$9,257	$9,257	$0	$0	$0
Unit Cost ($/acft)	$421	$421	$421	$0	$0	$0

5.3.6.4 Rural Area Residential and Commercial

The rural area of DeWitt County 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.

5.3.6.5 Industrial

Industrial is projected to have adequate water supplies available from the Gulf Coast Aquifer and Canyon Reservoir to meet the water user group's projected demand during the planning period.

5.3.6.6 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.

5.3.6.7 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.

5.3.6.8 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.

5.3.6.9 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.

5.3.7 Dimmit County Water Supply Plan

Table 5.3.7-1 lists each water user group in Dimmit County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.7-1.
Dimmit County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Asherton	70	27	Projected surplus
City of Big Wells	43	40	Projected surplus
City of Carrizo Springs	-1,054	-1,959	Projected shortage – see plan below
Rural Area Residential and Commercial	49	0	Projected surplus
Industrial	2	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	0	0	No projected surplus/shortage
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-7, Section 4.1 – Water Needs Projections by Water User Group.

5.3.7.1 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 demand during the planning period.

5.3.7.2 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 demand 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 5.3.7-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 15 acft/yr beginning in year 2000, decreasing to 8 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.7-2.
Recommended Water Supply Plan for the City of Big Wells

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	15	15	15	8	8	8
Total New Supply	15	15	15	8	8	8

The costs of the recommended plan for the City of Big Wells are shown in Table 5.3.7-3.

Table 5.3.7-3.
Recommended Plan Costs by Decade for the City of Big Wells

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,038	$3,861	$3,722	$826	$735	$652
Unit Cost ($/acft)	$269	$257	$248	$103	$92	$82

5.3.7.3 City of Carrizo Springs

The City of Carrizo Springs' current water supply is obtained from the Carrizo Aquifer. The City of Carrizo Springs is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Local Supply (SCTN-2a)

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 to meet the projected need for the city (Table 5.3.7-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 116 acft/yr of supply in 2000, increasing to 125 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2000. This project can provide additional supplies of 500 acft/yr in 2000, 1,000 acft/yr in 2010 and 2020, 2,500 acft/yr in 2030, 3,000 acft/yr in 2040, and 3,500 acft/yr in 2050.

Table 5.3.7-4.
Recommended Water Supply Plan for the City of Carrizo Springs

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	138	405	649	1,054	1,479	1,959
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	116	128	141	97	110	125
Carrizo Aquifer – Local Supply (SCTN-2a)	500	1,000	1,000	2,500	3,000	3,500
Total New Supply	616	1,128	1,141	2,597	3,110	3,625

The costs of the recommended plan to meet the City of Carrizo Springs' projected need are shown in Table 5.3.7-5.

Table 5.3.7-5.
Recommended Plan Costs by Decade for the City of Carrizo Springs

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$30,267	$30,444	$30,583	$10,014	$10,105	$10,188
Unit Cost ($/acft)	$261	$238	$217	$103	$92	$82
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)	$193,500	$387,000	$387,000	$812,500	$851,000	$1,044,500
Unit Cost ($/acft)	$387	$387	$387	$325	$284	$298

5.3.7.4 *Rural Area Residential and Commercial*

The rural area of Dimmit County 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.

5.3.7.5 *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.

5.3.7.6 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.

5.3.7.7 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.

5.3.7.8 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 palnning period.

5.3.7.9 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.

5.3.8 Frio County Water Supply Plan

Table 5.3.8-1 lists each water user group in Frio County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.8-1.
Frio County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Dilley	1,836	1,780	Projected surplus
City of Pearsall	1,225	1,108	Projected surplus
Rural Area Residential and Commercial	38	0	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected surplus/shortage
Mining	0	0	No projected surplus/shortage
Irrigation	-76,506	-70,662	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-8, Section 4.1 – Water Needs Projections by Water User Group.

5.3.8.1 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 demand 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 5.3.8-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 51 acft/yr beginning in year 2000, decreasing to 34 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.8-2.
Recommended Water Supply Plan for the City of Dilley

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	51	54	57	32	33	34
Total New Supply	51	54	57	32	33	34

The costs of the recommended plan for the City of Dilley are shown in Table 5.3.8-3.

Table 5.3.8-3.
Recommended Plan Costs by Decade for the City of Dilley

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$12,504	$12,497	$12,523	$3,561	$3,550	$3,540
Unit Cost ($/acft)	$245	$231	$220	$111	$108	$104

5.3.8.2 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 demand 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 5.3.8-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 133 acft/yr beginning in year 2000, decreasing to 90 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.8-4.
Recommended Water Supply Plan for the City of Pearsall

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	133	141	148	84	87	90
Total New Supply	133	141	148	84	87	90

The costs of the recommended plan for the City of Pearsall are shown in Table 5.3.8-5.

Table 5.3.8-5.
Recommended Plan Costs by Decade for the City of Pearsall

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$32,648	$32,655	$32,629	$9,349	$9,360	$9,370
Unit Cost ($/acft)	$245	$232	$220	$111	$108	$104

5.3.8.3 Rural Area Residential and Commercial

The rural area of Frio County 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.

5.3.8.4 Industrial

There is no projected industrial water demand in Frio County, therefore no water management strategies are recommended for this water user group.

5.3.8.5 Steam-Electric Power

Steam-electric power 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.

5.3.8.6 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.

5.3.8.7 Irrigation

Irrigation's current water supply is obtained from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Frio County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.8-6).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 5,947 acft/yr of supply.

Table 5.3.8-6.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	71,125	67,645	64,365	76,506	73,520	70,663
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	5,947	5,947	5,947	5,947	5,947	5,947
Total New Supply	5,947	5,947	5,947	5,947	5,947	5,947

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.8-7.

Table 5.3.8-7.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$758,183	$758,183	$758,183	$0	$0	$0
Unit Cost ($/acft)	$127	$127	$127	$0	$0	$0

5.3.8.8 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.

5.3.9 Goliad County Water Supply Plan

Table 5.3.9-1 lists each water user group in Goliad County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.9-1.
Goliad County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Goliad	948	915	Projected surplus
Rural Area Residential and Commercial	50	22	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	3,577	3,579	Projected surplus
Mining	3	0	Projected surplus
Irrigation	2,434	2,531	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-9, Section 4.1 – Water Needs Projections by Water User Group.

5.3.9.1 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 demand 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 5.3.9-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 19 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.9-2.
Recommended Water Supply Plan for the City of Goliad

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	19	19	19	0	0	0
Total New Supply	19	19	19	0	0	0

The costs of the recommended plan for the City of Goliad are shown in Table 5.3.9-3.

Table 5.3.9-3.
Recommended Plan Costs by Decade for the City of Goliad

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,626	$8,626	$8,626	$0	$0	$0
Unit Cost ($/acft)	$454	$454	$454	$0	$0	$0

5.3.9.2 *Rural Area Residential and Commercial*

The rural area of Goliad County 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.

5.3.9.3 *Industrial*

There is no projected industrial water demand in Goliad County, therefore no water management strategies are recommended for this water user group.

5.3.9.4 *Steam-Electric Power*

Steam-electric power is projected to have adequate water supplies available from the Gulf Coast Aquifer and Coleto Creek Reservoir to meet the water user group's projected demand during the planning period.

5.3.9.5 *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.

5.3.9.6 Irrigation

Irrigation is projected to have adequate water supplies available from run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.9.7 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.

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5.3.10 Gonzales County Water Supply Plan

Table 5.3.10-1 lists each water user group in Gonzales County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.10-1. Gonzales County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Gonzales	676	617	Projected surplus
City of Nixon	1,157	1,145	Projected surplus
City of Waelder	31	33	Projected surplus
Rural Area Residential and Commercial	858	832	Projected surplus
Industrial	148	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	3,025	3,527	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-10, Section 4.1 – Water Needs Projections by Water User Group.

5.3.10.1 City of Gonzales

The City of Gonzales is projected to have adequate water supplies available from run-of-river rights to meet the city's projected demand 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 5.3.10-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 122 acft/yr beginning in year 2000, decreasing to 67 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.10-2.
Recommended Water Supply Plan for the City of Gonzales

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	122	125	127	64	66	67
Total New Supply	122	125	127	64	66	67

The costs of the recommended plan for the City of Gonzales are shown in Table 5.3.10-3.

Table 5.3.10-3.
Recommended Plan Costs by Decade for the City of Gonzales

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$35,962	$35,962	$35,962	$9,338	$9,338	$9,338
Unit Cost ($/acft)	$295	$288	$283	$146	$141	$139

5.3.10.2 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 demand 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 5.3.10-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 20 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.10-4.
Recommended Water Supply Plan for the City of Nixon

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	20	20	20	0	0	0
Total New Supply	20	20	20	0	0	0

The costs of the recommended plan for the City of Nixon are shown in Table 5.3.10-5.

Table 5.3.10-5.
Recommended Plan Costs by Decade for the City of Nixon

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,320	$8,320	$8,320	$0	$0	$0
Unit Cost ($/acft)	$416	$416	$416	$0	$0	$0

5.3.10.3 City of Waelder

The City of Waelder is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand 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 5.3.10-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 7 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.10-6.
Recommended Water Supply Plan for the City of Waelder

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	7	7	7	0	0	0
Total New Supply	7	7	7	0	0	0

The costs of the recommended plan for the City of Waelder are shown in Table 5.3.10-7.

Table 5.3.10-7.
Recommended Plan Costs by Decade for the City of Waelder

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$2,912	$2,912	$2,912	$0	$0	$0
Unit Cost ($/acft)	$416	$416	$416	$0	$0	$0

5.3.10.4 Rural Area Residential and Commercial

The rural area of Gonzales County is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, Gulf Coast Aquifer, and Canyon Reservoir to meet the water user group's projected demand during the planning period.

5.3.10.5 Industrial

Industrial is projected to have adequate water supplies available from the Carrizo Aquifer, Sparta Aquifer, Queen City Aquifer, and Gulf Coast Aquifer to meet the water user group's projected demand during the planning period.

5.3.10.6 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.

5.3.10.7 Mining

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

5.3.10.8 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.

5.3.10.9 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.

5.3.11 Guadalupe County Water Supply Plan

Table 5.3.11-1 lists each water user group in Guadalupe County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.11-1.
Guadalupe County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Cibolo	231	118	Projected surplus
City of Marion	64	63	Projected surplus
McQueeney (CDP)	25	2	Projected surplus
City of New Braunfels			See Comal County
City of Schertz	-5,760	-7,059	Projected shortage – see plan below
City of Seguin	-7	-2,745	Projected shortage – see plan below
Rural Area Residential and Commercial[2]	22	-4,505	Projected shortage – see plan below
Industrial	-1,481	-1,893	Projected shortage – see plan below
Steam-Electric Power	-920	-920	Projected shortage – see plan below
Mining	-202	-213	Projected shortage – see plan below
Irrigation	-582	-406	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-11, Section 4.1 – Water Needs Projections by Water User Group.
[2] Includes the Cities of Santa Clara and New Berlin.

5.3.11.1 City of Cibolo

The City of Cibolo's current water supply is obtained from the Edwards Aquifer through Green Valley Special Utility District and from Canyon Reservoir. The City of Cibolo is projected to have adequate water supplies from these sources to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Cibolo implement the following water supply plan (Table 5.3.11-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 17 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.11-2.
Recommended Water Supply Plan for the City of Cibolo

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	17	17	17	0	0	0
Total New Supply	17	17	17	0	0	0

The costs of the recommended plan to meet the City of Cibolo's projected need are shown in Table 5.3.11-3.

Table 5.3.11-3.
Recommended Plan Costs by Decade for the City of Cibolo

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$6,807	$6,807	$6,807	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.11.2 City of Marion

The City of Marion's current water supply is obtained from the Edwards Aquifer and Canyon Reservoir. The City of Marion is projected to have adequate water supplies from these sources to meet the City's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Marion implement the following water supply plan (Table 5.3.11-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.11-4.
Recommended Water Supply Plan for the City of Marion

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	10	10	10	0	0	0
Total New Supply	10	10	10	0	0	0

The costs of the recommended plan to meet the City of Marion's projected need are shown in Table 5.3.11-5.

Table 5.3.11-5.
Recommended Plan Costs by Decade for the City of Marion

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$4,004	$4,004	$4,004	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.11.3 McQueeney (CDP)

McQueeney (CDP) is projected to have adequate water supplies available through contracts with Springs Hill WSC for the area east of Lake Dunlap and Green Valley SUD for the area west of Lake Dunlap to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that McQueeney implement the following water supply plan (Table 5.3.11-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 19 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.11-6.
Recommended Water Supply Plan for McQueeney

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	19	19	19	0	0	0
Total New Supply	19	19	19	0	0	0

The costs of the recommended plan for McQueeney are shown in Table 5.3.11-7.

Table 5.3.11-7.
Recommended Plan Costs by Decade for McQueeney

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,608	$7,608	$7,608	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.11.4 City of New Braunfels (See Comal County)

5.3.11.5 City of Schertz

The City of Schertz's current water supply is obtained from the Edwards Aquifer. The City of Schertz is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Schertz implement the following water supply plan to meet the projected need for the city (Table 5.3.11-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 140 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 7,596 acft/yr of supply beginning in 2000.

Table 5.3.11-8.
Recommended Water Supply Plan for the City of Schertz

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage) – Inside City	4,125	4,610	5,199	5,760	6,390	7,059
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	140	140	140	0	0	0
Schertz-Seguin Water Supply Project (Carrizo)*	7,596	7,596	7,596	7,596	7,596	7,596
Total New Supply	7,736	7,736	7,736	7,596	7,596	7,596
*Schertz's share of the Schertz-Seguin Water Supply Project is 10,000 acft/yr. See Table 5.3.2-29 for the remaining 2,404 acft/yr.						

The costs of the recommended plan to meet the City of Schertz's projected need are shown in Table 5.3.11-9.

Table 5.3.11-9.
Recommended Plan Costs by Decade for the City of Schertz

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$56,000	$56,000	$56,000	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
[1] This project is currently underway with existing funds, therefore costs are not included.						

5.3.11.6 City of Seguin

The City of Seguin's current water supply is obtained from run-of-river rights firmed with a GBRA contract for water from Canyon Lake. The City of Seguin is projected to need additional water supplies beginning in the planning year 2030. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Schertz-Seguin Water Supply Project (Carrizo)

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 to meet the projected need for the city (Table 5.3.11-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 186 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

Table 5.3.11-10.
Recommended Water Supply Plan for the City of Seguin

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	7	1,280	2,745
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	186	186	186	0	0	0
Schertz-Seguin Water Supply Project (Carrizo)*	6,400	6,400	6,400	6,400	6,400	6,400
Total New Supply	6,586	6,586	6,586	6,400	6,400	6,400

* Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet the City of Seguin's projected need are shown in Table 5.3.11-11.

Table 5.3.11-11.
Recommended Plan Costs by Decade for the City of Seguin

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$74,478	$74,478	$74,478	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included.

5.3.11.7 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, and Canyon Reservoir. Rural areas are projected to need additional water supplies beginning in the planning year 2030. The following options were considered to meet the projected need for rural areas:

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Schertz-Seguin Water Supply Project (Carrizo)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural area water 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 need for rural areas (Table 5.3.11-12).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2000. This project can provide an additional 100 acft/yr of supply in 2000, increasing to 3,200 acft/yr of additional supply in 2050.
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 1,700 acft/yr of supply beginning in 2000.

Table 5.3.11-12.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	929	1,326	3,565
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]	100	100	600	600	1,100	3,100
Schertz-Seguin Water Supply Project (Carrizo)[2]	1,700	1,700	1,700	1,700	1,700	1,700
Total New Supply	1,800	1,800	2,300	2,300	2,800	4,800

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

[2] Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.11-13.

Table 5.3.11-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$1,272,400	$1,272,400	$1,687,400	$490,800	$816,200	$2,300,600
Unit Cost ($/acft)	$12,724	$12,724	$2,812	$818	$742	$742
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
[1] This project is currently underway with existing funds, therefore costs are not included						

5.3.11.8 Industrial

Industrial's current water supply is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Industrial is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the industrial projected need:

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Schertz-Seguin Water Supply Project (Carrizo)

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 need for industrial (Table 5.3.11-14).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2000. This project can provide an additional 1,100 acft/yr of supply beginning in 2000.
- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 900 acft/yr of supply beginning in 2000.

Table 5.3.11-14.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	979	1,198	1,344	1,481	1,686	1,893
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]	1,100	1,100	1,100	1,100	1,100	1,100
Schertz-Seguin Water Supply Project (Carrizo)[2]	900	900	900	900	900	900
Total New Supply	2,000	2,000	2,000	2,000	2,000	2,000

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
[2] Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet the industrial projected need are shown in Table 5.3.11-15.

Table 5.3.11-15.
Recommended Plan Costs by Decade for Industrial

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$1,258,400	$1,258,400	$1,324,400	$899,800	$816,200	$816,200
Unit Cost ($/acft)	$1,144	$1,144	$1,204	$818	$742	$742
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included

5.3.11.9 Steam-Electric Power

Steam-electric power's current water supply is obtained from Canyon Reservoir. Steam-electric power is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the steam-electric power projected need:

- Schertz-Seguin Water Supply Project (Carrizo)

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 need for steam-electric power (Table 5.3.11-16).

- Schertz-Seguin Water Supply Project (Carrizo) to be implemented in 2000. This project can provide an additional 1,000 acft/yr of supply beginning in 2000.

Table 5.3.11-16.
Recommended Water Supply Plan for Steam-Electric Power

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	920	920	920	920	920	920
Recommended Plan						
Schertz-Seguin Water Supply Project (Carrizo)*	1,000	1,000	1,000	1,000	1,000	1,000
Total New Supply	1,000	1,000	1,000	1,000	1,000	1,000

* Seguin's share of this project is 10,000 acft/yr, and for the purposes of this study is divided as follows: 6,400 acft/yr of supply for the City, 1,700 acft/yr for adjacent rural areas (Table 5.3.11-12), 900 acft/yr for industry (Table 5.3.11-14), and 1,000 acft/yr for steam-electric power (Table 5.3.11-16).

The costs of the recommended plan to meet the steam-electric power projected need are shown in Table 5.3.11-17.

Table 5.3.11-17.
Recommended Plan Costs by Decade for Steam-Electric Power

Plan Element	2000	2010	2020	2030	2040	2050
Schertz-Seguin Water Supply Project (Carrizo)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore costs are not included

5.3.11.10 Mining

Mining's current water supply is obtained from the Carrizo Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)

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 need for mining (Table 5.3.11-18).

- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2000. This project can provide an additional 300 acft/yr of supply beginning in 2000.

Table 5.3.11-18.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	196	198	200	202	207	213
Recommended Plan						
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]	300	300	300	300	300	300
Total New Supply	300	300	300	300	300	300

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.11-19.

Table 5.3.11-19.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$343,200	$343,200	$361,200	$245,400	$222,600	$222,600
Unit Cost ($/acft)	$1,144	$1,144	$1,204	$818	$742	$742

5.3.11.11 Irrigation

Irrigation's current water supply is obtained from the Carrizo Aquifer, Canyon Reservoir, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. However, at this time there does not appear to be any feasible option to meet the need either in whole or in part, therefore, no water management strategies are recommended to meet the water user group's projected need.

5.3.11.12 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.

5.3.12 Hays County Water Supply Plan

Table 5.3.12-1 lists each water user group in Hays County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.12-1.
Hays County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Kyle	492	-225	Projected shortage – see plan below
City of San Marcos	-9,919	-27,297	Projected shortage – see plan below
City of Wimberley	127	-322	Projected shortage – see plan below
City of Woodcreek	38	31	Projected surplus
Rural Area Residential and Commercial	-6,350	-6,360	Projected shortage – see plan below
Industrial	1,312	1,287	Projected surplus
Steam-Electric Power	36	36	Projected surplus
Mining	-55	-28	Projected shortage – see plan below
Irrigation	512	518	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-12, Section 4.1 – Water Needs Projections by Water User Group.

5.3.12.1 City of Kyle

The City of Kyle's current water supply is obtained from the Edwards Aquifer. In addition, the City of Kyle has contracted with the Guadalupe-Blanco River Authority (GBRA) for supplies from Canyon Reservoir to be delivered through the Hays/IH35 Water Supply Project which is present in the implementation phase. Without these supplies from Canyon Reservoir, the City of Kyle is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Hays/IH35 Water Supply Project (HIH35WSP)
- GBRA Canyon Reservoir Contract Renewal

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Kyle implement the following water supply plan to meet the projected need for the city (Table 5.3.12-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 22 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (see Section 6, Supplement 2 and Volume III, Section 1.1).
- Hays/IH35 Water Supply Project to be completed in year 2000. This project can provide 589 acft/yr of supply through 2038.
- GBRA Canyon Reservoir Contract Renewal to be implemented in 2038. This project can provide an additional 589 acft/yr of supply.

Table 5.3.12-2. Recommended Water Supply Plan for the City of Kyle

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)[1]	0	0	0	0	156	225
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	22	22	22	0	0	0
Hays/IH35 Water Supply Project (HIH35WSP)[2]	*	*	*	*		
GBRA Canyon Reservoir Contract Renewal[3]					589	589
Total New Supply	22	22	22	0	589	589

[1] Includes 589 acft/yr GBRA contract from Canyon Reservoir as current supply to be delivered upon completion of Hays/IH35 Water Supply Project.
[2] The Hays/IH35 Water Supply Project is currently in the implementation phase; however the 589 acft/yr supply from this project has been counted as a current supply for the City of Kyle.
[3] GBRA contract renewal for the Hays/IH35 Water Supply Project.

The costs of the recommended plan to meet the City of Kyle's projected need are shown in Table 5.3.12-3.

Table 5.3.12-3.
Recommended Plan Costs by Decade for the City of Kyle

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$8,822	$8,822	$8,822	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0
Hays/IH35 Water Supply Project (HIH35WSP)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
GBRA Canyon Contract Renewal (GBRA)						
Annual Cost ($/yr)					N/A[2]	N/A[2]
Unit Cost ($/acft)					N/A[2]	N/A[2]

[1] This project is currently underway with existing funds, therefore, no cost has been projected.
[2].Cost would be to renew an existing contract acquired under existing funds, therefore no new cost shown.

5.3.12.2 City of San Marcos

The City of San Marcos' current water supply is obtained from the Edwards Aquifer and Canyon Reservoir. The City of San Marcos is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Purchase Water from Major Provider(s) (PMP)
- Colorado River Diversion Option (LCRA)
- GBRA Canyon Reservoir Contract Renewal (GBRA)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of San Marcos implement the following water supply plan to meet the projected need for the city (Table 5.3.12-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 590 acft/yr of supply in 2000, increasing to 1,174 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1)
- Purchase Water from Major Provider to be implemented in 2000. This project can provide an additional 5,000 acft/yr of supply beginning in 2000.

- Colorado River Diversion Option (LCRA) to be implemented between 2020 and 2030. This project can provide an additional 4,900 acft/yr of supply in 2030, increasing to 16,500 acft/yr of additional supply in 2050.
- GBRA Canyon Contract Renewal to be implemented in 2047. This project can provide an additional 5,000 acft/yr of supply in 2050.
- Additional Storage (Surface and/or ASR)

Table 5.3.12-4.
Recommended Water Supply Plan for the City of San Marcos

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	641	2,848	5,629	9,919	15,326	27,297
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	590	690	816	699	906	1,174
Purchase Water from Major Provider (PMP)	5,000	5,000	5,000	5,000	5,000	5,000
Colorado River Diversion Option (LCRA)				4,900	10,000	16,500
GBRA Canyon Contract Renewal (GBRA)						5,000
Additional Storage (ASR and/or Surface)[1]						
Total New Supply	5,590	5,690	5,816	10,599	15,906	27,674

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of San Marcos' projected need are shown in Table 5.3.12-5.

Table 5.3.12-5.
Recommended Plan Costs by Decade for the City of San Marcos

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$194,586	$194,586	$194,586	$81,103	$81,103	$81,103
Unit Cost ($/acft)	$330	$282	$238	$116	$90	$69
Purchase Water from Major Provider (PMP)[1]						
Annual Cost ($/yr)	$2,995,000	$2,995,000	$3,015,000	$3,015,000	$3,015,000	$3,015,000
Unit Cost ($/acft)	$599	$599	$603	$603	$603	$603
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)				$7,494,331	$11,678,275	$16,837,260
Unit Cost ($/acft)				$1,529	$1,168	$1,020
GBRA Canyon Contract Renewal (GBRA)						
Annual Cost ($/yr)						N/A[3]
Unit Cost ($/acft)						N/A[3]
Additional Storage (ASR and/or Surface)[2]						
Annual Cost ($/yr)	$1,514,459	$1,561,151	$1,607,843	$1,103,533	$194,216	$240,999
Unit Cost ($/acft)	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]

[1] The cost associated with this management strategy represents purchase, treatment, and distribution. There are currently sufficient facilities in place to deliver this water.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[3] The cost of renewing the contract is based on the cost of the existing contract that is paid from existing funds.
[4] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.3.12.3 City of Wimberley

The City of Wimberley's current water supply is obtained from the Trinity Aquifer. The City of Wimberley is projected to need additional water supplies beginning in the planning year 2050. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir (G-24)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Wimberley implement the following water supply plan to meet the projected need for the city (Table 5.3.12-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 25 acft/yr beginning in year 2000, decreasing to 0 acft/yr in 2030 (see Section 6, Supplement 2 and Volume III, Section 1.1).
- Canyon Reservoir (G-24) to be implemented in 2050. This project can provide an additional 400 acft/yr of supply.

Table 5.3.12-6.
Recommended Water Supply Plan for the City of Wimberley

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	322
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	25	25	25	0	0	0
Canyon Reservoir (G-24)						400
Total New Supply	25	25	25	0	0	400

The costs of the recommended plan to meet the City of Wimberley's projected need are shown in Table 5.3.12-7.

Table 5.3.12-7.
Recommended Plan Costs by Decade for the City of Wimberley

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$10,025	$10,025	$10,025	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0
Canyon Reservoir (G-24)						
Annual Cost ($/yr)	$245,540	$245,540	$245,540			$305,660
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]			$764

[1] Reflects early participation in a project to ensure future needs are met.

5.3.12.4 City of Woodcreek

The City of Woodcreek is projected to have adequate water supplies available from the Trinity Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Woodcreek implement the following water supply plan (Table 5.3.12-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.12-8.
Recommended Water Supply Plan for the City of Woodcreek

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	10	10	10	0	0	0
Total New Supply	10	10	10	0	0	0

The costs of the recommended plan for the City of Woodcreek are shown in Table 5.3.12-9.

Table 5.3.12-9.
Recommended Plan Costs by Decade for the City of Woodcreek

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,010	$4,010	$4,010	$0	$0	$0
Unit Cost ($/acft)	$401	$401	$401	$0	$0	$0

5.3.12.5 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Canyon Reservoir, and run-of-river rights. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet projected need for rural areas:

- Hays/IH35 Water Supply Project (HIH35WSP)
- Canyon Reservoir (G-24)
- Colorado River Diversion Option (LCRA)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that rural 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 need for rural areas (Table 5.3.12-10).

- Hays/IH35 Water Supply Project to be implemented in 2000. This project can provide an additional 4,400 acft/yr of supply beginning in 2000.
- Canyon Reservoir (G-24) to be implemented in 2000. This project can provide an additional 1,048 acft/yr of supply beginning in 2000, decreasing to 648 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2020 and 2030. This project can provide an additional 1,100 acft/yr of supply in 2030, increasing to 2,000 acft/yr of additional supply in 2040, then decreasing to 1,500 acft/yr of additional supply in 2050.

Table 5.3.12-10.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	3,958	5,035	5,625	6,704	7,644	6,714
Recommended Plan						
Hays/IH35 Water Supply Project (HIH35WSP)	4,400	4,400	4,400	4,400	4,400	4,400
Canyon Reservoir (G-24)	1,048	1,048	1,048	1,048	1,048	648
Colorado River Diversion Option (LCRA)				1,100	2,000	1,500
Total New Supply	5,448	5,448	5,448	6,548	7,448	6,548

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.12-11.

Table 5.3.12-11.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Hays/IH 35 Water Supply Project (HIH35WSP)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Canyon Reservoir (G-24)						
Annual Cost ($/yr)	$1,439,952	1,439,952	$1,444,144	$800,829	$800,829	$495,169
Unit Cost ($/acft)	$1,374	$1,374	$1,378	$764	$764	$764
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)				$1,310,059	$2,040,880	$1,644,035
Unit Cost ($/acft)				$1,191	$1,020	$1,096

[1] This project is currently underway with existing funds, therefore no cost has been projected.

5.3.12.6 *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.

5.3.12.7 *Steam-Electric Power*

Steam-electric power is projected to have adequate water supplies available from Canyon Reservoir and reclaimed sources to meet the water user group's projected demand during the planning period.

5.3.12.8 *Mining*

Mining's current water supply is obtained from the Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Hays/IH35 Water Supply Project (HIH35WSP)

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 need for mining (Table 5.3.12-12).

- Hays/IH35 Water Supply Project to be implemented in 2000. This project can provide an additional 100 acft/yr of supply beginning in 2000.

Table 5.3.12-12.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	84	82	68	55	37	28
Recommended Plan						
Hays/IH35 Water Supply Project (HIH35WSP)	100	100	100	100	100	100
Total New Supply	100	100	100	100	100	100

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.12-13.

Table 5.3.12-13.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Hays/IH35 Water Supply Project (HIH35WSP)						
Annual Cost ($/yr)	$66,300	$66,100	$63,900	$62,900	$62,300	$62,300
Unit Cost ($/acft)	$663	$661	$639	$629	$623	$623

5.3.12.9 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.

5.3.12.10 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.

5.3.13 Karnes County Water Supply Plan

Table 5.3.13-1 lists each water user group in Karnes County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.13-1. Karnes County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Karnes City	556	509	Projected surplus
City of Kenedy	369	285	Projected surplus
City of Runge	272	255	Projected surplus
Rural Area Residential and Commercial	64	0	Projected surplus
Industrial	43	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	0	0	No projected surplus/shortage
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-13, Section 4.1 – Water Needs Projections by Water User Group.

5.3.13.1 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 demand 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 5.3.13-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 29 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.13-2.
Recommended Water Supply Plan for the City of Karnes City

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	29	29	29	0	0	0
Total New Supply	29	29	29	0	0	0

The costs of the recommended plan for the City of Karnes City are shown in Table 5.3.13-3.

Table 5.3.13-3.
Recommended Plan Costs by Decade for the City of Karnes City

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$11,513	$11,513	$11,513	$0	$0	$0
Unit Cost ($/acft)	$397	$397	$397	$0	$0	$0

5.3.13.2 City of Kenedy

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

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Kenedy implement the following water supply plan (Table 5.3.13-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 37 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.13-4.
Recommended Water Supply Plan for the City of Kenedy

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	37	37	37	0	0	0
Total New Supply	37	37	37	0	0	0

The costs of the recommended plan for the City of Kenedy are shown in Table 5.3.13-5.

Table 5.3.13-5.
Recommended Plan Costs by Decade for the City of Kenedy

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$14,689	$14,689	$14,689	$0	$0	$0
Unit Cost ($/acft)	$397	$397	$397	$0	$0	$0

5.3.13.3 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 demand 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 5.3.13-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 11 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.13-6.
Recommended Water Supply Plan for the City of Runge

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	11	11	11	0	0	0
Total New Supply	11	11	11	0	0	0

The costs of the recommended plan for the City of Runge are shown in Table 5.3.13-7.

Table 5.3.13-7.
Recommended Plan Costs by Decade for the City of Runge

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,367	$4,367	$4,367	$0	$0	$0
Unit Cost ($/acft)	$397	$397	$397	$0	$0	$0

5.3.13.4 Rural Area Residential and Commercial

The rural area of Karnes County 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.

5.3.13.5 Industrial

Industrial 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.

5.3.13.6 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.

5.3.13.7 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.

5.3.13.8 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.

5.3.13.9 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.

5.3.14 Kendall County Water Supply Plan

Table 5.3.14-1 lists each water user group in Kendall County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.14-1.
Kendall County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Boerne	-974	-2,528	Projected shortage – see plan below
City of Comfort	387	356	Projected surplus
City of Fair Oaks Ranch			See Bexar County
Rural Area Residential and Commercial	-3,811	-6,847	Projected shortage – see plan below
Industrial	-4	-6	Projected shortage – see plan below
Steam-Electric Power	0	0	No projected demand
Mining	1	0	Projected surplus
Irrigation	30	30	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-14, Section 4.1 – Water Needs Projections by Water User Group.

5.3.14.1 City of Boerne

The City of Boerne's current water supply is obtained from the Trinity Aquifer and Cibolo Creek at Boerne Lake. The City of Boerne is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Western Canyon Regional Water Supply Project
- Purchase Water from Major Provider

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Boerne implement the following water supply plan to meet the projected need for the city (Table 5.3.14-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 42 acft/yr of supply in 2000, decreasing to 0 acft/yr in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,861 acft/yr of supply beginning in 2000.
- Purchase Water from Major Provider, such as the Regional Water Provider for Bexar County, to obtain additional supplies of 1,000 acft/yr in 2050.

Table 5.3.14-2.
Recommended Water Supply Plan for the City of Boerne

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	34	486	493	974	1,587	2,528
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	42	42	42	0	0	0
Western Canyon Regional Water Supply Project	1,861	1,861	1,861	1,861	1,861	1,861
Purchase Water from Major Provider						1,000
Total New Supply	1,903	1,903	1,903	1,861	1,861	2,861

The costs of the recommended plan to meet the City of Boerne's projected need are shown in Table 5.3.14-3.

Table 5.3.14-3.
Recommended Plan Costs by Decade for the City of Boerne

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$16,340	$16,340	$16,340	$0	$0	$0
Unit Cost ($/acft)	$389	$389	$389	$0	$0	$0
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Purchase Water from Major Provider						
Annual Cost ($/yr)	$549,000	$549,000	$549,000			$328,000
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]			$328

[1] This project is currently under development with existing funds, therefore costs not included.
[2] Reflects early participation in a project to ensure future needs are met.

5.3.14.2 City of Comfort

The City of Comfort is projected to have adequate water supplies available from the Edwards-Trinity Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Comfort implement the following water supply plan (Table 5.3.14-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 17 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.14-4.
Recommended Water Supply Plan for the City of Comfort

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	17	17	17	0	0	0
Total New Supply	17	17	17	0	0	0

The costs of the recommended plan for the City of Comfort are shown in Table 5.3.14-5.

Table 5.3.14-5.
Recommended Plan Costs by Decade for the City of Comfort

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$6,614	$6,614	$6,614	$0	$0	$0
Unit Cost ($/acft)	$389	$389	$389	$0	$0	$0

5.3.14.3 City of Fair Oaks Ranch (See Bexar County)

5.3.14.4 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Trinity Aquifer and the Edwards-Trinity Aquifer. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the projected need for rural areas:

- Purchase Water from Major Provider

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 need for rural areas (Table 5.3.14-6).

- Purchase Water from Major Provider, such as the Regional Water Provider for Bexar County, to be implemented in 2000 that can provide an additional 1,990 acft/yr of supply in 2000, increasing to 6,990 acft/yr of additional supply in 2050.

Table 5.3.14-6.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	1,070	1,539	2,808	4,099	5,578	6,847
Recommended Plan						
Purchase Water from Major Provider	1,990	1,990	2,990	4,990	5,990	6,990
Total New Supply	1,990	1,990	2,990	4,990	5,990	6,990

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.14-7.

Table 5.3.14-7.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Purchase Water from Major Provider						
Annual Cost ($/yr)	$4,490,230	$4,490,230	$4,818,230	$1,636,720	$1,964,720	$2,292,720
Unit Cost ($/acft)	$2,256	$2,256	$1,611	$328	$328	$328

5.3.14.5 Industrial

Industrial's current water supply is obtained from the Trinity Aquifer. Industrial is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the industrial projected need:

- Purchase Water from Major Provider

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 need for industrial (Table 5.3.14-8).

- Purchase Water from Major Provider, such as the Regional Water Provider for Bexar County, to be implemented in 2000 that can provide an additional 10 acft/yr of supply beginning in 2000.

Table 5.3.14-8.
Recommended Water Supply Plan for Industrial

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	2	3	4	4	5	6
Recommended Plan						
Purchase Water from Major Provider	10	10	10	10	10	10
Total New Supply	10	10	10	10	10	10

The costs of the recommended plan to meet the industrial projected need are shown in Table 5.3.14-9.

Table 5.3.14-9.
Recommended Plan Costs by Decade for Industrial

Plan Element	2000	2010	2020	2030	2040	2050
Purchase Water from Major Provider						
Annual Cost ($/yr)	$8,770	$8,770	$8,770	$3,280	$3,280	$3,280
Unit Cost ($/acft)	$877	$877	$877	$328	$328	$328

5.3.14.6 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.

5.3.14.7 Mining

Mining is projected to have adequate water supplies available from the Edwards-Trinity Aquifer and Trinity Aquifer to meet the water user group's projected demand during the planning period.

5.3.14.8 Irrigation

Irrigation is projected to have adequate water supplies available from the Edwards-Trinity Aquifer, Trinity Aquifer, and run-of-river rights to meet the water user group's projected demand during the planning period.

5.3.14.9 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.

5.3.15 LaSalle County Water Supply Plan

Table 5.3.15-1 lists each water user group in LaSalle County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.15-1.
LaSalle County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Cotulla	278	208	Projected surplus
City of Encinal	53	60	Projected surplus
Rural Area Residential and Commercial	6	5	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected demand
Irrigation	0	0	No projected surplus/shortage
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-15, Section 4.1 – Water Needs Projections by Water User Group.

5.3.15.1 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 demand 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 5.3.15-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 70 acft/yr beginning in year 2000, increasing to 83 acft/yr of supply in 2050 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.15-2.
Recommended Water Supply Plan for the City of Cotulla

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	70	74	78	43	81	83
Total New Supply	70	74	78	43	81	83

The costs of the recommended plan for the City of Cotulla are shown in Table 5.3.15-3.

Table 5.3.15-3.
Recommended Plan Costs by Decade for the City of Cotulla

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$19,268	$19,268	$19,268	$4,868	$4,868	$4,868
Unit Cost ($/acft)	$275	$260	$247	$113	$60	$59

5.3.15.2 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 demand 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 5.3.15-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 6 acft/yr beginning year 2000, decreasing to 0 acft/yr of supply in 2030. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.15-4.
Recommended Water Supply Plan for the City of Encinal

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	6	6	6	0	0	0
Total New Supply	6	6	6	0	0	0

The costs of the recommended plan for the City of Encinal are shown in Table 5.3.15-5.

Table 5.3.15-5.
Recommended Plan Costs by Decade for the City of Encinal

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$2,400	$2,400	$2,400	$0	$0	$0
Unit Cost ($/acft)	$400	$400	$400	$0	$0	$0

5.3.15.3 Rural Area Residential and Commercial

The rural area of LaSalle County 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.

5.3.15.4 Industrial

There is no projected industrial water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

5.3.15.5 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.

5.3.15.6 Mining

There is no projected mining water demand in LaSalle County, therefore no water management strategies are recommended for this water user group.

5.3.15.7 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.

5.3.15.8 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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5.3.16 Medina County Water Supply Plan

Table 5.3.16-1 lists each water user group in Medina County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.16-1.
Medina County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Castroville	-331	-393	Projected shortage – see plan below
City of Devine	-677	-718	Projected shortage – see plan below
City of Hondo	-1,154	-1,284	Projected shortage – see plan below
City of La Coste	-195	-234	Projected shortage – see plan below
City of Lytle			See Atascosa County
City of Natalia	70	46	Projected surplus
Rural Area Residential and Commercial	196	-70	Projected shortage – see plan below
Industrial	464	414	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	-72	-76	Projected shortage – see plan below
Irrigation	-65,382	-55,006	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-16, Section 4.1 – Water Needs Projections by Water User Group.

5.3.16.1 City of Castroville

The City of Castroville's current water supply is obtained from the Edwards Aquifer. The City of Castroville is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Castroville implement the following water supply plan to meet the projected need for the city (Table 5.3.16-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 43 acft/yr of supply in 2000, decreasing to 30 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 400 acft/yr of supply from 2000 to 2050.

Table 5.3.16-2.
Recommended Water Supply Plan for the City of Castroville

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	228	255	283	331	362	393
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	43	45	48	28	29	30
Edwards Irrigation Transfers (L-15)	400	400	400	400	400	400
Total New Supply	443	445	448	428	429	430

The costs of the recommended plan to meet the City of Castroville's projected need are shown in Table 5.316-3.

Table 5.3.16-3.
Recommended Plan Costs by Decade for the City of Castroville

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$15,111	$15,152	$15,360	$7,435	$7,495	$7,455
Unit Cost ($/acft)	$351	$337	$320	$266	$258	$249
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$37,647	$37,647	$37,647	$37,647	$37,647	$37,647
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.2 City of Devine

The City of Devine's current water supply is obtained from the Edwards Aquifer. The City of Devine is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Divine implement the following water supply plan to meet the projected need for the city (Table 5.3.16-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 76 acft/yr of supply in 2000, decreasing to an additional 48 acft/yr of supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 800 acft/yr of supply from 2000 through 2050.

Table 5.3.16-4.
Recommended Water Supply Plan for the City of Devine

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	666	656	653	677	700	718
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	76	79	82	45	46	48
Edwards Irrigation Transfers (L-15)	800	800	800	800	800	800
Total New Supply	876	879	882	845	846	848

The costs of the recommended plan to meet the City of Devine's projected need are shown in Table 5.3.16-5.

Table 5.3.16-5.
Recommended Plan Costs by Decade for the City of Devine

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$26,796	$26,755	$26,547	$11,948	$11,888	$11,928
Unit Cost ($/acft)	$353	$339	$324	$266	$258	$249
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$75,294	$75,294	$75,294	$75,294	$75,294	$75,294
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.3 City of Hondo

The City of Hondo's current water supply is obtained from the Edwards Aquifer. The City of Hondo is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Hondo implement the following water supply plan to meet the projected need for the city (Table 5.3.16-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 59 acft/yr of supply in 2000, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 1,300 acft/yr of supply from 2000 through 2050.

Table 5.3.16-6.
Recommended Water Supply Plan for the City of Hondo

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	923	983	1,055	1,154	1,218	1,284
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	59	59	59	0	0	0
Edwards Irrigation Transfers (L-15)	1,300	1,300	1,300	1,300	1,300	1,300
Total New Supply	1,359	1,359	1,359	1,300	1,300	1,300

The costs of the recommended plan to meet the City of Hondo's projected need are shown in Table 5.3.16-7.

Table 5.3.16-7.
Recommended Plan Costs by Decade for the City of Hondo

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$22,148	$22,148	$22,148	$0	$0	$0
Unit Cost ($/acft)	$375	$375	$375	$0	$0	$0
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$122,352	$122,352	$122,352	$122,352	$122,352	$122,352
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.4 City of La Coste

The City of La Coste's current water supply is obtained from the Edwards Aquifer. The City of La Coste is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of La Coste implement the following water supply plan to meet the projected need for the city (Table 5.3.16-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 10 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 300 acft/yr of supply from 2000 through 2050.

Table 5.3.16-8.
Recommended Water Supply Plan for the City of La Coste

	2000 (acft/yr)	*2010 (acft/yr)*	*2020 (acft/yr)*	*2030 (acft/yr)*	*2040 (acft/yr)*	*2050 (acft/yr)*
Projected Need (Shortage)	147	168	169	195	214	234
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	10	10	10	0	0	0
Edwards Irrigation Transfers (L-15)	300	300	300	300	300	300
Total New Supply	310	310	310	300	300	300

The costs of the recommended plan to meet the City of La Coste's projected need are shown in Table 5.3.16-9.

Table 5.3.16-9.
Recommended Plan Costs by Decade for the City of La Coste

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$3,754	$3,754	$3,754	$0	$0	$0
Unit Cost ($/acft)	$375	$375	$375	$0	$0	$0
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$28,236	$28,236	$28,236	$28,236	$28,236	$28,236
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.5 City of Lytle (See Atascosa County)

5.3.16.6 City of Natalia

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

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Natalia implement the following water supply plan (Table 5.316-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 12 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.16-10.
Recommended Water Supply Plan for the City of Natalia

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	12	12	12	0	0	0
Total New Supply	12	12	12	0	0	0

The costs of the recommended plan for the City of Natalia are shown in Table 5.3.16-11.

Table 5.3.16-11.
Recommended Plan Costs by Decade for the City of Natalia

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,505	$4,505	$4,505	$0	$0	$0
Unit Cost ($/acft)	$375	$375	$375	$0	$0	$0

5.3.16.7 Rural Area Residential and Commercial

Rural area's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, and Trinity Aquifer. Rural areas are projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the projected need for rural areas:

- Edwards Irrigation Transfers (L-15)

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 need for rural areas (Table 5.3.16-12).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 100 acft/yr of supply from 2000 through 2050.

Table 5.3.16-12.
Recommended Water Supply Plan for Rural Areas

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	23	39	70
Recommended Plan						
Edwards Irrigation Transfers (L-15)	100	100	100	100	100	100
Total New Supply	100	100	100	100	100	100

The costs of the recommended plan to meet rural area's projected need are shown in Table 5.3.16-13.

Table 5.3.16-13.
Recommended Plan Costs by Decade for Rural Areas

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$9,412	$9,412	$9,412	$9,412	$9,412	$9,412
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.8 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.

5.3.16.9 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.

5.3.16.10 Mining

Mining's current water supply is obtained from the Carrizo Aquifer and Trinity Aquifer. Mining is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the mining projected need:

- Edwards Irrigation Transfers (L-15)

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 need for mining (Table 5.3.16-14).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 100 acft/yr of supply from 2000 through 2050.

Table 5.3.16-14.
Recommended Water Supply Plan for Mining

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	68	68	70	72	74	76
Recommended Plan						
Edwards Irrigation Transfers (L-15)	100	100	100	100	100	100
Total New Supply	100	100	100	100	100	100

The costs of the recommended plan to meet the mining projected need are shown in Table 5.3.16-15.

Table 5.3.16-15.
Recommended Plan Costs by Decade for Mining

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$9,412	$9,412	$9,412	$9,412	$9,412	$9,412
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.16.11 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Medina County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.16-16).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 5,000 acft/yr of supply.

Table 5.3.16-16.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	78,206	72,360	66,580	65,382	60,082	55,006
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	5,000	5,000	5,000	5,000	5,000	5,000
Total New Supply	5,000	5,000	5,000	5,000	5,000	5,000

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.16-17.

Table 5.3.16-17.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$181,650	$181,650	$181,650	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0

5.3.16.12 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.

5.3.17 Refugio County Water Supply Plan

Table 5.3.17-1 lists each water user group in Refugio County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.17-1. Refugio County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Refugio	1,291	1,306	Projected surplus
City of Woodsboro	170	180	Projected surplus
Rural Area Residential and Commercial	66	89	Projected surplus
Industrial	0	0	No projected demand
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	0	0	No projected demand
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-17, Section 4.1 – Water Needs Projections by Water User Group.

5.3.17.1 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 demand 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 5.3.17-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 31 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.17-2.
Recommended Water Supply Plan for the City of Refugio

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	31	31	31	0	0	0
Total New Supply	31	31	31	0	0	0

The costs of the recommended plan for the City of Refugio are shown in Table 5.3.17-3.

Table 5.3.17-3.
Recommended Plan Costs by Decade for the City of Refugio

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$13,919	$13,919	$13,919	$0	$0	$0
Unit Cost ($/acft)	$449	$449	$449	$0	$0	$0

5.3.17.2 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 demand 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 5.3.17-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 17 acft/yr of supply, decreasing to 0 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.17-4.
Recommended Water Supply Plan for the City of Woodsboro

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	17	17	17	0	0	0
Total New Supply	17	17	17	0	0	0

The costs of the recommended plan for the City of Woodsboro are shown in Table 5.3.17-5.

Table 5.3.17-5.
Recommended Plan Costs by Decade for the City of Woodsboro

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,633	$7,633	$7,633	$0	$0	$0
Unit Cost ($/acft)	$449	$449	$449	$0	$0	$0

5.3.17.3 Rural Area Residential and Commercial

The rural area of Refugio County 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.

5.3.17.4 Industrial

There is no projected industrial water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

5.3.17.5 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.

5.3.17.6 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.

5.3.17.7 Irrigation

There is no projected irrigation water demand in Refugio County, therefore no water management strategies are recommended for this water user group.

5.3.17.8 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.

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5.3.18 Uvalde County Water Supply Plan

Table 5.3.18-1 lists each water user group in Uvalde County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.18-1. Uvalde County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Sabinal	-369	-476	Projected shortage – see plan below
City of Uvalde	-3,872	-5,133	Projected shortage – see plan below
Rural Area Residential and Commercial	250	366	Projected surplus
Industrial	410	293	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	-36,274	-27,383	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-18, Section 4.1 – Water Needs Projections by Water User Group.

5.3.18.1 City of Sabinal

The City of Sabinal's current water supply is obtained from the Edwards Aquifer. The City of Sabinal is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Sabinal implement the following water supply plan to meet the projected need for the city (Table 5.3.18-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 31 acft/yr of supply in 2000, decreasing to 26 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 500 acft/yr beginning in the year 2000 through 2050.

Table 5.3.18-2.
Recommended Water Supply Plan for the City of Sabinal

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	247	283	310	369	420	476
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	31	34	36	22	24	26
Edwards Irrigation Transfers (L-15)	500	500	500	500	500	500
Total New Supply	531	534	536	522	524	526

The costs of the recommended plan to meet the City of Sabinal's projected need are shown in Table 5.3.18-3.

Table 5.3.18-3.
Recommended Plan Costs by Decade for the City of Sabinal

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$8,364	$8,392	$8,342	$2,287	$2,272	$2,244
Unit Cost ($/acft)	$270	$247	$232	$104	$95	$86
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$47,060	$47,060	$47,060	$47,060	$47,060	$47,060
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.18.2 City of Uvalde

The City of Uvalde's current water supply is obtained from the Edwards Aquifer. The City of Uvalde is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Edwards Irrigation Transfers (L-15)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Uvalde implement the following water supply plan to meet the projected need for the city (Table 5.3.18-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 286 acft/yr of supply in 2000, declining to 257 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide additional supplies of 2,500 acft/yr 2000, 3,500 acft/yr in 2010 and 2020, 4,500 acft/yr in 2030 and 2040, and 5,500 acft/yr in 2050.

Table 5.3.18-4.
Recommended Water Supply Plan for the City of Uvalde

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	2,435	2,883	3,183	3,872	4,460	5,133
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	286	312	335	213	234	257
Edwards Irrigation Transfers (L-15)	2,500	3,500	3,500	4,500	4,500	5,000
Total New Supply	2,786	3,812	3,835	4,713	4,734	5,257

The costs of the recommended plan to meet the City of Uvalde's projected need are shown in Table 5.3.18-5.

Table 5.3.18-5.
Recommended Plan Costs by Decade for the City of Uvalde

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$76,596	$76,568	$76,618	$0	$0	$0
Unit Cost ($/acft)	$268	$245	$229	$0	$0	$0
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$235,300	$329,420	$329,420	$423,540	$423,540	$470,600
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80

5.3.18.3 Rural Area Residential and Commercial

The rural area of Uvalde County is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Edwards-Trinity Aquifer, and Trinity Aquifer to meet the water user group's projected demand during the planning period.

5.3.18.4 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.

5.3.18.5 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.

5.3.18.6 Mining

Mining is projected to have adequate water supplies available from the Carrizo Aquifer, Edwards-Trinity Aquifer, and Trinity Aquifer to meet the water user group's projected demand during the planning period.

5.3.18.7 Irrigation

Irrigation's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Edwards-Trinity (Plateau) Aquifer, Trinity Aquifer, and run-of-river rights. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Uvalde County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.18-6).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 5,958 acft/yr of supply.

Table 5.3.18-6.
Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	48,551	43,250	38,253	36,274	31,674	27,383
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	5,958	5,958	5,958	5,958	5,958	5,958
Total New Supply	5,958	5,958	5,958	5,958	5,958	5,958

The costs of the recommended plan to meet the irrigation projected need are shown in Table 5.3.18-7.

Table 5.3.18-7.
Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$216,454	$216,454	$216,454	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0

5.3.18.8 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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5.3.19 Victoria County Water Supply Plan

Table 5.3.19-1 lists each water user group in Victoria County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.19-1.
Victoria County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Bloomington	249	192	Projected surplus
City of Victoria	2,438	819	Projected surplus
Rural Area Residential and Commercial	262	0	Projected surplus
Industrial	8,462	0	Projected surplus
Steam-Electric Power	0	0	No projected surplus/shortage
Mining	0	0	No projected surplus/shortage
Irrigation	162	162	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-19, Section 4.1 – Water Needs Projections by Water User Group.

5.3.19.1 City of Bloomington

The City of Bloomington is projected to have adequate water supplies available from the Gulf Coast Aquifer to meet the city's projected demand during the planning period.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Bloomington implement the following water supply plan (Table 5.3.19-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 19 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.19-2.
Recommended Water Supply Plan for the City of Bloomington

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	19	19	19	0	0	0
Total New Supply	19	19	19	0	0	0

The costs of the recommended plan for the City of Bloomington are shown in Table 5.3.19-3.

Table 5.3.19-3.
Recommended Plan Costs by Decade for the City of Bloomington

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$7,683	$7,683	$7,683	$0	$0	$0
Unit Cost ($/acft)	$404	$404	$404	$0	$0	$0

5.3.19.2 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 demand 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 5.3.19-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 543 acft/yr beginning in year 2000, decreasing to 0 acft/yr of supply in 2030 (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Purchase Water from Major Provider to be implemented in 2000. This project can supply an additional 1,240 acft/yr beginning in 2000.

Table 5.3.19-4.
Recommended Water Supply Plan for the City of Victoria

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	543	543	543	0	0	0
Purchase Water from Major Provider	1,240	1,240	1,240	1,240	1,240	1,240
Total New Supply	1,783	1,783	1,783	1,240	1,240	1,240

The costs of the recommended plan for the City of Victoria are shown in Table 5.3.19-5.

Table 5.3.19-5.
Recommended Plan Costs by Decade for the City of Victoria

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$219,577	$219,577	$219,577	$0	$0	$0
Unit Cost ($/acft)	$404	$404	$404	$0	$0	$0
Purchase Water from Major Provider						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]

[1] This project is currently underway with existing funds, therefore no cost has been projected.

5.3.19.3 Rural Area Residential and Commercial

The rural area of Victoria County 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.

5.3.19.4 Industrial

Industrial 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.

5.3.19.5 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.

5.3.19.6 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.

5.3.19.7 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.

5.3.19.8 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.

5.3.20 Wilson County Water Supply Plan

Table 5.3.20-1 lists each water user group in Wilson County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.20-1.
Wilson County Surplus/Shortage

Water User Group	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
City of Floresville	15	-145	Projected shortage – see plan below
City of La Vernia	141	109	Projected surplus
City of Poth	1,495	1,417	Projected surplus
City of Stockdale	980	924	Projected surplus
Rural Area Residential and Commercial	2,844	0	Projected surplus
Industrial	35	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	169	169	Projected surplus
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-20, Section 4.1 – Water Needs Projections by Water User Group.

5.3.20.1 City of Floresville

The City of Floresville's current water supply is obtained from the Carrizo Aquifer. The City of Floresville is projected to need additional water supplies beginning in the planning year 2040. The following options were considered to meet the city's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Local Supply (SCTN-2a)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Floresville implement the following water supply plan to meet the projected need for the city (Table 5.3.20-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 101 acft/yr of supply in 2000, decreasing to 75 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Local Supply (SCTN-2a) to be implemented in 2040. This project can provide an additional 200 acft/yr of supply in 2040 and 2050.

Table 5.3.20-2.
Recommended Water Supply Plan for the City of Floresville

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	63	145
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	101	108	114	66	70	75
Carrizo Aquifer – Local Supply (SCTN-2a)					200	200
Total New Supply	101	108	114	66	270	275

The costs of the recommended plan to meet the City of Floresville's projected need are shown in Table 5.3.20-3.

Table 5.3.20-3.
Recommended Plan Costs by Decade for the City of Floresville

Plan Element	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$26,216	$26,216	$26,235	$6,872	$6,867	$6,848
Unit Cost ($/acft)	$260	$243	$230	$104	$98	$91
Carrizo Aquifer – Local Supply (SCTN-2a)						
Annual Cost ($/yr)					$110,000	$110,000
Unit Cost ($/acft)					$550	$550

5.3.20.2 City of La Vernia

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

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of La Vernia implement the following water supply plan (Table 5.3.20-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 14 acft/yr of supply, decreasing to 11 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.20-4.
Recommended Water Supply Plan for the City of La Vernia

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	14	15	15	9	10	11
Total New Supply	14	15	15	9	10	11

The costs of the recommended plan for the City of La Vernia are shown in Table 5.3.20-5.

Table 5.3.20-5.
Recommended Plan Costs by Decade for the City of La Vernia

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$3,586	$3,586	$3,493	$937	$981	$1,004
Unit Cost ($/acft)	$256	$239	$233	$104	$98	$91

5.3.20.3 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 demand 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 5.3.20-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 32 acft/yr of supply, decreasing to 25 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.20-6.
Recommended Water Supply Plan for the City of Poth

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	32	34	36	22	23	25
Total New Supply	32	34	36	22	23	25

The costs of the recommended plan for the City of Poth are shown in Table 5.3.20-7.

Table 5.3.20-7.
Recommended Plan Costs by Decade for the City of Poth

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$8,197	$8,162	$8,176	$2,291	$2,256	$2,283
Unit Cost ($/acft)	$256	$240	$227	$104	$98	$91

5.3.20.4 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 demand 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 5.3.20-8).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 24 acft/yr of supply, decreasing to 19 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.20-8.
Recommended Water Supply Plan for the City of Stockdale

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	24	26	28	17	18	19
Total New Supply	24	26	28	17	18	19

The costs of the recommended plan for the City of Stockdale are shown in Table 5.3.20-9.

Table 5.3.20-9.
Recommended Plan Costs by Decade for the City of Stockdale

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$6,148	$6,183	$6,244	$1,770	$1,766	$1,735
Unit Cost ($/acft)	$256	$238	$223	$104	$98	$91

5.3.20.5 Rural Area Residential and Commercial

The rural area of Wilson County is projected to have adequate water supplies available from the Edwards Aquifer, Carrizo Aquifer, Sparta Aquifer, and Queen City Aquifer to meet the water user group's projected demand during the planning period.

5.3.20.6 Industrial

Industrial 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.

5.3.20.7 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.

5.3.20.8 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.

5.3.20.9 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.

5.3.20.10 Livestock

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

5.3.21 Zavala County Water Supply Plan

Table 5.3.21-1 lists each water user group in Zavala County and their corresponding surplus or shortage in years 2030 and 2050. 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 5.3.21-1. Zavala County Surplus/Shortage

Water User Group	Surplus/Shortage[1]		Comment
	2030 (acft/yr)	2050 (acft/yr)	
City of Batesville	385	380	Projected surplus
City of Crystal City	1,979	1,979	Projected surplus
City of La Pryor	682	694	Projected surplus
Rural Area Residential and Commercial	275	0	Projected surplus
Industrial	272	0	Projected surplus
Steam-Electric Power	0	0	No projected demand
Mining	0	0	No projected surplus/shortage
Irrigation	-88,293	-81,200	Projected shortage – see plan below
Livestock	0	0	No projected surplus/shortage

[1] From Table 4-21, Section 4.1 – Water Needs Projections by Water User Group.

5.3.21.1 City of Batesville

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

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of Batesville implement the following water supply plan (Table 5.3.21-2).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 13 acft/yr of supply. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.21-2.
Recommended Water Supply Plan for the City of Batesville

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	13	13	13	0	0	0
Total New Supply	13	13	13	0	0	0

The costs of the recommended plan for the City of Batesville are shown in Table 5.3.21-3.

Table 5.3.21-3.
Recommended Plan Costs by Decade for the City of Batesville

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$4,277	$4,277	$4,277	$0	$0	$0
Unit Cost ($/acft)	$329	$329	$329	$0	$0	$0

5.3.21.2 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 demand 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 5.3.21-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 154 acft/yr of supply, decreasing to 83 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.21-4.
Recommended Water Supply Plan for the City of Crystal City

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	154	157	159	81	82	83
Total New Supply	154	157	159	81	82	83

The costs of the recommended plan for the City of Crystal City are shown in Table 5.3.21-5.

Table 5.3.21-5.
Recommended Plan Costs by Decade for the City of Crystal City

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$36,019	$36,063	$36,200	$9,695	$9,706	$9,716
Unit Cost ($/acft)	$234	$230	$228	$120	$118	$117

5.3.21.3 City of La Pryor

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

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of La Pryor implement the following water supply plan (Table 5.3.21-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 23 acft/yr of supply, decreasing to 8 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).

Table 5.3.21-6.
Recommended Water Supply Plan for the City of La Pryor

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	0	0	0	0	0	0
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun)	23	23	23	8	8	8
Total New Supply	23	23	23	8	8	8

The costs of the recommended plan for the City of La Pryor are shown in Table 5.3.21-7.

Table 5.3.21-7.
Recommended Plan Costs by Decade for the City of La Pryor

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun)						
Annual Cost ($/yr)	$5,560	$5,516	$5,379	$958	$947	$937
Unit Cost ($/acft)	$242	$240	$245	$120	$118	$117

5.3.21.4 Rural Area Residential and Commercial

The rural area of Zavala County is projected to have adequate water supplies available from the Carrizo Aquifer to meet the city's projected demand during the planning period.

5.3.21.5 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.

5.3.21.6 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.

5.3.21.7 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.

5.3.21.8 Irrigation

Irrigation's current water supply is obtained from the Carrizo Aquifer. Irrigation is projected to need additional water supplies in the planning year 2000. The following options were considered to meet the irrigation projected need:

- Demand Reduction (Conservation) (L-10 Irr.) (See Section 6, Supplement 2)

Working within the planning criteria established by the SCTRWPG and the TWDB, it has been found that it is not economically feasible to meet all of the projected irrigation needs at this time, since the cost of the water management strategies with enough water supply to meet the needs far exceeds the ability of irrigators to pay for the water. However, the irrigation water conservation option will meet a part of the projected irrigation needs in Zavala County where further irrigation conservation opportunity exists. It is recommended that individual irrigators implement the following water supply plan to meet a portion of the projected need for irrigation (Table 5.3.21-8).

- Demand Reduction (Conservation) to be implemented in 2000. This project can provide an additional 6,401 acft/yr of supply.

Table 5.3.21-8. Recommended Water Supply Plan for Irrigation

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need (Shortage)	80,722	76,589	72,655	88,293	84,673	81,200
Recommended Plan						
Demand Reduction (Conservation) (L-10 Irr.)	6,401	6,401	6,401	6,401	6,401	6,401
Total New Supply	6,401	6,401	6,401	6,401	6,401	6,401

The costs of the recommended plan to meet the projected irrigation need are shown in Table 5.3.21-9.

Table 5.3.21-9. Recommended Plan Costs by Decade for Irrigation

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Irr.)						
Annual Cost ($/yr)	$497,102	$497,102	$497,102	$0	$0	$0
Unit Cost ($/acft)	$78	$78	$78	$0	$0	$0

5.3.21.9 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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5.4 Water Supply Plans for Major Water Providers

Table 5.4-1 lists each Major Water Provider identified by the SCTRWPG and their corresponding surplus or shortage in years 2030 and 2050. For each Major Water Provider with a projected shortage, or need, a water supply plan has been developed and is presented in the following subsections.

Table 5.4-1.
Major Water Provider Surplus/Shortage

Major Water Provider	Surplus/Shortage[1] 2030 (acft/yr)	Surplus/Shortage[1] 2050 (acft/yr)	Comment
San Antonio Water System (SAWS)	-200,668	-281,219	Projected shortage – see plan below
Bexar Metropolitan Water District (BMWD)	-32,434	-44,010	Projected shortage – see plan below
Canyon Regional Water Authority (CRWA)	-3,449	-6,331	Projected shortage – see plan below
Guadalupe-Blanco River Authority (GBRA)	113,365	115,435	Projected surplus
New Braunfels Utilities (NBU)	-10,135	-17,365	Projected shortage – see plan below
City of San Marcos	-11,092	-23,606	Projected shortage – see plan below

[1] From Table 4-23, Section 4.2 – Water Needs Projections by Major Water Provider

5.4.1 Regional Water Provider(s) 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 more 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(s) for Bexar County is employed. Designation of Regional Water Provider(s) 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 major 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 beginning in the year 2000. The management strategies listed in Table 5.3.2-2, as well as several variations of these options, were considered to meet the county's projected need.

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the Regional Water Provider(s) for Bexar County implement the following water supply plan to meet the projected need for the portions of the county (Table 5.4-2).

- Edwards Irrigation Transfers (L-15) to be implemented in 2000. This project can provide an additional 25,000 acft/yr of supply in 2000, increasing to 32,986 acft/yr of additional supply in 2050.
- Demand Reduction (Conservation) (L-10 Irr.) to be implemented in 2000. This project can provide an additional 27,314 acft/yr of additional supply from 2000 through 2050.
- Carrizo Aquifer – Wilson & Gonzales (CZ-10C) to be implemented in 2000. This project can provide an additional 16,000 acft/yr of supply from 2000 through 2050.
- Lower Guadalupe River Diversion (SCTN-16) to be implemented in 2010. This project can provide an additional 94,500 acft/yr of supply.
- Edwards Recharge – Type 2 Projects (L-18a) to be implemented in 2010. This project can provide an additional 13,451 acft/yr of supply in 2010, increasing to 21,577 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2020. This project can provide an additional 66,000 acft/yr of supply in 2020, increasing to 132,000 acft/yr of additional supply in 2050.
- Desalination of Seawater – 75 MGD (SCTN-17) to be implemented in 2040. This project can provide an additional 56,008 acft/yr in 2040 and 84,012 acft/yr of additional supply in 2050.
- Brush Management
- Weather Modification
- Rainwater Harvesting
- Additional Municipal Recycling (Reuse) Programs
- Small Aquifer Recharge Dams
- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.4-2.
Recommended Water Supply Plan for the Regional Water Provider(s) for Bexar County

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Recommended Plan						
Edwards Irrigation Transfers (L-15)	25,000	32,986	32,986	32,986	32,986	32,986
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.	27,314	27,314	27,314	27,314	27,314	27,314
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)	16,000	16,000	16,000	16,000	16,000	16,000
Lower Guadalupe River Diversions (SCTN-16)		94,500	94,500	94,500	94,500	94,500
Edwards Recharge – Type 2 Projects (L-18a)		13,451	21,577	21,577	21,577	21,577
Colorado River Diversion Option (LCRA)			66,000	132,000	132,000	132,000
Desalination of Seawater – 75 MGD (SCTN-17)					56,008	84,012
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[1]						
Total New Supply	68,314	184,251	258,377	324,377	380,385	408,389

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan for the Regional Water Provider for Bexar County are shown in Table 5.4-3.

Table 5.4-3.
Recommended Plan Costs by Decade
for the Regional Water Provider(s) for Bexar County

Plan Element	2000	2010	2020	2030	2040	2050
Edwards Irrigation Transfers (L-15)						
Annual Cost ($/yr)	$2,353,000	$3,104,642	$3,104,642	$3,104,642	$3,104,642	$3,104,642
Unit Cost ($/acft)	$80	$80	$80	$80	$80	$80
Demand Reduction (Conservation) (L-10 Irr.) w/Trans.						
Annual Cost ($/yr)	$992,318	$992,318	$992,318	$0	$0	$0
Unit Cost ($/acft)	$36	$36	$36	$0	$0	$0
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Annual Cost ($/yr)	$12,496,000	$12,496,000	$12,496,000	$6,608,000	$6,608,000	$6,608,000
Unit Cost ($/acft)	$781	$781	$781	$413	$413	$413
Lower Guadalupe River Diversions (SCTN-16)						
Annual Cost ($/yr)		$75,925,080	$77,059,080	$77,437,080	$50,902,425	$47,509,205
Unit Cost ($/acft)		$803	$815	$819	$539	$503
Edwards Recharge – Type 2 Projects (L-18a)						
Annual Cost ($/yr)		$21,893,245	$23,455,062	$23,455,062	$20,843,166	$4,147,099
Unit Cost ($/acft)		$1,628	$1,087	$1,087	$966	$192
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)			$88,859,760	$134,163,480	$134,163,480	$96,976,490
Unit Cost ($/acft)			$1,346	$1,016	$1,016	$735
Desalination of Seawater – 75 MGD (SCTN-17)						
Annual Cost ($/yr)					$102,214,600	$120,977,280
Unit Cost ($/acft)					$1,825	$1,440
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$6,207,500	$5,007,990	$5,007,990	$2,074,280	$92,270	$184,540
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[2] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.4.2 San Antonio Water System (SAWS)

SAWS' current water supply is obtained from the Edwards Aquifer and direct reuse. SAWS is projected to need additional water supplies beginning in the year 2000. The options listed in Table 5.3.2-2 were considered to meet the Major Water Provider's projected need.

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 need for SAWS (Table 5.4-4).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 29,610 acft/yr of supply in 2000, increasing to 37,555 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Western Canyon Regional Water Supply Project to be implemented in 2000. This project can provide an additional 1,813 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Simsboro Aquifer (SCTN-3c) to be implemented in 2000. This project can provide an additional 55,000 acft/yr of supply.
- SAWS Recycled Water Program to be implemented in 2010. This project can provide an additional 19,826 acft/yr of supply in 2010, increasing to 52,215 acft/yr of additional supply in 2050.
- Aquifer Storage & Recovery – Regional (SCTN-1a)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 35,114 acft/yr by the year 2000, increasing to 295,189 acft/yr in 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)
  - Colorado River Diversion Option (LCRA)
  - Desalination of Seawater – 75 MGD (SCTN-17)
  - Brush Management
  - Weather Modification
  - Rainwater Harvesting
  - Additional Municipal Recycling (Reuse) Programs
  - Small Aquifer Recharge Dams
  - Edwards Aquifer Recharge & Recirculation Systems
  - Cooperation with Corpus Christi for New Water Sources
  - Additional Storage (ASR and/or Surface)

Table 5.4-4.
Recommended Water Supply Plan for SAWS[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	106,550	128,846	159,515	200,668	238,758	281,219
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	29,610	38,185	36,477	33,805	35,710	37,555
Western Canyon Regional Water Supply Project	1,813	1,813	1,813	1,813	0	0
Simsboro Aquifer (SCTN-3c)	55,000	55,000	55,000	55,000	55,000	55,000
SAWS Recycled Water Program		19,826	26,737	35,824	43,561	52,215
Aquifer Storage & Recovery – Regional (SCTN - 1a)						
Regional Water Provider(s) (SAWS)*	35,114	140,951	199,577	241,677	277,185	295,189
Total New Supply	121,537	255,775	319,604	368,119	411,456	439,959
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[2]						

[1] Needs and supplies for SAWS as a major water provider include service to surrounding rural areas and are generally greater than comparable figures for the City of San Antonio (Table 5.3.2-27).
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet SAWS' projected need are shown in Table 5.4-5.

Table 5.4-5. Recommended Plan Costs by Decade for SAWS

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$5,535,926	$5,550,525	$5,517,515	$1,846,050	$1,834,436	$1,830,288
Unit Cost ($/acft)	$187	$145	$151	$55	$51	$49
Western Canyon Regional Water Supply Project						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]		
Simsboro Aquifer (SCTN-3c)						
Annual Cost ($/yr)	$47,590,400	$47,590,400	$47,590,400	$28,029,650	$28,029,650	$28,029,650
Unit Cost ($/acft)	$865	$865	$865	$510	$510	$510
SAWS Recycled Water Program						
Annual Cost ($/yr)		$17,264,566	$17,981,583	$18,924,359	$4,519,454	$5,417,306
Unit Cost ($/acft)		$871	$673	$528	$104	$104
Aquifer Storage & Recovery (SCTN – 1a)						
Annual Cost ($/yr)	$11,762,100	$11,762,100	$11,762,100	$3,389,053	$3,389,053	$3,389,053
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Regional Water Provider(s) (SAWS)*						
Annual Cost ($/yr)	$11,533,287	$91,355,088	$162,962,369	$183,909,974	$231,673,263	$202,027,911
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
***Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (SAWS)**						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[3]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] The cost representing aquifer storage recovery is not calculated on a unit cost basis because a supply quantity has not been assigned to this management strategy.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

5.4.3 Bexar Metropolitan Water District (BMWD)

BMWD's current water supply is obtained from the Edwards Aquifer, Carrizo Aquifer, Trinity Aquifer, Canyon Reservoir, Medina Lake, and run-of-river rights. BMWD is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the Major Water Provider's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Carrizo Aquifer – Bexar and Guadalupe (BMWD)
- Trinity Aquifer – Bexar (BMWD)
- Western Canyon Regional Water Supply System
- Lake Dunlap WTP Expansion and Mid-Cities Water Transmission System (CRWA)
- Act as or cooperate with the Regional Water Provider(s) for Bexar County

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 need for BMWD (Table 5.4-6).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 2,284 acft/yr of supply in 2000, increasing to 2,657 acft/yr in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Carrizo Aquifer – Bexar & Guadalupe (BMWD) to be implemented in 2000. This project can provide an additional 4,000 acft/yr of supply.
- Trinity Aquifer – Bexar (BMWD) to be implemented in 2000. This project can provide an additional 1,000 acft/yr of supply.
- Western Canyon Regional Water Supply System to be implemented in 2000. This project can provide an additional 2,137 acft/yr of supply until 2040, at which time the supply becomes 0 acft/yr.
- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA) to be implemented in 2000. This project can provide an additional 4,000 acft/yr of supply through 2018, at which time the supply becomes 0 acft/yr.
- Act as or cooperate with the Regional Water Provider(s) for Bexar County in the development of some or all of the management strategies listed below in order to obtain additional supplies of 10,000 acft/yr by the year 2000, increasing to 39,500 acft/yr in 2050.
  - Edwards Irrigation Transfers (L-15)
  - Demand Reduction (Conservation) (L-10 Irr.)
  - Carrizo Aquifer – Wilson & Gonzales (CZ-10C)
  - Lower Guadalupe River Diversion (SCTN-16)
  - Edwards Recharge – Type 2 Projects (L-18a)

- Colorado River Diversion Option (LCRA)
- Desalination of Seawater – 75 MGD (SCTN-17)
- Brush Management
- Weather Modification
- Rainwater Harvesting
- Additional Municipal Recycling (Reuse) Programs
- Small Aquifer Recharge Dams
- Edwards Aquifer Recharge & Recirculation Systems
- Cooperation with Corpus Christi for New Water Sources
- Additional Storage (ASR and/or Surface)

Table 5.4-6.
Recommended Water Supply Plan for BMWD[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	13,033	19,360	25,496	32,434	39,569	44,010
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	2,284	2,633	2,978	2,130	2,457	2,657
Carrizo Aquifer – Bexar & Guadalupe (BMWD)	4,000	4,000	4,000	4,000	4,000	4,000
Trinity Aquifer – Bexar (BMWD)	1,000	1,000	1,000	1,000	1,000	1,000
Western Canyon Regional Water Supply System	2,137	2,137	2,137	2,137	0	0
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System (CRWA)	4,000	4,000	0	0	0	0
Regional Water Provider(s) (BMWD)*	10,000	16,000	20,000	28,000	35,000	39,500
Total New Supply	23,421	29,770	30,115	37,267	42,457	47,157
****Water Management Strategies to be Developed by the Regional Water Provider(s) for Bexar County***						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Brush Management						
Weather Modification						
Rainwater Harvesting						
Additional Municipal Recycling (Reuse) Programs						
Small Aquifer Recharge Dams						
Edwards Aquifer Recharge & Recirculation Systems						
Cooperation w/ Corpus Christi for New Water Sources						
Additional Storage (ASR and/or Surface)[2]						

[1] Needs and supplies for BMWD as a major water provider include service to surrounding rural areas and are generally greater than comparable figures for the BMWD service areas in Tables 5.3.2-41, 5.3.2-43, 5.3.2-45, and 5.3.2-47.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet BMWD's projected need are shown in Table 5.4-7.

Table 5.4-7.
Recommended Plan Costs by Decade for BMWD

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$566,345	$559,262	$590,322	$116,317	$126,217	$129,492
Unit Cost ($/acft)	$248	$212	$198	$55	$51	$49
Carrizo Aquifer – Bexar & Guadalupe (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Trinity Aquifer – Bexar (BMWD)						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Western Canyon Regional Water Supply System						
Annual Cost ($/yr)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Unit Cost ($/acft)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
Regional Water Provider(s) (BMWD)*						
Annual Cost ($/yr)	$3,227,569	$10,370,139	$16,330,777	$21,307,279	$29,253,258	$27,033,875
Unit Cost ($/acft)	$323	$648	$817	$761	$836	$684
***Costs for the Following Management Strategies are Included in the Cost for Regional Water Provider(s) (BMWD))**						
Edwards Irrigation Transfers (L-15)						
Demand Reduction (Conservation) (L-10 Irr.)						
Carrizo Aquifer – Wilson & Gonzales (CZ-10C)						
Lower Guadalupe River Diversions (SCTN-16)						
Edwards Recharge – Type 2 Projects (L-18a)						
Colorado River Diversion Option (LCRA)						
Desalination of Seawater – 75 MGD (SCTN-17)						
Additional Storage (ASR and/or Surface)[2]						

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage

5.4.4 Canyon Regional Water Authority (CRWA)

CRWA's current water supply is obtained from Canyon Reservoir. CRWA is projected to need additional water supplies beginning in the planning year 2010. The following options were considered to meet the Major Water Provider's projected need:

- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Cooperate with or purchase water from the Regional Water Provider(s)

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 need for CRWA (Table 5.4-8).

- Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System which is currently being implemented. This project can provide an additional 5,200 acft/yr of supply through 2018.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2020. This project can provide an additional 550 acft/yr of supply in 2020, increasing to 2,600 acft/yr of additional supply in 2050.
- Cooperate with or purchase water from the Regional Water Provider(s) to obtain additional supplies of 550 acft/yr by the year 2020, increasing to 4,000 acft/yr by 2050.

Table 5.4-8.
Recommended Water Supply Plan for CRWA

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	0	490	1,770	3,449	4,817	6,331
Recommended Plan						
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System	5,200	5,200	0	0	0	0
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[1]			550	550	1,000	2,600
Purchase/Participate with Regional Water Provider(s)			1,500	3,000	4,000	4,000
Total New Supply	5,200	5,200	2,050	3,550	5,000	6,600

[1] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.

The costs of the recommended plan to meet CRWA's projected need are shown in Table 5.4-9.

Table 5.4-9.
Recommended Plan Costs by Decade for CRWA

Plan Element	2000	2010	2020	2030	2040	2050
Lake Dunlap WTP Expansion & Mid-Cities Water Transmission System						
Annual Cost ($/yr)	N/A[1]	N/A[1]				
Unit Cost ($/acft)	N/A[1]	N/A[1]				
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)	$1,003,600	$1,003,600	$1,453,500	$449,900	$742,000	$1,160,000
Unit Cost ($/acft)	N/A[2]	N/A[2]	$2,643	$818	$742	$742
Purchase/Participate with Regional Provider						
Annual Cost ($/yr)			$1,224,808	$2,282,923	$3,343,229	$2,737,608
Unit Cost ($/acft)			$817	$761	$836	$684

[1] This project is currently underway with existing funds, therefore no cost has been projected.
[2] Reflects early participation in a project to ensure future needs are met.

5.4.5 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 Major Water Provider's projected demands, however certain entities within GBRA's service area are projected to have a shortage (need) during the planning period. GBRA, acting as a Major Water Provider, plans to develop or participate in the following water management strategies to meet those projected needs:

- Additional Canyon Reservoir Diversions (Amend CA#18-2074);
- Major Provider of Additional Supplies;
- Canyon Reservoir – River Diversion (G-15C);
- Canyon Reservoir – Wimberley, Woodcreek, & Blanco (G-24);
- Western Canyon Regional Water Supply Project (WCRWSP); and
- Hays/IH35 Water Supply Project (HIH35WSP)
- Lake Dunlap WTP Expansion & Mid-Cities Project (CRWA).

Costs for implementation of these various water management strategies are shown for the water user group(s) for which these water management strategies are recommended.

5.4.6 New Braunfels Utilities (NBU)

NBU's current water supply is obtained from the Edwards Aquifer and run-of-river rights.[1] NBU is projected to need additional water supplies beginning in the planning year 2020. The following options were considered to meet the Major Water Provider's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Canyon Reservoir – River Diversion (G-15C)
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that NBU implement the following water supply plan to meet the projected need for NBU (Table 5.4-10).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 583 acft/yr of supply in 2000, increasing to 904 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Canyon Reservoir – River Diversion (G-15C) to be implemented in 2000. This project can provide an additional 580 acft/yr of supply in 2000, increasing to 15,000 acft/yr of additional supply in 2050.
- Carrizo Aquifer – Gonzales & Bastrop (CZ-10D) to be implemented in 2040. This project can provide an additional 1,800 acft/yr of supply in 2040, increasing to 5,100 acft/yr of additional supply in 2050.
- Additional Storage (ASR and/or Surface)

[1] NBU also obtains a part of its water supply from Canyon Reservoir, however, for the purposes of calculating supplies available for Major Water Providers, the contract with GBRA was considered to be a part of GBRA's available supply to meet that contractual obligation.

Table 5.4-10.
Recommended Water Supply Plan for NBU[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	0	2,085	5,426	10,135	13,539	17,365
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	583	680	804	683	785	904
Canyon Reservoir – River Diversion (G-15C)	580	2,080	7,200	11,200	15,000	15,000
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)[2]					4,000	7,000
Additional Storage (ASR and/or Surface)[3]						
Total New Supply	1,163	2,760	8,004	19,785	19,785	22,904

[1] Needs and supplies for NBU as a major water provider include service to surrounding rural areas and are generally greater (when adjusted for Canyon contract) than comparable figures for the City of New Braunfels (Table 5.3.5-5)..
[2] Region L estimates of groundwater development exceed Region K estimates of availability in and beyond 2030. The regions have agreed that discussion of differences will be more productive upon completion of new Groundwater Availability Models.
[3] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet NBU's projected need are shown in Table 5.4-11.

Table 5.4-11.
Recommended Plan Costs by Decade for NBU

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$181,922	$182,046	$182,246	$71,011	$71,116	$71,562
Unit Cost ($/acft)	$312	$268	$227	$104	$91	$79
Canyon Reservoir – River Diversion (G-15C)						
Annual Cost ($/yr)	$2,062,060	$2,922,560	$6,238,800	$7,044,800	$9,435,000	$4,435,000
Unit Cost ($/acft)	$3,555	$1,429	$867	$629	$629	$629
Carrizo Aquifer – Gonzales & Bastrop (CZ-10D)						
Annual Cost ($/yr)			$2,702,000	$2,702,000	$5,022,000	$5,069,000
Unit Cost ($/acft)			N/A[2]	N/A[2]	$1,256	$580
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$1,052,135	$1,081,868	$1,111,602	$590,341	$120,078	$150,002
Unit Cost ($/acft)	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[2] Reflects early participation in a project to ensure future needs are met.
[3] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

5.4.7 City of San Marcos

The City of San Marcos' current water supply is obtained from the Edwards Aquifer.[2] The City of San Marcos is projected to need additional water supplies beginning in the year 2000. The following options were considered to meet the Major Water Provider's projected need:

- Demand Reduction (Conservation) (L-10 Mun.)
- Purchase Water from Major Provider
- Colorado River Diversion Option (LCRA)
- Additional Storage (ASR and/or Surface)

Working within the planning criteria established by the SCTRWPG and the TWDB, it is recommended that the City of San Marcos implement the following water supply plan to meet the projected need for the City of San Marcos (Table 5.4-12).

- Municipal demand reduction (conservation) to be implemented in 2000. This project can provide an additional 590 acft/yr of supply in 2000, increasing to 1,174 acft/yr of additional supply in 2050. (See Section 6, Supplement 2 and Volume III, Section 1.1).
- Purchase Water from Major Provider to be implemented in 2000. This project can provide an additional 5,000 acft/yr of supply in 2000, increasing to 6,000 acft/yr of additional supply in 2050.
- Colorado River Diversion Option (LCRA) to be implemented in 2030. This project can provide an additional 4,900 acft/yr of supply in 2030, increasing to 16,900 acft/yr of additional supply in 2050.
- Additional Storage (ASR and/or Surface)

[2] The City of San Marcos also obtains a part of its water supply from Canyon Reservoir, however, for the purposes of calculating supplies available for Major Water Providers, the contract with GBRA was considered to be a part of GBRA's available supply to meet that contractual obligation.

Table 5.4-12.
Recommended Water Supply Plan for the City of San Marcos[1]

	2000 (acft/yr)	2010 (acft/yr)	2020 (acft/yr)	2030 (acft/yr)	2040 (acft/yr)	2050 (acft/yr)
Projected Need	1,639	3,891	6,741	11,092	16,565	23,606
Recommended Plan						
Demand Reduction (Conservation) (L-10 Mun.)	590	690	816	699	906	1,174
Purchase Water from Major Provider	5,000	5,000	6,000	6,000	6,000	6,000
Colorado River Diversion Option (LCRA)				4,900	10,000	16,900
Additional Storage (ASR and/or Surface)[2]						
Total New Supply	5,590	5,690	6,816	11,599	16,906	24,074

[1] Needs and supplies for San Marcos as a major water provider include service to surrounding rural areas and are generally greater than comparable figures for the City of San Marcos (Table 5.3.12-4).
[2] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.

The costs of the recommended plan to meet the City of San Marcos's projected need are shown in Table 5.4-13.

Table 5.4-13.
Recommended Plan Costs by Decade for the City of San Marcos

Plan Element	2000	2010	2020	2030	2040	2050
Demand Reduction (Conservation) (L-10 Mun.)						
Annual Cost ($/yr)	$198,286	$200,851	$203,245	$81,103	$81,103	$81,103
Unit Cost ($/acft)	$336	$291	$249	$116	$90	$69
Purchase Water from Major Provider						
Annual Cost ($/yr)	$2,995,000	$2,995,000	$3,618,000	$3,618,000	$3,618,000	$3,618,000
Unit Cost ($/acft)	$599	$599	$603	$603	$603	$603
Colorado River Diversion Option (LCRA)						
Annual Cost ($/yr)				$7,721,156	$11,768,975	$17,245,436
Unit Cost ($/acft)				$1,576	$1,177	$1,020
Additional Storage (ASR and/or Surface)[1]						
Annual Cost ($/yr)	$1,514,459	$1,561,151	$1,607,843	$1,103,533	$194,216	$240,999
Unit Cost ($/acft)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]

[1] Includes, but is not limited to, small reservoirs near regional water treatment facilities to provide balancing storage necessary to meet peak seasonal and daily water needs.
[2] The cost representing additional storage is not calculated on a unit basis because a supply quantity has not been assigned to this management strategy.

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Section 6
Policies and Recommendations

6.1 Introduction

The South Central Texas Regional Water Planning Group developed numerous policies and guiding assumptions as it worked on the Regional Plan. An important part of this effort was the definition of a set of evaluation criteria employed during the process of reviewing options and strategies, creating alternative plan approaches and building consensus. In addition, the RWPG produced a number of legislative recommendations, a statement on ecologically unique stream segments and unique reservoir sites, and other recommendations, all of which are integral to achieving the Regional Plan's goals and articulating the values on which it is based.

6.2 Additional Regional Water Plan Recommendations

6.2.1 Additional Regional Water Supply Storage

The Regional Water Plan creates opportunities for additional year-to-year storage that can conserve new supplies and extend their usefulness. The Planning Group therefore recommends further study and eventual implementation of one or more of several possible storage strategies. These include:

- Additional Aquifer Storage and Recovery projects in all aquifers, including the saline zone of the Edwards Aquifer
- Unused storage capacity of existing regional reservoirs
- Use of additional small off-channel storage facilities
- Palmetto Bend Stage 2 Reservoir

The purpose of this additional regional storage facility is to store wet-year supplies from the options and strategies included in the Regional Water Plan for use in drought situations. As noted in the policy statements accompanying the plan, the Edwards Aquifer Authority could require reductions in pumpage below the 340,000 acft/yr planning level in order to protect springflow.[1] Such reductions could exhaust the additional management supply already built into the Regional Water Plan. The added storage capacity would enable the region to preserve

[1] As noted in Section 5 of the Regional Water Plan, the RWPG agreed to use the pumping level of 340,000 acre-feet per year for planning purposes only. Also, see Section 6.3, "Guiding Principles and Assumptions; and Section 6.3.6, "Protection of Edwards Aquifer Springflow and Downstream Water Rights."

imported, take-or-pay and other water supplies when not needed for delivery to water user groups.

6.2.2 Lockhart Reservoir

The Lockhart Reservoir is recommended as a potential reservoir site. Although the Regional Plan recommends other means of meeting projected water needs in Caldwell County, the Planning Group recognizes the strong interest of the local government in shifting from low-quality groundwater sources to a surface water supply system. The reservoir is considered by the local government to be an important economic development project to create new growth opportunities for the area. There are questions about economic feasibility at present, but the RWPG 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 supply option as a possible amendment to the Regional Water Plan.

6.3 Guiding Principles and Assumptions

The South Central Texas Regional Water Planning Group bases the criteria for evaluating alternative regional water plans on these overarching assumptions and principles:

6.3.1 Regional Balance of Benefits and Costs — Mitigation Policy

The plan must meet the defined water needs of every Water User Group in each of the region's 21 counties and must consider carefully the impact and the balance of benefits and costs of water supply development for every county in the region. In evaluating the impacts of one or more components of the Regional Plan, the SCTRWPG will consider the long and short term costs, benefits, losses and gains to affected communities and the environment, to the extent reliable information is readily available. The developer of any option or strategy included in the Regional Water Plan should implement effective and specific mitigation measures designed to minimize any social, cultural, economic and environmental adverse impacts, including impacts on rate-payers, caused by the option or strategy. The goal of the Regional Plan is to maximize benefits and minimize negative impacts for affected communities, the region, the state and the environment.

To further the goal of maximizing benefits, the Regional Water Planning Group encourages developers of water management strategies under this Plan to consider alternative distribution, routing or other project modifications that would extend benefits to agricultural and other Water User Groups presently lacking access to new water sources.

6.3.2 Conservation

Conservation is basic to the regional water planning strategy. The Texas Water Development Board has built substantial conservation assumptions into its projections of water demand. Furthermore, the South Central Texas Regional Water Planning Group has adopted the advanced conservation case of the alternative per capita water use levels applied by the TWDB in its water demand projections. Thus, the water demands used in the alternative plans already reflect significant reductions in water use from those that would have been projected without the conservation assumptions. The conservation options and strategies evaluated during the planning process would aim for further reductions in demand beyond those already reflected in the projections.

6.3.3 Use of Evaluation Criteria

The Regional Water Planning Group uses the criteria in evaluating each alternative plan *as an integrated whole* and not as a series of independent projects. The options and strategies selected for each alternative have already been evaluated on a stand-alone basis using the evaluation criteria enumerated in the TWDB regulations at §357.7 (a)(7).

6.3.4 Potential Reductions in Permitted Groundwater Supply

The Plan identifies amounts of water that would be withdrawn from various aquifers as part of the region's projected available supplies. It is understood that, if a permitting agency, such as a groundwater district, restricts these withdrawals, then additional supplies will need to be identified to compensate for any reductions in supply. The Regional Water Plan respects the rules and regulations of groundwater districts, just as it does those of all other state subdivisions and agencies. The RWPG believes that all rules should be adopted pursuant to accepted administrative procedures based on the standards of rationality, equity and scientific evidence.

6.3.5 Groundwater Sustainability

The Regional Water Planning Group 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 Planning Group 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.

6.3.6 Protection of Edwards Aquifer Springflow and Downstream Water Rights

While the plan assumes annual withdrawals of 340,000 acre-feet from the Edwards Aquifer under drought of record conditions, it is recognized that this level of pumpage may not protect springflows. A plan for protecting springflow may not be available for approximately three years, when a Habitat Conservation Plan being prepared by the Edwards Aquifer Authority (EAA) is completed. If the EAA 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, to manage peak water demand periods and to protect downstream water rights. Recognizing this, the South Central Texas Regional Water Planning Group accepts 340,000 acre-feet as an appropriate pumpage level for planning purposes.

6.3.7 Planning for System Management Water Supplies

System Management water supplies, i.e. supplies over and above those apparently needed to meet projected demands, must be included in the plan, first, so that water options and management strategies are identified to replace any planned options or strategies that may fail to develop and, second, to serve as additional supplies in the event rules, regulations or other restrictions limit use of any planned options or strategies. The plan should specify those factors affecting reliability of the recommended options and strategies and indicate what alternatives are available as possible replacements.

6.4 Feasibility of Meeting Irrigation Water Needs

The South Central Texas Regional Water Planning Group finds that, under current conditions, it is not economically feasible for agricultural producers to pay for additional water supplies to meet project irrigation water shortages

See Supplement 1 to this chapter for the analysis of economic feasibility underlying this finding of the Regional Water Planning Group.

During the next planning cycle, the SCTRWPG will conduct additional socio-economic studies regarding impacts of the Regional Water Plan on agricultural resources and also carry out additional studies on water management strategies that may meet irrigation needs.

6.5 Evaluation Criteria

The South Central Texas Regional Water Planning Group initially adopted a set of criteria to guide the evaluation of alternative Regional Water Plans in January 1999. In response to public comment, concerns of Planning Group members and technical evaluation, the RWPG twice revised the criteria, in December 1999 and in July 2000. These criteria are distinct from the criteria described in the TWDB regulations, which are used to evaluate the individual water supply options and strategies. Unique among the water planning regions, the South Central Texas Region chose to develop a series of alternative regional plans and to supplement technical evaluation by using the following set of additional criteria. These criteria have been used by the RWPG to evaluate each alternative *as a whole* (see section 6.2.3 above) rather than its individual component options and strategies.

- Economic Impact
  (1) Furthers economic development
  (2) Minimizes long-range negative socio-economic impacts (including loss of tax base)
  (3) Promotes opportunities for cost-sharing and economic partnership
  (4) Provides cost-effective solutions
- Water Quality
  (1) Provides and maintains appropriate quality for the intended use

- Fairness
  (1) Emphasizes efficient use of water in areas that import water
  (2) Promotes equitable distribution of costs and benefits in meeting region's water needs
- Feasibility
  (1) Demonstrates feasibility in terms of the following factors:
    (a) Timing
    (b) Technical/ scientific
    (c) Economic
    (d) Political
    (e) Regulatory
    (f) Legal
    (g) Public acceptance
- Efficiency
  (1) Minimizes evaporative and distribution losses
  (2) Promotes conservation
  (3) Promotes conjunctive use
- Flexibility
  (1) Adaptable to new and innovative technology
  (2) Adaptable to changes in demand projections
  (3) Adaptable to changes in law
  (4) Adaptable to future supply options
- Compatibility
  (1) Maximizes regional compatibility with local water plans
  (2) Minimizes negative impacts on property rights
  (3) Maximizes consistency with local growth management plans
  (4) Maximizes compatibility with plans from surrounding regions
- Reliability
  (1) Maximizes a sustainable (referring to yield) supply of water for short-term and long-term needs
  (2) Minimizes interruptions to water supplies
- Environment
  (1) Minimizes short-term and long-term negative impacts on native species and habitat diversity, including but not necessarily limited to:
    (a) Endangered & Threatened Species
    (b) Ecologically Unique Stream Segment Candidate Sites (as identified by Texas Parks and Wildlife Department)

(c) Vegetation & Wildlife Habitat (including wooded riparian areas, wetlands and other habitat categories defined by the Physiognomic Regions of the Texas Parks and Wildlife Department)

(d) Groundwater Sustainability (as measured by aquifer drawdown)

(e) Water Quality and Aquatic Habitat (including streamflows, springflows, estuarine inflows, and all aquatic habitats)

(2) Minimizes short-term and long-term negative impacts to the human environment

(a) Cultural Resources (including archeological and historic sites)

(b) Recreational

(c) Aesthetics

6.6 Conservation Planning Guidelines

Because of the central role of advanced conservation in achieving the water supply objectives of the Regional Plan, the RWPG is including in this report Conservation Planning Guidelines for potential use by water user groups across the region. We recognize that the creation of conservation programs and the selection of specific conservation technologies is a matter of local choice. The RWPG hopes that this educational tool will facilitate understanding of the importance of conservation efforts and the wide range of methods available for use.

See Supplement 2 to this section for the full text of the Conservation Planning Guidelines.

6.7 Legislative Recommendations

6.7.1 Plan Implementation

Given the unprecedented level of time and money expended in the development of Regional Water Plans across the state, the South Central Texas Regional Water Planning Group urges the Legislature to act promptly to help ensure full implementation of these plans.

6.7.1.1 Funding

The South Central Texas Regional Water Planning Group believes that State funding should be provided as a key incentive for partnership in funding from local, regional and federal governmental agencies.

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 TNRCC to administer their programs and activities associated with planning, financing and permitting of the projects in the State Plan.

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 (e) Population projections.

Access to State Water Data. There should be adequate funding for the critical roles of TWDB and TNRCC in facilitating access to water data essential for local and regional planning and plan implementation purposes.

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 after January 2001.

Surface Water Rights Monitoring and Administration. TNRCC 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.

Assistance for Alternative Water Supply Strategies. The State should provide 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.

Irrigation Technology Center. The State should provide funding to help establish within the South Central Texas Water Planning Region the Irrigation Technology Center, as proposed 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.

UTSA Center for Water Research. The South Central Texas Regional Water Planning Group recommends funding for the UTSA Center for Water Research. Central Texas and the U.S./Mexico border region are areas of rapid population growth and of tremendous demands on limited natural resources, especially water. In order to meet and sustain growth, these areas must have access to the information, education, research capabilities, technology and highly trained individuals necessary to address current problems and provide professional management for the future.

The Center for Water Research at the University of Texas at San Antonio, a component of the university that is not funded by the State budget, has been providing these services on a limited basis for the past thirteen years. With adequate State funding the Center could be a resource for:

- Water quality concerns, including public health issues, water treatment and water chemistry.
- Water resource management, including the application of models to surface and groundwater resource management.
- Education and technology transfer to other institutions and individuals in this region using state-of-the-art distance learning technologies and on-site education assets.
- Land use, environmental issues, reclamation techniques, pollution prevention and control, especially as these issues relate to the rapid growth and resource demands of the border regions along the Rio Grande, in South Texas, and in the environmentally fragile Hill Country of Central Texas.

Edwards Aquifer Research and Data Center. The South Central Texas Regional Water Planning Group supports funding for the Edwards Aquifer Research and Data Center at Southwest Texas State University in San Marcos. The Edwards Aquifer Research and Data Center (EARDC) was established in 1979 by special funding for Southwest Texas State University to provide a public service in the study, understanding and use of the very fragile natural resource, the Edwards Aquifer. EARDC operations are organized around four major areas:

- The Data Center, operating both statewide and nationally, collects, maintains, and makes available information on the Edwards Aquifer.
- The Technical Services Center offers a variety of technical services to the public and various government offices. Most prominent at the present are the Laboratory Services for water analyses.
- The Education Center seeks to improve public understanding of the Edwards Aquifer through the development and the dissemination of educational materials and through development and implementation of educational programs.
- The Research Center conducts basic and applied research related to the Aquifer in the area of aquatic biology, geochemistry, and hydrogeology.

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.

6.7.1.2 Other Implementation Issues

SB-1 Junior Water Rights Provision. The Regional Water Planning Group has considered the positive and negative impacts of the Junior Water Rights provision. 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 were preserved in interbasin transfers because of the need to provide reliable water supplies in the plans.

Other members of the Planning Group cite the following positive effects of the Junior Water Rights provision of SB-1.

- The 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.

The Regional Water Planning Group makes no specific recommendation for legislative change at this time.

County Authority. Counties should have additional authority for land use planning and for regulating development based on availability and protection of water resources.

Water Withdrawn from Coastal Bays or the Gulf of Mexico. The Legislature should clarify that water withdrawn from the coastal bays or the Gulf of Mexico for desalination projects does not constitute an Interbasin Transfer.

6.7.2 Changes in TWDB Planning Process

6.7.2.1 Notice of Projects with Impacts on Shared Groundwater Resources

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 with adjoining planning region(s), notice shall be provided to the adjoining region(s) of the proposed date of implementation and anticipated acre-feet per year demand on the shared groundwater resource.

6.7.2.2 Regional Boundaries

The boundaries of Region L should be adjusted to include the southern portion of Blanco County that is to be served by a Major Water Provider in Region L.

6.7.2.3 Population and Water Demand Projections

The RWPG 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.

6.7.2.4 "County Other" Water User Group

The Planning Regions should have the option and the resources required to disaggregate the "County Other" Water User Group and to develop water demand projections and water management strategies in cooperation with the entities included within this group on an individual basis, according to an agreed-upon methodology.

6.7.2.5 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.

6.7.2.6 Coastal Basins

Coastal basins adjacent to major river basins are considered part of the major basins. The RWPG 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.

6.7.2.7 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.

6.7.2.8 Volunteer Travel Expenses

Many members of Planning Groups do not receive any compensation or reimbursement for expenses. These volunteer members of Regional Water Planning Groups must often travel significant distances to attend meetings and should receive state-funded reimbursement for travel expenses. The lack of travel expense reimbursement has created an undue hardship in some regions.

6.7.2.9 Regional Boundaries Should Foster Collaboration

The Planning Group 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.

6.7.3 Proposals for Other Legislative Changes

6.7.3.1 Proposal to Support the Recommendations of the Texas Groundwater Collaborative Process

The South Central Texas Regional Water Planning Group commends the effort of participants in the Texas Groundwater Collaborative Process to address important and difficult issues pertaining to groundwater management in the state. The SCTRWPG supports their recommendations as recorded in the report, *Future of Groundwater Management in Texas*, except for the recommendation supporting repeal of the Junior Water Rights Provision of SB-1. As noted above, the South Central Texas Regional Water Planning Group takes no position on that issue.

6.7.3.2 Groundwater District Management Plans

Current law [36.1071 (e)(4)] requires groundwater district management plans to "address water supply needs in a manner that is not in conflict with the appropriate approved regional water plan if a regional water plan has been approved under Section 16.053". The Legislature should amend 36.1071 (e)(4) by substituting a requirement that groundwater district management plans and regional water plans use the same data, provided by TWDB under the applicable regional water planning rules, regarding water demand projections.

6.7.3.3 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.

6.7.4 Ecologically Unique Stream Segments and Unique Reservoir Sites

The South Central Texas Regional Water Planning Group asks the Legislature to provide further definition and clarification of the legal implications it intends by the designation of stream segments as either "ecologically unique" or as "unique reservoir sites". Until that definition and clarification occurs, the RWGP recommends that there be no designation of sites in this round of planning. However, the RWPG recognizes the great importance of the issue for the protection of sites of high ecological value as well as future reservoir sites.

The RWPG 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 S.B-1. There have been additional suggestions of sites made by members of the RWPG, 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 RWPG 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.

The RWPG should address any conflict between water supply strategies and the candidate sites for designation as ecologically unique within the context of the regional water planning process. In addressing this task, the RWPG will work with TPWD on refinement of candidate stream segments that are also potential sites for recharge structures.

The group urges all advocates of river protection and potential site designation to provide whatever relevant documentation they possess during the plan development process. The RWPG will use this documentation in its consideration of alternative plans and possible modification of specific water supply strategies.

Supplements to Section 6

Supplement 1 ***Economic Feasibility of Meeting Projected Irrigation Water Needs***

Supplement 2 ***Conservation Planning Guidelines***

SUPPLEMENT 1

South Central Texas Region

Regional Water Plan

Special Report

Economic Feasibility of Meeting Projected Irrigation Water Needs

Prepared by HDR

August 2000

Projected Irrigation Water Needs and Economic Feasibility of Meeting Projected Irrigation Water Needs

South Central Texas Region

Introduction

Texas Water Development Board (TWDB) Rules, Section 357.7(5)(A) specify that Regional Water Management Plans "…shall meet all needs for the water use categories of municipal, manufacturing, irrigation, steam-electric power generation, mining, and livestock watering except: (A) plans may identify those needs for which no water management strategy is feasible. Full evaluation of water management strategies must be presented and reasons given for why no water management strategies are feasible; or (B)…"[1] The purposes of this report are to present: (1) estimates of projected irrigation water needs of the South Central Texas Region (Region L), and (2) information about the economic feasibility of meeting the projected irrigation water needs.

Irrigation Water Needs

The TWDB's estimates of irrigation water use in the 21-county South Central Texas Region was 669,440 acft/yr in 1990, with projected irrigation water demands in 2030 of 563,513 acft/yr, and in 2050 of 516,244 acft/yr.[2] A comparison of projected irrigation demands with available irrigation supplies for each of the counties of the region shows that 14 counties do not have an irrigation water need, with 7 counties showing an irrigation water need (Table A). The total of the projected irrigation needs for these 7 counties, with adjustments for water conservation in 2030 are 289,743 acft/yr, and in 2050 are 251,550 acft/yr (Table A).[3] Estimated additional irrigation conservation is 28,903 acft/yr (Table A and Demand Reduction [L-10] Water Management Strategy).[4]

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[1] Regional Water Planning Areas and Special Water Resources, Adopted Rules for: Regional Water Planning Grants, Regional Water Planning Guidelines, State Water Planning Guidelines, and Initial Coordinating Body Representatives, Texas Water Development Board, Austin, Texas, March 11, 1998.
[2] South Central Texas Region Water Management Plan, Task 1 and Task 2, Interim Report, SCTRWPG, San Antonio, Texas, August 1999.
[3] South Central Texas Region Water Management Plan, Water Supplies and Water Needs by Water User Group, Task 3 and Task 4, Interim Report, SCTRWPG, San Antonio, Texas, February 2000.
[4] Water conservation in addition to that included in the irrigation water demand projections.

Table A
Projected Irrigation Water Needs*
South Central Texas Region

Counties	Projections (acft)					
	2000	2010	2020	2030	2040	2050
1 Atascosa	38,418	36,719	35,170	43,726	42,190	40,713
2 Bexar	14,059	10,935	9,376	7,883	6,453	5,082
3 Caldwell	0	0	0	0	0	0
4 Calhoun	0	0	0	0	0	0
5 Comal	0	0	0	0	0	0
6 De Witt	0	0	0	0	0	0
7 Dimmit	0	0	0	0	0	0
8 Frio	71,125	67,645	64,365	76,506	73,520	70,663
9 Goliad	0	0	0	0	0	0
10 Gonzales	0	0	0	0	0	0
11 Guadalupe	883	777	677	582	492	406
12 Hays(part)**	0	0	0	0	0	0
13 Karnes	0	0	0	0	0	0
14 Kendall	0	0	0	0	0	0
15 LaSalle	0	0	0	0	0	0
16 Medina	78,206	72,360	66,580	65,382	60,082	55,006
17 Refugio	0	0	0	0	0	0
18 Uvalde	48,551	43,250	38,243	36,274	31,674	27,383
19 Victoria	0	0	0	0	0	0
20 Wilson	0	0	0	0	0	0
21 Zavala	80,772	76,589	72,655	88,293	84,673	81,200
Total Projected Irrigation Water Needs	**332,014**	**308,275**	**287,066**	**318,646**	**299,084**	**280,453**
Additional Irrigation Conservation						
Edwards Counties**						
Bexar	1,905	1,905	1,905	1,905	1,905	1,905
Medina	5,000	5,000	5,000	5,000	5,000	5,000
Uvalde	5,958	5,958	5,958	5,958	5,958	5,958
Subtotal	12,863	12,863	12,863	12,863	12,863	12,863
Carrizo Counties						
Atascosa	3,692	3,692	3,692	3,692	3,692	3,692
Frio	5,947	5,947	5,947	5,947	5,947	5,947
Zavala	6,401	6,401	6,401	6,401	6,401	6,401
Subtotal	16,040	16,040	16,040	16,040	16,040	16,040
Total Additional Conservation	**28,903**	**28,903**	**28,903**	**28,903**	**28,903**	**28,903**
Total Water Need Adjusted for Effects of Additional Conservation******	**303,111**	**279,372**	**258,163**	**289,743**	**270,181**	**151,550**

* Based upon TWDB irrigation water demand projections, with advanced conservation

** Estimates based upon use of Low Energy Precision Application Systems (LEPA), with furrow dikes, applied to 80 percent of acres irrigated in 1997, with water savings of 40 percent of irrigation rate, but applicable to only 50 percent of Edwards Aquifer irrigation permitted quantities (e.g., the 50 percent that is required by SB-1477 to remain with the land and be used for the purposes for which it was permitted.

*** Estimates based upon use of Low Energy Precision Application Systems (LEPA), with furrow dikes, applied to 50 percent of acres irrigated in 1997, with water savings of 20 percent of irrigation rate.

**** The quantity of conservation is considered a part of irrigation water supply and is used to reduce needs.

Economic Feasibility of Meeting Projected Irrigation Water Needs of South Central Texas Region

The concept or expression of economic feasibility to be used in this analysis is based upon estimated income per acre-foot of water used in irrigation that remains after all other irrigation production expenses have been met (e.g., net return to water at the irrigation farm, on the surface of the land, at the point from which the water is distributed to the crops being irrigated). For example, in the South Central Texas Region for the case of irrigation using groundwater, this is net return per acre-foot of water at the land surface where the irrigation well is located. In the case of irrigation using surface water, the net income data needed are for the land surface location on the irrigation farm where water is or would be diverted from delivery canals or pipelines to be distributed to the crops being irrigated.

The reason for the form of net income to irrigation water expressed above is that information is available in the form of Crop Enterprise Budgets of the "costs and returns" from irrigation of individual crops in the South Central Texas Region.[5] These Crop Enterprise Budgets were developed using representative crop yields, production practices, and irrigation applications of the region. These budges take into account the gross income, the quantity of water applied per acre, and all of the costs of production, including pumping costs to lift water from the aquifer to the surface of the land, costs to move the water from the well and distribute it to the crops, hired labor, seed, fertilizer, fungicides, insecticides, pesticide application, harvesting, transportation, insurance, fuel, lubrication, interest on capital, machinery depreciation and maintenance, administration, and a charge for land use. Thus, by deleting from the Crop Enterprise Budgets, the cost of pumping water (pump fuel and maintenance, amortized well drilling, pump, and motor costs) one can see the net returns from the water used for irrigation, as of the location from which it is distributed to the crops.

Net income computations have been made for crops that are irrigated in the South Central Texas Region, including: corn, cotton, grain sorghum, guar, peanuts, sesame, wheat, beets, cantaloupes, carrots, cucumbers, cabbage, lettuce, onions, and spinach (Table B). For example, in the case of corn for food, the yield is 115 bushels per acre and gross income is $373.75 per acre (Table B). The quantity of water used per acre is 1.42 acft (17 inches) (Table B). Variable

[5] "Texas Crop Enterprise Budgets," Southwest Texas District, Texas Agricultural Extension Service, B-1241 (C10), Texas A&M University System, College Station, Texas, 1997.

costs per acre are $234.20 and fixed costs are $112.98, for a total cost of $347.18 per acre (Table B). Net income to pay for water from the production of corn for food is $26.57 per acre, and $18.71 per acft of water used for irrigation (Table B). That is to say, that for 1997 price and cost conditions, the most that an irrigation farmer of the South Central Texas Region could afford to pay for water delivered to his present well locations for use in producing corn for food is $18.71 per acft.

The estimated net returns to water for other irrigated crops of the region are shown in Table B and range from a loss of $75.80 for lettuce to a positive net return of $782.80 for onions.

Although costs have not been computed for water management strategies that would deliver water to the locations of irrigation water needs in the South Central Texas Region, costs were calculated for water management strategies that are indicative of strategies which would provide meaningful quantities of water that could be considered to meet irrigation needs. These include (1) raw water at new reservoirs, (2) Edwards Recharge—raw water in the aquifer, and (3) Carrizo Aquifer water pumped and delivered to the major municipal demand center. These costs of raw water, which is judged to be suitable for irrigation of crops grown in the region, range from $390 per acft to $764 per acft (Table B, Page 2, Box in Lower Right Corner and Figure 1). When compared to net returns to water, as described above, of all the crops produced in the region only one crop—onions—could afford any of this water (Table B). In addition, the costs of raw water shown in Table B are only a portion of the total costs to develop and convey this water from reservoirs and/or the Carrizo Aquifer to the irrigation farms of the South Central Texas Region. For example, the costs shown in Table B do not include conveyance costs to the farms from the reservoirs and Carrizo wells. Thus, it is clear that it is not economically feasible to meet the projected irrigation needs of the South Central Texas Region, since the net income to pay for water is less than the costs of water at the sources without including the conveyance costs from the sources to the farms (Table B).

Third party impacts of water shortages for all water user groups, including irrigated agriculture, were computed by TWDB for the SCTRWPG (Tables 4-24 through 4-28). The SCTRWPG has recognized the importance of both direct and third party impacts of irrigation water shortages, and has recommended an irrigation technology center, expanded water data and research programs, and major emphasis be placed upon in-depth socio-economic analyses of water shortages in the next water planning cycle (see Section 6).

Table B
Estimates of Income from Irrigation to Produce Crops*
South Central Texas Region

Grains, Cotton, & Nuts	Corn for Food	Cotton (Long Season)	Cotton (Short Season)	Grain Sorghum	Guar	Peanuts	Sesame	Winter Wheat	Spring Wheat
Yield Per Acre	115 bu.	1,000 lb lint	960 lb lint	50.00 cwt**	18.50 cwt**	35.00 cwt**	12.5 cwt**	40.00 bu	50.00 bu
Yield Per Acre		0.81 ton seed	0.77 ton seed					90day/grz	
Water Use Per Acre in Acre-Feet	1.42	1.67	1.00	1.00	1.08	1.75	1.00	1.00	1.08
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Gross Income Per Acre	373.75	789.21	756.48	250.00	296.00	1,120.00	375.00	191.00	200.00
Costs Per Acre Except Irrigation Pumping									
Variable (Seed, Chemicals, Labor, Harvesting)	234.20	495.49	418.60	187.05	174.54	451.46	127.01	141.58	130.79
Fixed (Depreciation, Land, Management)	112.98	128.70	124.15	97.23	87.80	331.11	98.67	62.44	59.82
Total Costs Per Acre Except Irrigation Pumping	347.18	624.19	542.75	284.28	262.34	782.57	225.68	204.02	190.61
Net Income Per Acre to Pay for Water	26.57	165.02	213.73	-34.28	33.66	337.43	149.32	-13.02	9.39
Net Income Per Acre-Foot of Water	18.71	98.81	213.73	-34.28	31.17	192.82	149.32	-13.02	8.69

Deep Rooted Vegetables	Beets for Processing	Cantaloupes for Fresh Mkt	Carrots for Fresh Mkt	Carrots for Processing	Cucumbers for Fresh Mkt	Cucumbers for Pickles
Yield Per Acre	14 tons	300 cartons	500 bags	14 Tons	250 cartons	160 cwt**
Water Use Per Acre in Acre-Feet	1.00	2.33	1.75	1.67	1.67	1.00
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Gross Income Per Acre	560.00	1,800.00	2,750.00	525.00	1,625.00	1,680.00
Costs Per Acre Except Irrigation Pumping						
Variable (Seed, Chemicals, Labor, Harvesting)	229.38	1,672.49	2,530.90	299.89	1,429.68	1,284.11
Fixed (Depreciation, Land, Management)	117.25	128.00	118.25	118.25	115.61	115.12
Total Costs Per Acre Except Irrigation Pumping	346.63	1,800.49	2,649.15	418.14	1,545.29	1,399.23
Net Income Per Acre to Pay for Water	213.37	-0.49	100.85	106.86	79.71	280.77
Net Income Per Acre-Foot of Water	213.37	-0.21	57.63	63.99	47.73	280.77

*"Texas Crop Enterprise Budgets;" Southwest Texas District, Texas Agricultural Extension Service, B-1241(C10); Texas A&M Univ. System, College Sta. Tx., 1997. This is the most recent information available for the SCT region. Income and costs are in 1997 prices. 1997 farm prices were higher than either 1998 or 1999, which results in a higher net income than would have been the result if 1998 or 1999 farm prices had been used.

Continued next page

**cwt means hundredweight.

Table B (Continued)
Estimates of Income from Irrigation to Produce Crops*
South Central Texas Region

Continued from previous page

Shallow Rooted Vegetables	Cabbage for Fresh Mkt	Lettuce for Fresh Mkt	Onions for Fresh Mkt	Spinach for Fresh Mkt	Spinach for Processing
Yield Per Acre	650 bags	500 cartons	750 bags	450 bu	11 Tons
Water Use Per Acre in Acre-Feet	2.33	1.00	2.25	1.67	1.83
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Gross Income Per Acre	2,925.00	2,750.00	5,625.00	2,925.00	814.00
Costs Per Acre Except Irrigation Pumping					
Variable (Seed, Chemicals, Labor, Harvesting)	2,160.63	2,704.13	3,728.05	2,319.55	318.35
Fixed (Depreciation, Land, Management)	121.35	121.67	135.65	123.69	119.56
Total Costs Per Acre Except Irrigation Pumping	2,281.98	2,825.80	3,863.70	2,443.24	437.91
Net Income Per Acre to Pay for Water	643.02	-75.80	1,761.30	481.76	376.09
Net Income Per Acre-Foot of Water	275.97	-75.80	782.80	288.48	205.51

SUMMARY OF NET RETURNS TO WATER AT FARM IN SOUTH CENTRAL TEXAS REGION

CROP	DOLLARS PER ACRE-FOOT (rounded down)	CROP	DOLLARS PER ACRE-FOOT (rounded down)
Grains, Cotton, & Nuts		**Shallow Rooted Vegetables**	
Corn for food	18	Cabbage for Fresh Mkt	275
Cotton (Long Season)	98	Lettuce for Fresh Mkt	-75
Cotton(Short Season)	213	Onions for Fresh Mkt	782
Grain Sorghum	-34	Spinach for Fresh Mkt	288
Guar	31	Spinach for Processing	205
Peanuts	192		
Sesame	149	**Estimated costs of water to meet projected needs in SCTR** **	
Winter Wheat	-13		
Spring Wheat	8	New Reservoirs/Raw Water at Reservoir	$560 to $764 per acft.
Deep Rooted Vegetables		Edwards Recharge/Raw Water in Aquifer	$486 to $627 per acft.
Beets for Processing	213		
Cantaloupes	0	Carrizo CZ-10C Raw Water at Municipal Demand Center	~$390 to $505 per acft.
Carrots for Fresh Mkt	57		
Carrots for Processing	63		
Cucumbers for Fresh Mk	47	Note: Cost estimates presented above do not include cost to pump to location of irrigation need, nor cost to deliver water to irrigation farms within irrigation centers of need; e.g.; irrigation laterals from main pipelines to farms.	
Cucumbers for Pickles	280		

* See footnotes on previous page.
** Abstracted from "Technical Evaluations of South Central Texas Region Water Supply Options", Oct. 1999.

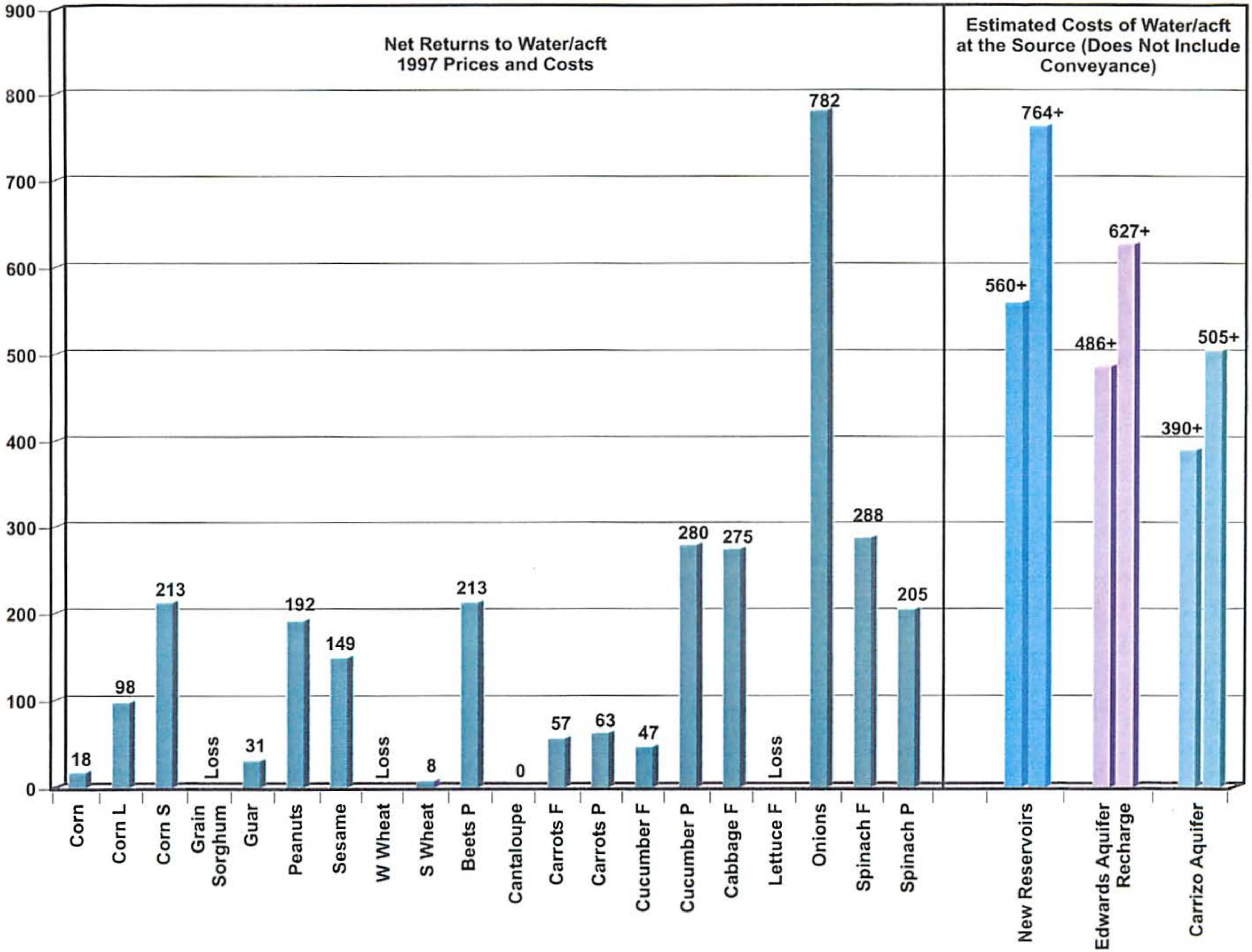

Figure 1. Economic Feasibility of Meeting Projected Irrigation Water Needs
South Central Texas Region

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SUPPLEMENT 2

South Central Texas Region
Regional Water Plan
Special Report

Water Conservation Planning Guidelines

Prepared by Chris Brown

August 2000

Conservation Planning Guidelines
South Central Texas Regional Water Planning Group

Introduction

Aggressive conservation measures have been helping communities in Texas and throughout the world reduce demand as an alternative to developing new water supplies. Large municipal purveyors, such as the San Antonio Water System, have award-winning conservation programs. Many of the elements of conservation programs have been developed into Best Management Practices by agencies such as the California Urban Water Conservation Council and the Edwards Aquifer Authority. The South Central Texas Regional Water Planning Group has chosen the advanced conservation option in projecting water demands for the future. The Conservation Practices and water saving tips in this document will assist communities in meeting those projections.

Successful conservation programs will help to expand the existing water supply of the region by reducing demand. At a minimum conservation programs need to address two means of reducing water use: change of behavior and change of equipment. Turning off the water when it is no longer necessary for rinsing, irrigating, or other productive uses, plays a significant role in reducing demand. Replacing older, less efficient equipment, with new modern equipment can realize water savings mechanically.

These Conservation Planning Guidelines of the South Central Texas Regional Water Planning Group are designed to assist new and existing conservation programs to pick the best of available options to help reduce water demand. Conservation programs are tailored to meet the specific demand profile of communities or regions, as defined in planning documents. As such they will have unique elements regarding the cost of water, the type of promotional activities, and the specific measures which are combined within a program. However, past success in conservation efforts of communities throughout Texas and the western United States has led to the development of a basic framework for program development referred to as conservation best management practices. This Planning Guidelines document is organized into a description of specific Conservation Practices which can be used to meet the demand reductions anticipated in the South Central Texas Regional Water Plan's Option L-10, Demand Reduction.

Each Conservation Practice comprises a grouping of conservation measures. It contains some information that will assist a utility or water district in achieving its goals, and suggestions for how to calculate anticipated water savings. Conservation measures are the basic elements of a practice or program. They include for example toilet retrofits or showerhead replacements.

Each practice description is followed by some coverage prerequisites that will assist a planning unit in designing a successful program. The final section of each Practice is a set of assumptions or equations that will assist in determining the potential water savings.

Conservation practices include system-wide measures, such as System Water Audits, Leak Detection and Repair, Metering of all New Connections and Retrofit of Existing Connections, and Water Waste Prohibition. Practices directed at the customer or general public include Public Information Programs and School Education Programs.

Other conservation practices include measures intended to assist residents and businesses in the installation of new or retrofitted equipment that is water efficient. These include Water Survey Programs for Single- and Multi-Family Residential Customers with Residential Plumbing Retrofit Programs, Residential Ultra-Low-Flush Toilet (ULFT) Replacement Programs, High-Efficiency Washing Machine Rebate Programs, Hot Water on Demand Systems, and Conservation Programs for Industrial, Commercial, and Institutional (ICI) Accounts including ICI ULFT Replacement Programs.

South Central Texas is located in a semi-arid ecoregion on the edge of the Chihuahua desert. High temperatures and long periods without a significant amount of rainfall place a premium on outdoor water conservation. Conservation practices directed at outdoor water use include Landscape Conservation Programs and Incentives and Rainwater Harvesting Systems.

Following the section on Conservation Practices is a list of water saving tips prepared by the Texas Water Development Board. The tips are aimed for the residential water user, and can be used by municipal utilities and water districts in their public information or education programs. The conservation practices described in this document are listed below. References at the end of the Guidelines give additional facts including anecdotal information regarding successful conservation programs that have implemented these practices.

Conservation Practices

1. System Water Audits, Leak Detection and Repair
2. Metering of all New Connections and Retrofit of Existing Connections
3. Water Waste Prohibition
4. Conservation Pricing
5. Public Information Programs
6. School Education Programs
7. Water Survey Programs for Single and Multi-Family Residential Customers (Including Plumbing Retrofit Programs)
8. Residential Ultra-Low Flush Toilet (ULFT) Replacement Programs
9. High-Efficiency Washing Machine Rebate Programs
10. Hot Water on Demand Systems
11. Conservation Programs for Industrial, Commercial, and Institutional Accounts (Including ULFT Replacement Programs)
12. Cooling Water Recirculation Systems
13. Landscape Conservation Programs and Incentives
14. Rainwater Harvesting Systems
15. Agricultural Irrigation Conservation Programs

Conservation Practice 1: System Water Audits, Leak Detection and Repair

Description

System Water Audit and Leak Detection and Repair programs are effective methods of accounting for all water usage within a service area and are essential to a sound water management program. Under this Conservation Practice, the purveyor needs to conduct annual pre-screening system audits to determine if full-scale system audits are necessary. If determined to be necessary, the purveyor then will conduct a full distribution-system audit.

In order to reduce water losses due to leakage, the purveyor needs to maintain a Leak Detection and Repair Program and needs to repair leaks when detected. Unaccounted water losses need to be no more than 10 percent of total water in the system. The purveyor needs to make every effort to inform customers when leaks exist on the customers' side of the meter.

Coverage Conditions

To realize this practice, the purveyor needs to accomplish the following:

1. Annually complete a pre-screening system audit to determine the need for a full-scale system audit. The pre-screening system audit needs to be calculated as follows:
   a. Determine metered sales and other system verifiable uses;
   b. Determine total supply into the system; and
   c. If metered sales plus other verifiable uses represent less than 90 percent of total supply into the system, a full-scale system audit is necessary.
2. Annually conduct a distribution system water audit using methodology consistent with that described in AWWA's "Water Audit and Leak Detection Guidebook" (if applicable);
3. Perform distribution system leak detection when warranted and repair identified leaks when cost-effective; and
4. Advise customers when it appears that leaks exist on the customers' side of the meter.

Water Savings Assumptions

In the case of purveyors who do not have existing programs, substantial savings can accrue from implementing this practice. In the South Central Texas Region some purveyors have shown water loss rates upward of 30 percent prior to implementing System Water Audit and Leak Detection and Repair programs.

Conservation Practice 2: Metering of All New Connections and Retrofit of Existing Connections

Description

Metering of all connections within a service area is an effective method of accounting for all water usage and is essential to a sound water management program. Under this conservation practice, the purveyor needs to meter all new connections within the service area and needs to develop and implement a program to retrofit all existing unmetered accounts within the service area.

Many Industrial, Commercial and Institutional (ICI) accounts use significant amounts of water for landscape irrigation. Unless these accounts have dedicated landscape meters, it is difficult to track and control landscape water usage. For this reason, the purveyor needs to determine the feasibility of retrofitting mixed-use ICI meters with dedicated landscape meters. If it is determined that retrofitting is a feasible method of reducing landscape water usage, the purveyor needs to develop a plan to retrofit mixed-use meters, either through incentive programs or mandates.

Many multi-family and ICI accounts require large meters that cannot measure water usage during low-flow periods. In order to account for all water usage for large users, the purveyor should determine the feasibility of retrofitting multi-family and ICI accounts with compound meters or similar technology.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

20. Install meters on all new connections;
21. Within 1 year of implementation date, develop a plan to retrofit existing unmetered connections;
22. Within 1 year of implementation date, determine the feasibility of retrofitting mixed-use ICI meters with dedicated irrigation meters; and
23. By March 31, 2007, install meters on 100 percent of existing unmetered connections.

Water Savings Assumptions

Assume meter retrofits will result in a 20 percent reduction in demand by retrofitted accounts.

Conservation Practice 3: Water Waste Prohibition

Description

Water Waste Prohibition measures are enforceable actions intended to prohibit specific wasteful activities. Under this practice, the purveyor needs to enact and enforce ordinances to prohibit wasteful activities including: gutter flooding, landscape watering by sprinkler system between the hours of 10:00 a.m. and 8:00 p.m., single pass cooling systems in new connections, non-recirculating systems in new conveyer car washes, non-recirculating systems in new commercial laundry systems, non-recycling decorative water fountains, and other wasteful activities.

Coverage Prerequisites

To realize this practice, the purveyor needs to adopt and enforce water waste prohibitions consistent with the description above.

Water Savings Assumptions

Not quantified. Water savings will depend on previous ordinances and local practices. If available, provide calculated water savings and calculation methodology.

Municipal Conservation Practice 4: Conservation Pricing

Description

Conservation Pricing is a method of encouraging efficient water use through quantity-based pricing structures. In order to provide economic incentives for efficient water use, the purveyor must bill by metered volume of use. Conservation pricing provides incentives to customers to reduce average or peak use, or both. Such pricing includes: rates designed to recover the cost of providing service and billing for water and sewer service based on metered water use.

Conservation pricing is also characterized by one or more of the following components: rates in which the unit rate is constant regardless of the quantity used (uniform rates) or increases as the quantity used increases (increasing block rates); seasonal rates or excess-use surcharges to reduce peak demands during summer months; and rates based upon the long-run marginal cost or the cost of adding the next unit of capacity to the system.

For purveyors supplying both water and sewer service, this Practice applies to pricing of both water and sewer service. Purveyors that supply water but not sewer service need to make good faith efforts to work with sewer agencies so that those sewer agencies adopt conservation pricing for sewer service.

Adoption of lifeline rates for low-income customers will neither qualify nor disqualify a rate structure as meeting the requirements of this Practice.

Coverage Requirements

Purveyors need to maintain rate structure consistent with this Practice's definition of conservation pricing.

Water Savings Assumptions

Studies done within the region have shown a price elasticity of approximately -0.20. This means that for every 10 percent increase in water prices a resulting 2.0 percent reduction in water use may be anticipated. Increase in average income must be factored in by the utility to determine the actual net impact on consumer perception and response to price. For planning purposes this number may be used.

Source: Whitcomb, J., Stratus Consulting, 1999.

Conservation Practice 5: Public Information Programs

Description

Public Information Programs are effective methods of promoting water conservation and informing the public of the necessity to use water efficiently. Under this practice, the purveyor needs to establish and maintain an active public information program to educate and inform the public about water conservation.

An effective public information program should include, but is not limited to: providing speakers to employees, community groups, and the media; using paid and public service advertising; using bill inserts; providing individualized trend and comparison information on bills; and providing informational pamphlets, flyers, and manuals. In order to maximize available resources, the purveyor should coordinate with government agencies, industry groups, public interest groups, and the media.

The purveyor may realize this practice by employing resources available through the Edwards Aquifer Authority, Texas Water Development Board, or Texas Natural Resource Conservation Commission.

Coverage Prerequisites

To accomplish this practice, the purveyor needs to realize the following:

Establish and maintain an active public information program to promote and educate customers about water conservation.

Water Savings Assumptions

Not quantified. If available, provide calculated water savings and calculation methodology.

Conservation Practices 6: School Education Programs

Description

School Education Programs are a proven and widely accepted method of achieving water conservation. Under this practice, the purveyor should establish and maintain an active school education program to inform and educate students within the service area of the importance of efficient water use.

An effective school education program should include, but is not limited to: classroom presentations, instructional assistance, and distribution of educational materials. Grade-appropriate materials and presentations should be available for grade levels K-12. The purveyor is encouraged to coordinate with government agencies, industry groups, public interest groups, and the media to maximize available educational resources. Education materials should meet the state education framework requirements. Some programs, such as the "Learning to Be Water Wise and Energy Efficient" program described below, also include retrofit kits for use in the home.

Coverage Prerequisites

To realize this practice, the purveyor should accomplish the following:

Establish and maintain an active school education program to educate students in the service areas about water conservation and efficient water usage.

To accomplish this practice the following documentation will assist the purveyor:

1. Number of school presentations made annually;

2. Number and grade level of students reached;
3. Number of in-service presentations or teacher's workshops conducted annually;
4. Number of teachers reached;
5. Number and type of curriculum materials developed or provided by the purveyor; and
6. Estimated water savings achieved through school education programs.

Water Savings Assumptions

Not quantified. If available, purveyors should attempt to calculate water savings and costs. The exact methods and content of programs will affect the final water savings obtained.

One successfully implemented program where water savings have been quantified in Texas was the Harris-Galveston, Texas, collaboration with schools and private partners to distribute conservation kits to sixth-grade students using the "Learning to Be Water Wise and Energy Efficient" curriculum. At a cost of $31 per kit, water savings were calculated at an average of 1,400 gallons per month per household over a 10-year period.[1]

Conservation Practice 7: Water Survey Programs for Single-Family and Multi-Family Residential Customers

Description

Water survey programs are an effective method of tracking and controlling water usage in the single-family and multi-family residential sector. Under this practice, the purveyor needs to develop and implement a plan to market water-use surveys to single-family and multi-family residential customers.

At a minimum the survey needs to include: meter checks; leak checks for toilets and faucets; determination of flow rates for showerheads, aerators, and toilets; irrigation system and timer checks; and review or development of irrigation schedules. Residential water-use surveys should also include measurement of currently landscaped and total irrigable areas. The purveyor needs to provide the customer with an information packet including evaluation results and water saving recommendations.

Purveyors should include water softener checks in residential water surveys and should distribute information about demand-initiated regenerating (DIR) and exchange-type water softeners to encourage replacement of the less efficient timer models.

Residential Plumbing Retrofit Programs

A related method of reducing residential water use is plumbing retrofits. Under this practice, the purveyor should identify single-family and multi-family residences constructed prior to 1992, and develop a plan to distribute or directly install high-quality, low-flow plumbing devices as needed. High-quality, low-flow plumbing devices include: showerheads rated at 2.5 gallons per minute (gpm) or less, faucet aerators rated at 2.2 gpm or less, toilet displacement devices, and

[1]Gerston, J., "Schoolkids Home in on Conservation," Texas Watersavers, TAEX, College Station, Texas, Summer 1998.

toilet flappers. The purveyor needs to maintain the distribution or installation programs to achieve retrofits on at least 10 percent of single-family residences and 10 percent of multi-family residences each reporting period.

The purveyor may meet the prerequisites of this practice through enforceable ordinances requiring replacement of inefficient plumbing fixtures.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

1. Within 1 year of implementation date, develop and implement a plan to market water-use surveys to single-family and multi-family residential customers;
2. Within 10 years of implementation, contact and offer water-use surveys to all single-family and multi-family residential customers;
3. Within 10 years of implementation, complete water-use surveys for at least 15 percent of single-family residential accounts; and
4. Within 10 years of implementation, complete water-use surveys for at least 15 percent of multi-family residential accounts.

Water Savings Assumptions

Calculate water savings as follows:

Water Savings = Device Savings * Number of Devices * Probability of Installation

Where:

Device Savings may be found in the Retrofit Device Savings table.

Probability of Installation may be determined by the purveyor using the following guidelines or may be determined independently by the purveyor.

a. 100 percent for retrofits resulting from surveys conducted by the purveyor
b. 80 percent for retrofits resulting from customer requests for survey kits
c. 50 percent for retrofits resulting from survey kit distribution at public events
d. Survey follow-ups increase the probability of installation.

Retrofit Device Savings Table

Device	***Initial Savings (gpd per device)***	***Device Life Span***
Low Flow Showerheads	5.5 gpd	3 to 7 years
Toilet Displacement Devices	4 gpd	2 to 5 years
Faucet Aerators	1.5 gpd	1 to 3 years
Toilet Leak Detection	.64 gpd (8 gpd per repaired leaking toilet; 8 percent of toilets leaking)*	7 to 10 years
Other Household Leak Check	.5 gpd (12.4 gpd per household repair; 4 percent of households with leaks)	7 to 10 years
Turf Survey	12.2 gpd	4 years
Turf Survey with Timer	25.9 gpd (12.2 gpd for turf audit plus 14.7 if timer)	4 years
Source	Field Studies	Judgement

*Municipal purveyors that implement conservation programs with household leak repairs are recommended to update these calculations at their earliest convenience as water hardness and age of device will have direct impacts on these rates.

Source: A&N Technical Services, Inc, 1999.

Conservation Practice 8: Residential ULFT Replacement Programs

Description

Ultra-low-flush toilet (ULFT) replacement programs are an effective method of achieving conservation in the residential sector. Under this practice, the purveyor needs to develop and implement a program to replace existing high-water-using toilets with ULFTs in single-family and multi-family residences. ULFTs are toilets that use 1.6 gallons per flush or less.

The purveyor's ULFT replacement programs need to be at least as effective as ordinances requiring toilet replacement at the time of resale.

Purveyors should consider supplementing ULFT replacement programs with ordinances that require ULFT replacement at the time of resale.

Coverage Prerequisites

To receive credit for this practice, the purveyor needs to accomplish the following:

Develop and implement a program to replace existing high-water-using toilets with ULFTs in single-family and multi-family residences.

Water Savings Assumptions

Calculate water savings as follows:

For single-family dwellings:

> Water Savings = [6.693 * Persons per Dwelling - 0.529 * (Persons per Dwelling)2 + 7.826] * 365 * Number of Toilets

OR

> Water Savings = [29.9 * Number of First Toilets Replaced + 20.6 * Number of Second Toilets Replaced + 19.1 * Number of third (or higher) Toilets Replaced] * 365

For multi-family dwellings:

> Water Savings = [19.138 * Persons per Unit - 0.942 * (Persons per Unit)2 + 2.181] * 365 * Number of Toilets

OR

> Water Savings = [44 * Number of First Toilets Replaced + 34 * Number of Second Toilets Replaced] *365

Where: Water Savings = Gallons per Year

Source: A&N Technical Services, Inc., 1999.

Conservation Practice 9: High-Efficiency Washing Machine Rebate Programs

Description

High-efficiency washing machines are an effective method of achieving conservation in the residential sector. Under this practice, the purveyor needs to offer cost-effective financial incentives to encourage the purchase and use of high-efficiency washing machines. Incentive levels may be calculated using methods found in *A Guide to Customer* Incentives *for Water* Conservation, prepared by Barakat and Chamberlain (February 1994).

Incentives and rebates may be offered in conjunction with rebate programs sponsored by local energy providers.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

Provide cost-effective customer incentives for the purchase of high-efficiency washing machines.

Water Savings Assumptions

Calculate water savings as follows:

For single-family machines:

> Water Savings = Savings per Load * Water use per Load * Loads per Person * Persons per Household * 365 * Number of Machines

For multi-family machines:

> Water Savings = Savings per Load * Water use per Load * Loads per Person * Persons per Household * Units per Machine * 365 * Number of Machines

Where: Water Savings = Gallons per Year
Savings per Load = 37.8 percent
Water Use per Load = 48.5 Gallons
Loads per Person = 0.45

Source: A&N Technical Services, Inc., 1999.

Conservation Practice 10: Hot Water on Demand Systems

Description

Hot water on demand systems deliver hot water at the showerhead or faucet without draining cold water from the pipes between the fixture and the water heater. This is accomplished by either a valve and pump to recirculate cold water to the water heater, or by using a instantaneous heater located near the fixture of interest. In the valve and pump system, the recirculating pump stops and the valve closes when a temperature sensor measures the arrival of hot water from the heater.

Factors that influence savings include the distance between the water heater and the fixtures, and pipe location and insulation (pipes are often uninsulated and in attics or under a pier and beam foundation). Most of these devices are targeted for the single-family residential sector, although the ICI and multi-family sectors have potential.

Some communities have taken the approach of requiring installation of recirculating hot water systems similar to those used in the commercial sector in new houses.

Coverage Prerequisites

To accomplish this practice, the purveyor needs to achieve the following:

1. Establish and maintain an active public information program to promote and educate customers about hot water on demand systems;
2. Identify average distance from hot water heater to shower in local homes or businesses;
3. Determine the benefits of a hot water on demand systems for average home or business, and develop incentives for existing customers to retrofit; or

4. Where pertinent an ordinance requiring installation of hot water on demand systems in new construction.

Water Savings Assumptions

Savings Calculation (gpd/hot water demand unit):

Water Savings = Cold Start Hot Water Runs * Savings per Run * Plumbing

Where: Cold Start Hot Water Runs = PPH * Hot Water Runs * Scale Factor
Savings per Run: Mean: 4.0 gallons per hot water run; Range: 2 to 12 gallons per run
Hot Water Runs: Mean: 6 hot water runs per day per person; Range: 2 to 10
Scale Factor: .8
PPH: Persons per household—single-family
Plumbing: .75 Plumbing system factor assumes half of houses realize only half savings.

Source: A&N Technical Services, Inc., 1995; CEC, 1995.

The savings figures are for retrofits. The savings estimates may be underestimated because they do not account for all behavioral components. For example, many people tend to warm up their water beyond what is necessary (e.g., until it "steams").

Conservation Practices 11: Conservation Programs for Industrial, Commercial, and Institutional Accounts

Description

Conservation programs for industrial, commercial, and institutional (ICI) accounts are essential for reducing water usage in the ICI sector. Under this practice, the purveyor needs to identify industrial, commercial, and institutional customers and rank them according to water usage.

To accurately track water usage by ICI accounts, the purveyor needs to develop and market an ICI water-use survey and customer incentives program. Directly contact (via letter, telephone, or personal visit) and offer water use surveys and customer incentives to at least 10 percent of commercial, industrial, and institutional accounts on a repeating basis. A water use survey needs to include: a site visit; an evaluation of all water-using equipment and processes; a report identifying recommended conservation measures and their expected payback; and available agency incentives. The purveyor should conduct annual follow-up visits to evaluate the status of recommended water-saving improvements.

In lieu of the water-use survey and customer incentives program, the purveyor may choose to implement other programs to reduce water usage in the ICI sector. The purveyor may reduce ICI water usage through rebates for equipment replacement, perform workshops targeted to specific sectors of their ICI base, or provide other incentives for new and established businesses to improve their water efficiency.

Providing educational materials for visitors to South Central Texas through commercial hospitality industry, such as optional laundry services in hotels/motels, is one innovative example of public/private partnerships for water conservation in San Antonio. Incentives for commercial and industrial users who can recycle water internally can also lead to significant water savings. On-site water recycling systems require proper plumbing and treatment equipment. Retrofits of existing and construction of new car washes or other industrial uses in San Antonio have shown recycling capabilities of 60 to 90 percent.

For purposes of this practice, commercial, industrial, and institutional customers are defined as follows:

A. Commercial Customers: any water user that provides or distributes a product or service, such as hotels, restaurants, office buildings, commercial businesses, or other places of commerce. These do not include multi-family residences, agricultural users, or customers that fall within the industrial or institutional classifications.
B. Institutional Customers: any water-using establishment dedicated to public service. This includes schools, courts, churches, hospitals, and government facilities. All facilities serving these functions are to be considered institutions regardless of ownership.
C. Industrial Customers: any water users that are primarily manufacturers or processors of materials as defined by the Standard Industrial Classifications (SIC) Code numbers 2000 through 3999.

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

1. Identify industrial, commercial, and institutional accounts and rank them by water use;
2. Within 10 years of initiation, contact and offer water-use surveys and/or customer incentives to 100 percent of ICI accounts;
3. Within 10 years of initiation, complete water-use surveys for 10 percent of ICI accounts; and
4. If utilizing other programs in lieu of the water-use survey and customer incentives program: within 10 years of initiation, reduce ICI water usage by 10 percent of baseline ICI usage.

Water Savings Assumptions

Calculate water savings as follows:

Water Savings = Number of Surveys * Estimated Savings * Water Used

Where: Estimated Savings = 18 percent or percentage determined through survey results
Water Used = Average (5 years) annual water use by ICI customers receiving the survey

Source: A&N Technical Services, Inc., 1999.

For purveyors considering a ULFT replacement or retrofit program for ICI customers the following table will assist in calculating estimated water savings by market segment.

Savings per ICI ULFT Installed

Market Segment	*Estimated Savings (gpd)*	*90 percent Confidence Interval*
Wholesale	57	19-94
Food Store	48	37-59
Restaurant	47	36-58
Retail	37	33-42
Automotive	36	22-50
Multiple Use	29	14-45
Religious	28	20-37
Manufacturing	23	15-32
Health Care	21	13-28
Office	20	17-23
Miscellaneous	17	11-23
Hotel/Motel	16	11-20
Source: Hagler Bailly Services, 1997.		

ICI Conservation Practice 12: Cooling Water Recirculation

The use of water for cooling towers in industrial and commercial applications represents a significant water use in the South Central Texas. Water is typically used to cool heat-generating equipment or to condense gases in a thermodynamic cycle. Single-pass cooling is the most water-intensive cooling method used in industrial applications. Water contacts a heat source, lowers its temperature, and then is discharged.

Recycling water within a recirculating cooling system can greatly reduce water use by using the same water to perform several cooling operations. The EPA notes that the water savings are sufficiently substantial to result in overall cost savings to the industry.[2] Three cooling water conservation approaches that can be used to reduce water use are evaporative cooling, ozonation, and air heat exchange (Brown and Caldwell, 1990).

In industrial/commercial evaporative cooling systems, water loses heat when a portion of it is evaporated. Evaporation, drift, and blowdown result in substantial water loss from evaporative cooling towers. (Blowdown is a process in which some of the poor-quality recirculating water is discharged from the tower in order to reduce the total dissolved solids and protect the equipment from corrosion.) Water savings associated with the use of evaporative cooling towers can be increased by treating the water to reduce blowdown or water discharges from cooling towers.

[2]EPA, Cleaner Water Through Conservation, http://www.epa.gov/OWOW/NPS/sec6/chap3.html, 2000

Air heat exchange works on the same principle as a car's radiator. In an air heat exchanger, a fan blows air past finned tubes carrying the recirculating cooling water. Air heat exchangers involve no water loss, but they can be relatively expensive when compared with cooling towers (Brown and Caldwell, 1990).

Coverage Prerequisites

To realize this practice, the purveyor needs to accomplish the following:

1. Identify industrial, commercial, and institutional accounts with significant water use for cooling;
2. Within 10 years of initiation, contact and offer water-use surveys and/or customer incentives to 100 percent of these ICI accounts;
3. Within 10 years of initiation, complete water-use surveys for 10 percent of ICI accounts; and
4. If utilizing other programs in lieu of the water-use survey and customer incentives program: within 10 years of initiation, reduce ICI water usage by 10 percent of baseline ICI cooling water usage.

Water Savings Assumptions

Steam generating plants have shown ten-fold reductions in water use by converting from water heat exchangers to air heat exchangers. The higher cost of operating an air heat exchanger may provide a disincentive to such conversions. Industrial, commercial and institutional consumers may save significant amounts of water by moving from single-pass cooling to multiple cycles through use of chemical or ozone treatment systems.

The use of ozone to treat cooling water (ozonation) can result in a five-fold reduction in blowdown when compared to traditional chemical treatments and should be considered as an option for increasing water savings in a cooling tower (Brown and Caldwell, 1990).

A simple formula for estimating potential savings is:

> Water Savings = (evap loss in gpm/(cycles of concentration after conversion- 1)) - (evap loss in gpm/(cycles of concentration before conversion - 1))

Where: evap loss in gpm = 30 gpm evaporation is standard for a 1,000 ton cooling tower

Source: San Antonio Water System Conservation Department, 2000.

Conservation Practices 13: Landscape Conservation Programs and Incentives

Description

Landscape conservation programs are an effective method of accounting for and reducing outdoor water usage. Under this practice, the purveyor should provide non-residential customers with customer support, education, incentives, and assistance in improving their landscape water use efficiency. To increase the cost-effectiveness of these programs many purveyors target customers with large landscapes.

The purveyor should identify accounts with dedicated irrigation meters and assign PET-based water use budgets equal to no more than 100 percent of the potential evapotranspiration of turfgrass per square foot of landscape area.[3] For accounts with water-use budgets, the purveyor should provide notices each billing cycle showing the relationship between budgeted water usage and actual consumption.

The purveyor should develop and implement a plan to market large landscape water-use surveys to Industrial, Commercial and Institutional (ICI) accounts with mixed-use meters. At a minimum the water-use surveys should include: measurement of the landscape area; measurement of the total irrigable area; irrigation system checks and distribution uniformity analysis; review of irrigation schedules or development of schedules as appropriate; provision of a customer survey report and information packet. When cost-effective, the purveyor should offer the following: landscape water-use analyses and surveys; voluntary water-use budgets; installation of dedicated landscape meters; and follow-up to water-use analyses and surveys. Similar services can be extended to residential customers.

The San Antonio Water System offers rebates to customers who install xeriscape landscaping in place of turfgrass. Xeriscape plants are typically lower water users than turfgrass and are better adapted to long periods without rainfall. Greywater reuse systems are another innovative means of supplementing or replacing potable irrigation water for landscape irrigation. Proper filtration is required on greywater reuse systems.

For new customers and change-of-service customer accounts, the purveyor should provide information on landscape design appropriate to the climate and efficient irrigation equipment and management. The purveyor should install water-efficient landscaping appropriate to the climate at water-agency facilities and install landscape meters where appropriate. Ordinances requiring minimum design standards for efficient irrigation systems is another potential approach.

When cost-effective, the purveyor should consider offering the following services:

1. Training in landscape maintenance and irrigation system design;
2. Financial incentives (such as loans, rebates, and grants) to improve irrigation system efficiency and to purchase and/or install water efficient irrigation systems;
3. Financial incentives to replace high-water-use plants with drought-tolerant ones;
4. Rebates and incentives to purchase rain sensors or soil-moisture sensors;
5. Notices at the start and end of the irrigation season alerting customers to check irrigation systems and to make repairs and adjustments as necessary.

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[3]Potential evapotranspiration data for turfgrasses can be obtained from the Texas A&M PET web site (http://texaset.tamu.edu/). Potential Evapotranspiration (PET) = reference evapotranspiration (ETo) multiplied by a cool-season turfgrass coefficient. Information on adjusting the coefficient for common varieties of warm-season grasses found in South Central Texas can be found in the *"San Antonio EvapoTranspiration Pilot Study Report,"* Texas Agricultural Extension Service, Bexar County, for San Antonio Water System, 1998.

Coverage Prerequisites

To realize this practice, the purveyor should accomplish the following:

1. Within 1 year of implementation date, develop and implement a plan to market water-use surveys to ICI accounts with mixed-use meters;
2. Within 1 year of implementation date, develop and implement a customer incentive program;
3. Within 2 years of implementation date, develop ETo-based water-use budgets for 90 percent of ICI accounts with dedicated irrigation meters;
4. Within 10 years of implementation date, contact and offer landscape water-use surveys to 100 percent of ICI accounts with mixed-use meters; and
5. Within 10 years of implementation date, complete landscape water-use surveys for at least 15 percent of ICI accounts with mixed-use meters.

Water Savings Assumptions

For planning purposes assume landscape surveys will result in a 15 percent reduction in demand for landscape uses by surveyed accounts. Actual savings should be calculated from surveys or landscape conversions that are realized.

Conservation Practice 14: Rainwater Harvesting

Description

Rainwater harvesting has been practiced in Texas to provide for household, landscape, livestock, and agricultural use. By catching the rain that falls upon the roof or other impervious surface and routing it to a cistern for storage an additional or alternative water supply can be created.

Rainwater harvesting can be a significant supply where costs for drilling and pumping water are high or as a supplement where supply limitations call for augmentation to provide for aesthetic uses such as landscape watering. A successful project calls for adequate storage space to accommodate anticipated uses of the water and intermittent and intense rainfall events.

Rainfall harvesting systems in Texas have capacities ranging from 55 gallon water barrels to 25,000 gallon capacity ferrocement or metal cisterns. Rainfall harvesting requires an impervious surface, preferably smooth, but some composite roofs are used. Water is collected and transferred to the cistern by means of pipes and then pumped to its final use. The final use dictates the type of treatment or filtration the water will need. Screening, settling, filtering, and disinfecting are all techniques which may be used in a rainwater harvesting system.

In addition to public education about the water saving potential for rainwater harvesting, incentives can be offered to customers who choose to install a system. The City of Austin, Texas, offers a rebate to its customers who properly install a rainwater harvesting system. The costs for design and installation of a rainwater harvesting system during new construction are significantly lower than retrofits. Rainwater harvesting systems may also be combined with greywater reuse system, but additional filtration equipment is required for the greywater.

Coverage Prerequisites

To accomplish this practice, the purveyor needs to achieve the following:

1. Identify potential uses of rainwater harvesting in their planning area;
2. Establish and maintain an active public information program to promote and educate customers about rainwater harvesting;
3. Where a rebate program is established, keep records of the total number of rebates and gallons saved.

Water Saving Assumptions

In the South Central Texas planning region average annual precipitation rates range widely—from 21 inches in the west to 40 inches in the east. Each inch of rain represents 0.62 gallons of water for each square foot of collection area. Catchment efficiency rates are estimated to be from 75 percent to 95 percent.

Water Savings = Inches of rain * area of catchment in sq. ft. * 0.62 * catchment efficiency rate.

Source: Texas Water Development Board, 1997.

Conservation Practice 15: Agricultural Irrigation Conservation

Description

Over the last several decades irrigation technology and cropping practices have dramatically increased the efficiency of water use in farming, leading to lower water and energy costs. This demand reduction can also play a part in conservation planning for future water needs. The Edwards Aquifer Authority has developed a number of Best Management Practices for agricultural irrigation conservation that are summarized in this Practice.

Leak detection and repair programs are an effective method of minimizing water losses due to leakage. An irrigator needs to develop and implement a program to regularly monitor and maintain irrigation pipelines, canals, equipment, etc. Lining of irrigation ditches is another effective method of reducing water losses due to percolation. Lining materials may include, but are not limited to, flexible pipelines, plastic membranes, or concrete.

Irrigation equipment can also increase water-use efficiency through increasing the uniformity of water application, thus reducing water waste. Depending upon soil type and slope, size, and shape of the field, a number of options are available. A generally accepted list of water saving irrigation techniques includes: surge-flow, side-roll sprinkler, center-pivot sprinkler such as LPIC or LEPA,[4] linear-move sprinkler, and drip- or micro-irrigation systems.

In addition to irrigation techniques a number of irrigation and farming practices can contribute significant water savings. These include irrigation scheduling, tailwater recovery and reuse systems, furrow dikes, land leveling, cropping practices, and use of treated effluent for non-food

[4] LPIC = Low Pressure in Canopy (includes LEPA-like systems which do not have all LEPA components)
LEPA = Low Energy Precision Application

crops. These farming conservation practices can be combined with efficient irrigation techniques to extend water savings.

A water district or other planning unit needs to provide incentives in the form of assistance with the expense of retrofitting or installing efficient irrigation equipment. A number of federal programs exist which assist with the financing of water conserving irrigation equipment. Accelerated conservation programs can work in tandem with programs such as the Environmental Quality Incentives Program (EQIP).

Coverage Prerequisites

In order to achieve this practice, the planning unit needs to account for the following information:

1. Copies of equipment invoices or other evidence of equipment purchase;
2. Within 1 year of implementation date, farmer installs and maintains a water conserving irrigation system consistent with the description above; and
3. Evidence of equipment installed to monitor soil moisture, reference evapotranspiration (ETo), or crop water stress index (CWSI) to implement an irrigation schedule.

Where applicable, the following may be documented:

1. Description of tailwater recovery and reuse system;
2. Description of irrigation system used with furrow dikes;
3. Pre- and post-leveling grade and roughness, or other evidence of leveling activities;
4. Replacement of potable water usage with usage of treated municipal effluent for irrigation of non-food crops; or
5. Change of crops or cropping practices to reduce irrigation water usage.

Water Savings Assumptions

Savings calculation.

Total annual water savings = Current total water applied - potential total water applied

Where: potential total water applied = (current total water applied) * (present application efficiency) ÷ (potential application efficiency)

***Representative Application Efficiency*[1]**

System Type	***Percentage Efficiency Range***
Stationary Sprinklers	20 to 60%
Furrow	50 to 65%
Surge-flow	60 to 65%
Center Pivot Systems[2]	
Spray	40 to 78%
LPIC	75 to 90%
LEPA	80 to 95%
Drip- or Micro-irrigation	70 to 95%

1 Soil type, field contours, and age and maintenance level of current system will affect actual values. The author recommends consultation with NRCS field staff from a local office to determine values for particular fields within the South Central Texas Region.

2 Linear Move Irrigation systems, depending upon their design, may have efficiencies in the range of Center-Pivot Spray systems to as high as Center Pivot LPIC systems if they have dropped heads.

Source: NRCS, Irrigation Water Savings Documentation Form

Water Saving Tips

In the Bathroom...

- Install a low-flow showerhead that limits the flow from the shower to less than 3 gpm.
- Take short showers and install a cutoff valve, or turn the water off while washing and back on again only to rinse.
- Take a shower instead of taking a bath. Showers with low-flow showerheads often use less water than taking a bath.
- Reduce the level of the water being used in a bathtub by 1 or 2 inches if a shower is not available.
- Shampoo hair in the shower. Shampooing in the shower takes only a little more water than is used to shampoo hair during a bath and much less than shampooing and bathing separately.
- When remodeling a bathroom, install a new low-volume flush toilet that uses only 1.6 gallons per flush or choose a dual flush option toilet fixture.
- Test toilets for leaks. Add a few drops of food coloring or a dye tablet to the water in the tank, but do not flush the toilet. Watch to see if the coloring appears in the bowl within a few minutes. If it does, the toilet has a silent leak that needs to be repaired.

- Use a toilet tank displacement device such as a toilet dam or bag. Also, a plastic bottle can be filled with stones or water, recapped, and placed in the toilet tank. These devices will reduce the volume of water in the tank but will still provide enough for flushing. (Bricks are not recommended since they eventually crumble and could damage the working mechanism.) Displacement devices are not recommended with new low-volume flush toilets.
- Never use the toilet to dispose of cleansing tissues, cigarette butts, or other trash. This wastes a great deal of water and also places an unnecessary load on the sewage treatment plant or septic tank.
- Do not use hot water when cold will do. Water and energy can be saved by washing hands with soap and cold water. Hot water should be added only when hands are especially dirty.
- Do not let the water run when washing hands. Water should be turned off while washing and scrubbing and be turned on again to rinse. A cutoff valve may be installed on the faucet.
- When brushing teeth, turn the water off until it is time to rinse.
- When shaving, fill the lavatory basin with hot water instead of letting the water run continuously.
- Install faucet aerators to reduce water consumption.

In the Kitchen...

- Scrape the dishes clean instead of rinsing them before washing. There is no need to rinse unless they are heavily soiled.
- Use a pan of water (or place a stopper in the sink) for washing and rinsing pots, pans, dishes, and cooking implements, rather than turning on the water faucet each time a rinse is needed.
- Never run the dishwasher without a full load. This practice will save water, energy, detergent, and money.
- Use the garbage disposal sparingly or start a compost pile.
- Keep a container of drinking water in the refrigerator. Running water from the tap until it is cool is wasteful. Better still, both water and energy can be saved by keeping cold water in a picnic jug on a kitchen counter to avoid opening the refrigerator door frequently.
- Use a small pan of cold water when cleaning vegetables, rather than letting the water run over them.
- Use only a little water in the pot and put a lid on it for cooking most food. Not only does this method save water, but food is more nutritious since vitamins and minerals are not poured down the drain with the extra cooking water.
- Always keep water conservation in mind, and think of other ways to save in the kitchen. Small kitchen savings from not making too much coffee or letting ice cubes melt in a sink can add up in a year's time.

In the Laundry...

- Wash only a full load when using an automatic washing machine (32 to 59 gallons are required per load).
- Whenever possible, use the lowest water-level setting on the washing machine for light or partial loads.
- Use cold water as often as possible to save energy and to conserve the hot water for uses that cold water cannot serve. (This is also better for clothing made of today's synthetic fabrics.)

For Appliances and Plumbing...

- Check water requirements of various models and brands when considering purchasing any new appliances. Some use less water than others.
- Check all water-line connections and faucets for leaks. A slow drip can waste as much as 170 gallons of water EACH DAY, or 5,000 gallons per month, and will add to the water bill.
- Learn to repair faucets so that drips can be corrected promptly. It is easy to do, costs very little, and can mean a substantial savings in plumbing and water bills.
- Check for hidden water leakage such as a leak between the water meter and the house. To check, turn off all indoor and outdoor faucets and water-using appliances. The water meter should be read at 10 to 20 minute intervals. If it continues to run or turn, a leak probably exists and needs to be located.
- Insulate all hot water pipes to reduce the delays (and wasted water) experienced while waiting for the water to "run hot."
- Be sure the water heater thermostat is not set too high. Extremely hot settings waste water and energy because the water often has to be cooled with cold water before it can be used.
- Use a moisture meter to determine when houseplants need water. More plants die from over-watering than from being on the dry side.

For Outdoor Use ...

- Water only when needed. Look at the grass, feel the soil, or use a soil moisture meter to determine when to water.
- Do not over-water. Soil can hold only so much moisture, and the rest simply runs off. A timer will help, and either a kitchen timer or an alarm clock will do. Apply only enough water to fill the plant's root zone. Excess water beyond that is wasted. Three quarters of an inch to 1 inch of water applied once a week in the summer will keep most Texas grasses alive and healthy.
- Water lawns early in the morning during the hotter summer months. Otherwise, much of the water used on the lawn can simply evaporate between the sprinkler and the grass.
- Forget about watering the streets or walks or driveways. They will never grow a thing.
- To avoid excessive evaporation, use a sprinkler that produces large drops of water, rather than a fine mist. Sprinklers that send droplets out on a low angle also help control evaporation. Adjust sprinkler heads as necessary, to avoid waste and runoff and ensure proper coverage.

- Set automatic sprinkler systems to provide thorough but infrequent watering. Pressure-regulating devices should be set to design specifications. Rain shutoff devices can prevent watering in the rain.
- Use drip-irrigation systems for bedded plants, trees, or shrubs, or turn soaker hoses upside-down so the holes are on the bottom. This will help avoid evaporation.
- Water slowly for better absorption, and never water on windy days.
- Condition the soil with mulch or compost before planting grass or flowerbeds so that water will soak in rather than run off.
- Fertilize lawns at least twice a year for root stimulation, but do not over-fertilize. Grass with a good root system makes better use of less water and is more drought-tolerant.
- Do not scalp lawns when mowing during hot weather. Taller grass holds moisture better. Grass should be cut fairly often, so that only 1/2 to 3/4 inch is trimmed off. A better looking lawn will result.
- Use a watering can or hand water with the hose in small areas of the lawn that need more frequent watering (those near walks or driveways or in especially hot, sunny spots).
- Use water-wise plants. Learn what types of grass, shrubbery, and plants do best in the area and in which parts of the lawn, and then plant accordingly. Choose plants that have low water requirements, are drought-tolerant, and are adapted to the area of the state where they are to be planted.
- Consider decorating some areas of the lawn with wood chips, rocks, gravel, or other materials now available that require no water at all.
- Do not "sweep" walks and driveways with the hose. Use a broom or rake instead.
- When washing the car, use a bucket of soapy water and turn on the hose only for rinsing.
- Learn and use waterwise concepts in your landscape.

Source: Texas Water Development Board, 2000.

Acknowledgments

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Section 7
Regional Water Plan Adoption

7.1 Facilitation

7.1.1 Overview

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. In addition, the Chair has fostered an atmosphere of fairness and open dialogue during the regular meetings of the RWPG. The group has also 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 major 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. The Public Involvement Program, already described, played a major role in shaping a broadly acceptable plan. In addition, the Technical Consultant supported the process of building consensus by providing the necessary tools and technical means for testing alternative approaches. The full facilitation process, then, must be seen as the interplay of all these efforts.

7.1.2 Initial Workshop

After many months of meetings devoted to procedural matters, the RWPG held a workshop (January 1999), organized by the Facilitation and Public Involvement teams. The session helped the planning group begin discussions on substantive issues, revise the goal statement, initially adopt the evaluation criteria presented in Chapter 6 and begin the process of identifying the water options and strategies they wished to have technically evaluated. Regarding the options and strategies, the RWPG had a list of over 100 technical options for meeting water needs in the region. An early major step was to select a limited number for evaluation while committing the group to the principle of remaining as inclusive of strategies as possible. Over the next few months, the selection and redefinition of options and strategies was completed and the evaluation process was begun by the Technical Consultant.

7.1.3 Interviews

In addition to structured discussions during the workshop, the Facilitation Team used another technique to identify the issues and concerns most important to members of the RWPG. Individual interviews were held on a confidential basis in order to encourage members to be as candid as possible about their aims and hopes for the process. The interviews brought out numerous issues, later summarized in a report, that needed to be addressed if consensus was to be achieved.

7.1.4 Facilitation

The major procedural objectives of the Facilitation Team, as expressed in the Scope of Work, remained central throughout the many months of meetings, workshops and small group sessions that comprised the major portion of the planning process. These were:

1. To facilitate a good working relationship among the RWPG members in order to lay the foundation for the decision process,
2. To facilitate the process of identifying and assessing the trade-offs among various water supply options and strategies by the application of selection criteria developed through the public participation process,
3. To assist the RWPG in using the criteria to formulate as many as six regional water management alternative plans for initial evaluation, then facilitate the process by which those six were reduced to three, then reduced to two,
4. To provide facilitation, as needed, during the RWPG's decision making process in order to
   - Ensure that all viewpoints were heard;
   - Ensure that minority viewpoints were preserved;
   - Ensure that the decision making process abided by any ground rules established by the RWPG;
   - Ensure the decision making process was fair and unbiased;
5. To coordinate closely with the Technical Consultant, the Public Involvement Consultant, the Chairperson and the Administrator in order to harmonize efforts to achieve agreement among the RWPG members on a consensus plan.

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.

7.1.5 Development of Alternatives

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 in moving to the next step of narrowing the number of alternatives.

7.1.6 Selection of Initially Prepared Plan

The process of selecting a plan originally envisioned by the Planning Group and incorporated into the Scope of Work for consultants, prepared in 1998, called for first developing as many as six alternative plans, then narrowing these down to as many as three for further evaluation, then two and finally arriving at agreement on the regional plan itself. After completing the first step in this process by the end of June 2000, the RWPG members felt there was no time to complete the remaining steps as originally contemplated. Instead of fashioning three alternatives based on the input to that point, the members chose to use a "single-text" procedure in the interest of meeting the deadline for preparation of the Initially Prepared Regional Water Plan. That procedure consists of focusing on a single plan and making revisions to it until consensus has been achieved.

By the time the RWPG members developed the single text, known as the "Hybrid Alternative", they had become familiar with extensive information from the public and from various county, municipal and other local officials about concerns relating to particular management strategies and the major alternatives. They had developed from this input a keen sense of which strategies and alternatives would gain the widest acceptance across the region. 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.

7.2 Public Participation

7.2.1 Introduction

Moorhouse Associates, Inc. was contracted by the SCTRWPG to provide Public Participation professional services. Moorhouse Associates representatives attended all RWPG meetings and staff work group meetings conducted during the planning process. The public participation process for the SCTRWPG was designed to facilitate information out to the public about the work of the planning group throughout the process, and to provide feedback from the public at key decision points.

7.2.2 Phase I Public Participation

The first phase of the public participation contract consisted of project planning and involved working with the planning group members, technical contractor, and the facilitator to define public participation roles and objectives. It 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. The criteria adopted by the planning group were those developed during the Trans Texas process. Future public participation and planning group input was designed to further define and/or weight these criteria for use in developing the regional water plan. The criteria, as adopted by the SCTRWPG, are listed in Section 6.5 of this volume.

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.

7.2.3 Phase II Public Participation

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 as to how they would like to see the public participation process occur, how to best reach the group or groups that they represent on the committee, and how they would like to participate in the public participation process. The 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. The final task of the Phase II was to develop the scope of work for the Phase III or implementation phase of the Public Participation process.

7.2.3.1 Regional Water Planning Group Member Survey

Regional Water Planning Group members, as well as non-voting members, were surveyed in February 1999 regarding their perceptions of previous public participation efforts, effective participation and informational strategies, roles and responsibilities of group members and contractors, and key messages. A total of 24 responses were received, representing 19 voting and 5 non-voting members. Survey result highlights are presented in the Phase II Public Participation RWPG Survey and Targeted Audience Survey Results Report (May 6, 1999).

7.2.3.2 Targeted Audience Survey

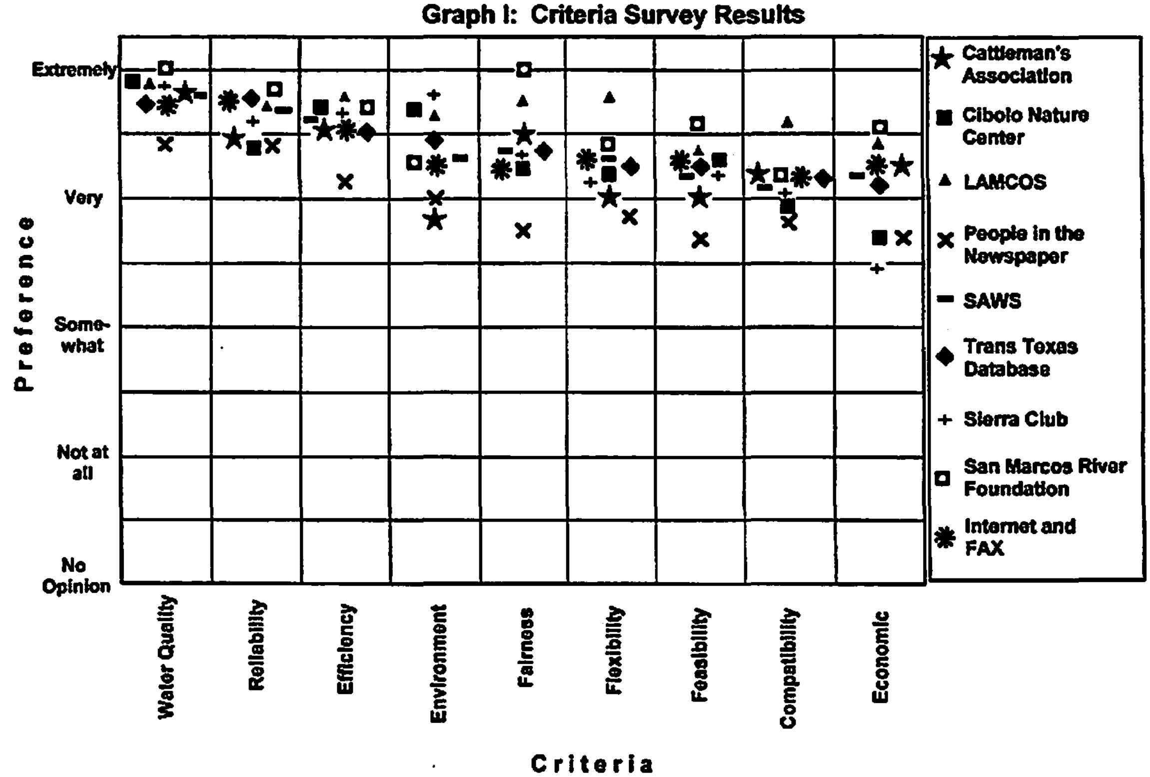
The mailing list for the survey was compiled from several mailing lists provided by various organizations, associations, river authorities, clubs and interested parties. The survey is not a statistically valid random representation of the general public in the region. It is a targeted or focused survey 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.

Graph I: Criteria Survey Results



7.2.4 Phase III Public Participation

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.

7.2.4.1 Public Information Dialogue Presentations and Questions from the Public

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 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. Questions and Answers from the Public are available on the website.

7.2.4.2 Focus Group Report I

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 was presented to the RWPG at a workshop October 12, 1999. The Phase III Public Participation Twenty-One County focus Group Report (October 1999) is available on the website.

7.2.4.3 Option Specific Public Input Sheets

For the workshops where the planning group was considering options to include in the alternative plans or the hybrid draft, option specific public participation input sheets were generated. These sheets summarized the Targeted Audience Survey Results, Focus Group input, public comments and concerns about the option, and any newspaper coverage relative to the option. These option specific input sheets were first presented at the workshop on January 27, 2000 and were updated for those options included in the five alternative plans and presented at the workshop on June 13, 2000.

7.2.4.4 Focus Group Report II

A second group of Focus Groups was conducted in July of 2000. The original 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 was made at the August 3, 2000 SCTRWPG meeting. The Public Participation Focus Group II Report, Hybrid Draft Plan as of July 2000 (August 2000) is available on the website.

Website: www.watershedexperience.com

The website was presented for review at the September 14, 1999 SCTRWPG meeting. The website provided access to the technical documents, the calendar of events, meeting minutes, and several interactive map activities relative to the options under consideration. The website activity report was presented at each monthly SCTRWPG meeting. The busiest day (2633 hits) on the website was April 17, 2000. This was the time when alternative plan information was becoming available on the website. The total hits to the website from September 1999 to July 2000 were 275,902 and the number of users of the site during that time is estimated to be 8,167.

7.2.4.5 Planning Group Literature

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. These brochures were distributed at all public information dialogue meetings, RWPG meetings and included in all mail-outs. The brochure was also available in Spanish.

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.

7.2.4.6 Media Relations and Monitoring

Press releases were distributed prior to every SCTRWPG meeting and staff work group meeting. Press releases were also issued about planning group decisions and studies as they became available. Media coverage of water issues was monitored through clippings. Coverage of RWPG business was more intense in areas where potential reservoir sites were under evaluation. The April 2000 press release outlining the five alternative plans was covered in twenty-two clippings throughout the region.

7.2.4.7 Public Hearings on Initially Prepared Regional Water Plan

The 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 on September 25, 26 and 27, 2000 respectively. During the week prior to the public hearings an eight-page tabloid summarizing the IPP was inserted into newspapers throughout the region for a total circulation of 550,000. Approximately 650 persons attended the public hearings and oral comments were recorded by a court reporter that provided a certified transcript of the comments. The official public comment period ended on October 6, 2000. During the comment period the planning group received 270 written comments and heard 97 oral presentations at the public hearings.

Each written comment was entered into a database, assigned a number and reviewed individually. The transcripts from the public hearings were provided on computer disk and these oral comments were also integrated into the database format, assigned a number and reviewed individually. During the review process, thirty-eight common comment categories were identified. The list of categories is presented in Table 7-1, 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 were often assigned to one document or comment. Table 7-1 also indicates the number of comments addressing each category by source.

The planning group decided to develop responses to the comments by category groups. A set of comment documents sorted by category was provided to each planning group member for review. Through a series of workshops, the planning group developed responses by category for each comment received. 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 comments are presented in Section 7.2.4.8, below, changes were made to the IPP in response to the public comments. The RWPG listened to the public, and the evidence is clear from the number of changes incorporated in the Final Regional Water Plan. Many communities, agencies and interest groups had a decisive role in shaping the development of the South Central Texas Regional Water Plan.

Table 7-1. Comment Categories and Number Received per Category

	Description	Written Comments	Victoria	Uvalde	San Antonio	Total
1	Recharge and Recirculation	170	0	0	6	176
2	Augmentation of Springflows	168	0	0	5	173
3	Goliad Reservoir	6	2	0	0	8
4	Growth Management/Smart Growth	18	3	1	3	25
5	Cisterns/Rainwater Harvesting	6	1	2	1	10
6	Infrastructure	1	0	0	0	1
7	Conservation/Recycling/Reuse	25	6	6	4	41
8	Groundwater/Carrizo	18	1	2	2	23
9	Groundwater/General	17	2	1	0	20
10	Desalination	13	3	0	1	17
11	Authority/Study Process/ Boundaries/Representation of RWPG	23	4	3	2	32
12	Endangered Species Protection	13	0	1	12	26
13	Population/Demand Projections	7	1	2	2	12
14	Third Party Impacts to Economy	11	0	1	0	12
15	Brush Management	8	1	2	2	13
16	Irrigation Technology Center	2	0	0	0	2
17	Reservoir Construction – General	4	2	1	2	9
18	Agricultural Water Rights Transfers	7	1	0	1	9
19	Recharge – General	9	1	3	2	15
20	Lake Dunlap Diversion	2	0	0	0	2
21	Public Education	4	0	0	1	5
22	Costs – General	25	3	0	6	34
23	Local Government Code/County Authority	10	0	1	0	11

Table 7-1. Comment Categories and Number Received per Category (Continued)

	Description	Written Comments	Victoria	Uvalde	San Antonio	Total
24	Rule of Capture	3	0	1	1	5
25	Junior Water Rights Provision/Interbasin Transfers	7	1	0	0	8
26	Simsboro/SAWS Alcoa	13	0	0	1	14
27	Cibolo Reservoir	15	3	2	1	21
28	Weather Modification	3	1	0	0	4
29	General Support for Plan/Process	4	1	0	0	5
30	LCRA Project	2	0	0	0	2
31	Downstream/Bays & Estuaries	11	1	0	4	16
32	Rules/Pumping Levels of EAA	9	0	3	5	17
33	Cumulative Effects Analysis	1	0	0	0	1
34	Do not support plan	3	0	0	3	6
35	ASR	4	1	0	0	5
36	Mixing Surface & Groundwater	0	0	1	0	1
37	Water Quality Regulations	0	0	1	0	1
38	Technical Issues	30	0	0	0	30
	TOTALS	672	39	34	67	812

7.2.4.8 Regional Planning Group Responses to TWDB and Public Comments on Initially Prepared Regional Water Plan

7.2.4.8.1 TWDB Comments and RWPG Responses

TWDB Preliminary Staff Comments, Letter 1, October 11, 2000

Section I. Comments that have to be satisfactorily addressed in order to meet Statute, Texas Water Development Board Rules and the Regional Water Planning Contract.

1. Texas Water Code Section 16.053(e)(3)(A) and 31 TAC §357.5(e)(7), require that for each source of water supply in the regional water planning area designated in accordance with 31 TAC §357.7(a)(1), the regional water plan shall 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. This information could not be located in the Initially prepared Plan (IPP) and must be clarified to explicitly address the referenced Statute and rule.
   Response: Sources of ground and surface water are listed and described in Section 3 of Volume I. Subsection 3.3 was added to Section 3 in which items A and B above are addressed. EAA's draft "Critical Period Management Rules" are included for the Edwards Aquifer. For other sources, the Emergency Demand Management Plans that have been summarized in Volume 1, Section 1 are referenced.

2. The supply available from Canyon Lake was not consistently reported in the following tables: IPP Volume I, Table 4-23, 52,350 ac-ft; Exhibit-B Table 6, 64,070 ac-ft. Additionally, IPP Volume I, Table 3-2, reports a <u>permitted</u> volume of 50,000 ac-ft. Please address the differences that relate to available supply and report the information in a manner consistent with 31 TAC §357.7(a)(3), regarding evaluation of adequacy of current water supplies available to the regional water planning area for use during drought of record.
   Response: Volume I, Table 4-23 shows 50,000 acft/yr for GBRA from Canyon Lake. The "additional" Canyon amount for CRWA is part of the 50,000 acft/yr and is noted accordingly. In Exhibit B, Table 6, Canyon supplies shown for New Braunfels, San Marcos, and CRWA are part of the 50,000 acft/yr for GBRA and are noted accordingly. Presentation in this manner is necessary to accurately portray supplies available to each Major Provider.

3. The surface water supply available from direct reuse was not consistently reported in the following tables: IPP Volume I, Page 3-11, item E, and IPP Volume I, Table 4-2, 24,941 ac-ft; Exhibit-B Table 4, 28,877 ac-ft. Please address these differences and report the information in a manner consistent with 31 TAC §357.7(a)(3), regarding evaluation of adequacy of current water supplies available to the regional water planning area for use during drought of record.
   Response: The 24,941 ac-ft is listed both in IPP Volume I Table 4-2 and Exhibit B Table 4 for Bexar County. An additional 3,936 acft/yr is listed in IPP Volume I, Table 4-12 and Exhibit B Table 4 for Hays County, bringing the total to the 28,877 ac-ft mentioned above. These are obtained from wastewater and are considered to be dependable during drought, as tabulated. The 3,939 acft/yr for steam-electric use in Hays County is noted in Section 3.4 (Section 3.3 in IPP).

4. Volume I, Section 3.1.8, Groundwater Availability in the South Central Texas Region, Page 3-4, includes a footnote regarding an agreement endorsed by staff of the TWDB relative to the available supply from the Edwards aquifer. To more adequately reflect the implication to the planning effort of the referred agreement, please expand and incorporate this reference in the main body of the report to better inform the reader as to the process resulting in the agreed supply volume and the conditions associated with the agreement regarding protection of endangered species.

Response: The following language is included in Volume I, (Page 3-4 of IPP) at the point in the text where footnote No. 1 previously appeared.

> **"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 completes and acquires approval from the U.S. Fish and Wildlife Service for 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 to the endangered species at San Marcos and Comal Springs will be maintained during a drought of record".**

The previous footnote was replaced with the new footnote No. 1 as stated above.

5. IPP Volume I, Page 3-11 through 3-15, Methodology to Calculate the Water Supplies Available to the South Central Texas Region and Methodology for Calculating Water Supplies Available for Water User Groups, and Tables 4-1 through 4-23. The report states that surface water availability for permits within the Nueces, Guadalupe and San Antonio River Basins were obtained from the Texas Natural Resource Conservation Commission (TNRCC) Water Availability Model (WAM) Runs. Table 4-22 provides the river basin summaries comparing water demand and supply within each basin. However, the report lacks a link to allow a correlation between the surface water availability for permits and the contents of Table 4-1 to 4-22 and with the tables required as per Exhibit B of the contract. In order to allow for an independent verification of these facts and to assess compliance with 31 TAC §357.7(a)(3), please:

   a. Clarify which one of the various runs of the TNRCC WAM was used for this report.

      Response: For the Nueces, Run 9. For the Guadalupe – San Antonio, Run 10. Run 10 is a special run that provides information regarding water availability subject to assumptions adopted by the SCTRWPG. The technical assumptions and conditions used in Run 10 are stated in Section 3.4 (formerly 3.3), Volume I.

   b. Provide a list of major water right holders by river basins within the planning area, along with the permit number and the minimum annual supply during the drought of record from results of WAM. Please refer to Section 3.3.4, Required Documentation, of the TWDB technical memorandum for Tables 3 & 4, dated October 4, 1999;

      Response: This list is included in Appendix C –Major Water Right Holders by River Basin.

   c. Provide a list of the major reservoirs, supply available from these reservoirs, and the water rights associated with these reservoirs including permit numbers, for each of the river basins within the planning area.

      Response: Table 3-2, Page 3-7 of Volume I shows the list of reservoirs and permitted water rights values for each. The supplies available, as per Run 10 mentioned in 5.a above are tabulated in the Tables 4-1 through 4-22, and Exhibit B Table 4, as applicable. The list was added to Volume I, Section 3.

   d. For review purposes, please segregate the supply by source category in Table 4-22 to allow verification of these values with Exhibit B Table 4.

      Response: Table 4-22 is a River Basin by source category summary for all counties and parts of counties of the region. TWDB is referred to Tables 4-2 through 4-21 where the

sources of supply for the drought of record are shown, together with the name of the source. The sources are further tabulated by TWDB's numeric codes in Exhibit B, Table 4.

6. 31 TAC §357.5(e)(1) requires that in developing the regional water plan, the regional water planning groups shall "evaluate alternative water management strategies for effect on environmental water needs including effect on instream flows and bays and estuaries using environmental information resulting from site-specific studies, or, in the absence of such information, using state environmental planning criteria adopted by the board for inclusion in the state water plan after coordinating with staff of Texas Natural Resource Conservation Commission and Texas Parks and Wildlife Department." In order to verify compliance with the referenced rule, please explain how this requirement has been addressed in your evaluation of alternative water management strategies and provide the following information on the evaluation of each alternative water management strategy and the recommended regional water plan:

   a. List all diversion points in the WAM model where a decision is required for application of the environmental flow criteria.

      Response: This information is included in Volume III, Appendix F entitled Application of Consensus Environmental Criteria.

   b. For each one of the diversion points identified in item a., please show the median, 25%tile, and 7Q2 flows in cfs. The units for the tables and graphs presented in IPP Volume I, Figures 5.2-40 through 43 are not consistent.

      Response: Data are included in Volume III, Appendix F mentioned in Comment 6.a above. For Volume I, Figures 5.2-40- through 42, which are for the San Antonio and Guadalupe Basins, units on the vertical axes are in acft/mo. This is because the computer modeling for these basins was done in monthly time steps. For Figure 5.2-43, which is for the Colorado River Basin, the vertical axis units are in cfs, and is because the computer modeling was done in daily time steps.

   c. In order to facilitate review of this information with regards to the environmental flow requirements, please provide them in cfs as required in the Regional Water Planning Contract, Exhibit B, Section 1.3.1.

      Response: Data are included in Volume III, Appendix F as mentioned in Comment 6.a above.

7. 31 TAC §357.5 (d) requires that in developing regional water plans, regional water planning groups shall use state population and water demand projections contained in the state water plan or those adopted by the TWDB. On August 13, 1998 the South Central Texas Regional Water Planing Group (SCT RWPG) approved a scope of work and budget to conduct a review of the population and water demand projections for the planning region to correct those projection judged to be in error. On November 20, 1998, the SCT RWPG submitted a request for revisions of population and water demand projections to the TWDB. On January 21, 1999 the TWDB considered and approved a recommendation from TWDB staff that all revisions requested by the SCT RWPG be approved. Appendix A to these comments compares the information presented in the IPP with the TWDB approved projections. Please correct the discrepancies noted in Appendix A in order to comply with the referenced rule.

   Response: Subsequent to the actions described above, the Technical Consultant was presented information by GBRA and the Schertz-Seguin consultant that 3 new steam-electric power plants were being constructed in the region—2 in Guadalupe County and 1 in Hays County. The Technical Consultant obtained data about the water demands of each, conferred with representatives of TWDB (none of whom are still with TWDB), and proceeded to include these demands in the water demand tables of the plan, and in Exhibit

B, Table 4. In addition, the Technical Consultant remembered that the TWDB irrigation water demands are in terms of quantities of water on the farms in the fields being irrigated. For irrigation using groundwater sources, this is the appropriate and correct quantity, because in most cases the water is pumped from beneath the acres being irrigated, and does not have to be transported any distance to the points of use. In the case of irrigation using surface water, this may not be the correct quantity to use as the irrigation demand, because water diverted from streams usually must be transported to the fields to be distributed. This is the case in parts of Region L, where surface water is conveyed to the fields using unlined canals. Therefore the Technical Consultant obtained data from the TWDB with which to compute canal losses, and added these quantities to the irrigation demands where applicable (Calhoun, Medina, Zavala, and Dimmit Counties).

The Technical Consultant did not inform the SCTRWPG of the actions described above, and of course the SCTRWPG did not know that a formal, written request of the TWDB to get these changes approved was required. A letter was prepared requesting the changes mentioned above. At its regular meeting on November 2, 2000, the SCTRWPG approved the action to make the request.

8. In Exhibit-B Tables 1 and 2, the outside-city population and associated municipal water demands for the City of Schertz are noted under the water user group (WUG) number for the City of Schertz, #120808000. This is incorrect. The outside-city population and related demands should be included in the "county-other" category under WUG # 120996015. Please correct the error to facilitate accurate reporting and verification of compliance with 31 TAC §357.7 (a)(2).

   Response: The suggested change was made.

9. 31 TAC §357.7(4) requires that the social and economic impact of not meeting regional water supply needs be evaluated by the Region. The information is in the IPP; however, the corrections to the water demand projections (Comment #7) will cause changes in the projected water needs of the Region (IPP Volume I, Sections 4.1 and 4.2, Tables 4-1 through 4-9). The revised needs will require the update of Section 4.3 "Social and Economic Impacts of Failure to Meet Projected Water Needs" (Tables 4-24 through 4-28), an update of the "Exhibit B" electronic Tables 9 and 10, and a reevaluation of the impacts of unmet water needs by TWDB staff. In addition to the noted corrections, the Projected Water Needs for a significant number of Water User Groups in Tables 4-24 through 4-28 (socio-economic impacts) are NOT CONSISTENT with shortages listed earlier in the IPP (Tables 4-1 through 4-21) or with shortages provided to TWDB for the preparation of the socio-economic impact analysis. Please revise the socio-economic tables and Exhibit B, Tables 9 and 10. to ensure that water shortages are reported in a consistent manner throughout the document and in the TWDB analysis of socio-economic impacts.

   Response: The necessary changes were forwarded to TWDB on or about November 1, 2000. Upon receipt of the revised computations, Volume 1, Tables 4-24 through 4-28 were revised, as appropriate.

Section II. Comments/Suggestions for Improvements to the Regional Water Plan

1. 31 TAC §357.7(a)(1) requires that the regional water plan include a description of natural resources. Please consider the following suggestions to improve the plan's description of the natural resources in the region, specifically as related to Volume 1, Section 1.2.4.2, Wildlife Resources:

   a. The referenced section includes a description of the rare Texas Salamander, Eurycea neotenes, which is not listed as an Edwards aquifer dependent species in Volume III, Appendix E-1, Endangered Species Related to the Edwards. For completeness, the species should also be included in Appendix E-1.

   Response: The species is listed, as suggested.

b. Volume 1, Section 1.2.4.2, Wildlife Resources, discusses only one of 23 Edwards aquifer dependent species. This section would be more informative and benefit from inclusion of a more comprehensive discussion of the 23 species of listed in Volume III, Appendix E-1.

Response: Discussion in the SWG meeting on October 24 raised the question of what value the discussion is to development of the regional water plan, and especially since the IPP has been developed with only one species having been discussed. Therefore, the referenced discussion was removed.

c. It might also be appropriate to point out which species are dependent on San Marcos and Comal springs, versus those that are dependent on deeper aquatic environments of the Edwards aquifer. The later group of species may not be as sensitive to water planning issues.

Response: Inasmuch as environmental laws and regulations have declared that the flows of these springs be maintained at levels satisfactory to protect the habitats of the species of the springs, and water planning has been directed to proceed accordingly, the SCTRWPG questions this comment, and has decided to forgo the opportunity to engage in the suggested exercise.

2. 31 TAC §357.7 (a) (1) requires that the regional water plan include a description of any identified threats to the natural resources of the regional water planning area due to water quality problems or water quantity problems related to water supply. Even though there are various related references throughout the text in the report, the index to Volume I of the IPP directs the reader to Section 1.9, Volume I, Threats to Agricultural and Natural Resources, for information on this particular requirement. Please consider enhancing this section with more specific information related to threats to natural resources to improve the clarity of the report. Also note that, 31 TAC §375.7(a)(7)(D) requires that evaluations of water management strategies include impacts of water management strategies on threats to agricultural and natural resources of the regional water planning area.

   Response: Cross-references have been added in Section 1.9 to the other places in the report where the subject is addressed specifically.

3. Volume III, Appendix D, entitled Endangered Species by County, includes threatened and endangered species by county. Please consider changing the title to reflect the inclusion of threatened species. Also, there is apparently no reference in the text of the IPP to this appendix. It is recommended that information about threatened and endangered species in the region be referenced to Appendix D. Those endangered species dependent on the Edwards aquifer would be more appropriately located in Appendix E, Endangered Species Related to Edwards Aquifer.

   Response: Appendix D was renamed, "Threatened, Endangered, and Rare Species by County." Each of the county tables already bears this title. A reference to Appendices D and E has been added to Volume I in Section 5.2.5.1.

4. Volume I, Tables 1-13 and 3-3 are identical. Therefore, in Table 3-2, note 1, the IPP should also perhaps include a reference to Table 3-3.

   Response: Referenced.

5. IPP, Volume I, Table 3.2 in Section 3.2.1 reports permitted volumes for the various existing reservoirs in the planning region. 31 TAC §357.7(a)(3) requires that the analysis of surface water available during drought of record from reservoirs shall be based on firm yield analysis of reservoirs. Given that Section 3.2.1 is the logical place for the reader to find that information, it is suggested that the firm-yield information for the reservoirs in the region be included in Section 3 of Volume I.

   Response: Done.

Appendix A on the following pages contains a comparison of IPP and TWDB approved population and water demand projections. These will be reconciled and/ or corrected as needed.

Appendix A
Review of Population and Water Demand Projections

Location in the IPP's Executive Summary -Page-	Water User Group		Number Listed in the IPP	SCT RWPG and TWDB-Approved
ES-11	Total Municipal water use	1990	318,495	318,430
ES-11	Total Municipal water use	2050	769,508	769,522
ES-12, Figure ES-3	Other (Steam-Electric Power, Mining and Livestock) Water Demand	2050	168,489	151,329
ES-12, Figure ES-3	Irrigation	2050	516,348	506,009
ES-12, Figure ES-3	Municipal	2050	769,508	769,522
ES-12	Mining	2050	7,799	7,795
ES-12	Total Irrigation water demand	2050	516,348	506,009
ES-29	Atascosa, Rural	2000	2,240	2,239
ES-32	Bexar, Irrigation	2000	40,003	36,318
ES-32	Bexar, Irrigation	2030	33,827	32,318
ES-32	Bexar, Irrigation	2050	31,026	29,717
ES-33	Calhoun, Irrigation	2000	26,822	22,233
ES-33	Calhoun, Irrigation	2030	17,673	9,138
ES-33	Calhoun, Irrigation	2050	15,028	6,794
ES-33	Calhoun, County-Other	2050	3,258	3,257
ES-33	Comal, Irrigation	2050	371	372
ES-34	Dimmit, County-Other	2030	220	237
ES-34	Dimmit, County-Other	2050	272	287
ES-34	Dimmit, Irrigation	2000	10,551	10,222
ES-34	Dimmit, Irrigation	2030	9,828	8,975
ES-34	Dimmit, Irrigation	2050	9,026	8,229
ES-35	Gonzales, Livestock	2000	4,108	5,999
ES-35	Guadalupe, Steam-Electric Power	2000	10,760	0
ES-35	Guadalupe, Steam-Electric Power	2030	10,760	0
ES-35	Guadalupe, Steam-Electric Power	2050	10,760	0
ES-36	Hays, Steam-Electric Power	2030	6,400	0
ES-36	Hays, Steam-Electric Power	2050	6,400	0
ES-36	Kendall, County-Other	2000	1,778	1,777
ES-37	Refugio, County-Other	2000	352	362
ES-37	Refugio, County-Other	2030	288	296
ES-37	Refugio, County-Other	2050	265	273
ES-38	Wilson, Irrigation	2000	14,519	14,521

Location in the IPP, Vol. I -Page-	Water User Group	Year	Number Listed in the IPP	SCT RWPG and TWDB-Approved
2-3, Table 2-2	Bexar County population	2030	2,419,290	2,491,291
2-3, Table 2-2	Comal County population	2000	79,396	79,378
2-3, Table 2-2	Kendall County population	2020	49,155	49,154
2-13, Table 2-4 4-3, Table 4-1	Atascosa County municipal	2000	7,794	7,793
2-13, Table 2-4	Atascosa County municipal	2040	11,211	11,210
2-13, Table 2-4	Bexar County municipal	2040	493,649	493,694
2-13, Table 2-4 4-19, Table 4-4	Calhoun County municipal	2010	4,455	4,456
2-13, Table 2-4 4-19, Table 4-4	Calhoun County municipal	2030	4,896	4,895
2-13, Table 2-4	Calhoun County municipal	2040	5,274	5,273
2-13, Table 2-4 4-19, Table 4-4	Calhoun County municipal	2050	5,747	5,746
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2020	3,376	3,393
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2030	3,822	3,839
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2040	4,298	4,313
2-13, Table 2-4 4-37, Table 4-7	Dimmit County municipal	2050	4,825	4,840
2-13, Table 2-4 4-72, Table 4-14	Kendall County municipal	2000	3,534	3,533
2-13, Table 2-4 4-72, Table 4-14	Kendall County municipal	2020	6,213	6,214
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2000	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2010	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2020	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2030	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2040	10,760	0
2-18, Table 2-6 4-57, Table 4-11	Guadalupe County steam-electric power	2050	10,760	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2010	6,400	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2020	6,400	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2030	6,400	0
2-18, Table 2-6 4-62, Table 4-12	Hays County steam-electric power	2040	6,400	0
2-18, Table 2-6	Hays County steam-electric power	2050	6,400	0

Location in the IPP, Vol. I -Page-	Water User Group	Year	Number Listed in the IPP	SCT RWPG and TWDB-Approved
4-62, Table 4-12				
2-19, Table 2-7	Calhoun County mining	1990	5	1
2-19, Table 2-7	Calhoun County mining	2020	13	12
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2000	40,003	36,318
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2010	36,879	34,796
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2020	35,320	33,389
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2030	33,827	32,191
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2040	32,397	30,928
2-22, Table 2-8 4-11, Table 4-2	Bexar County irrigation	2050	31,026	29,717
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2000	26,822	22,235
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2010	22,747	16,526
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2020	19,950	14,228
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2030	17,673	9,138
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2040	16,132	7,879
2-22, Table 2-8 4-21, Table 4-4	Calhoun County irrigation	2050	15,028	6,794
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2000	10,551	10,222
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2010	10,199	9,788
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2020	9,932	9,373
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2030	9,828	8,975
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2040	9,432	8,594
2-22, Table 2-8 4-38, Table 4-7	Dimmit County irrigation	2050	9,026	8,229
2-22, Table 2-8 4-20, Table 4-20	Wilson County irrigation	2000	14,519	14,521
2-25, Table 2-9 4-53, Table 4-10	Gonzales County livestock	2000	4,108	5,999
2-25, Table 2-9 4-53, Table 4-10	Gonzales County livestock	2010	5,999	6,334

Location in the IPP, Vol. I -Page-	Water User Group	Year	Number Listed in the IPP	SCT RWPG and TWDB-Approved
2-28, Table 2-10 4-5, Table 4-1	Atascosa*	2000, 2040	(*) These numbers are total water demand projected by counties. Please note that the corrections to individual WUGs will affect these values.	
2-28, Table 2-10 4-12, Table 4-2	Bexar*	2000-2050		
2-28, Table 2-10 4-22, Table 4-4	Calhoun*	1990, 2000-2050		
2-28, Table 2-10 4-27, Table 4-5	Comal*	1990, 2050		
2-28, Table 2-10 4-39, Table 4-7	Dimmit*	2000-2050		
2-28, Table 2-10 4-53, Table 4-10	Gonzales*	2000, 2010		
2-28, Table 2-10 4-58, Table 4-11	Guadalupe*	2000-2050		
2-28, Table 2-10 4-63, Table 4-12	Hays*	1990, 2010-2050		
2-28, Table 2-10 4-75, Table 4-14	Kendall*	2000, 2020		
2-28, Table 2-10 4-103, Table 4-20	Wilson*	2000		
4-61, Table 4-12	Wimberly municipal	1990	732	418
4-61, Table 4-12	Woodcreek municipal	1990	182	155
4-61, Table 4-12	Hays County-Other municipal	1990	2,244	2,520
4-61, Table 4-12	Total Municipal Demand	1990	9,805	9,740

Exhibit B, Table 1. Population by City and Rural County

Fair Oaks Ranch, Bexar County		
Source	2030	2040
Table 1	4,799	4,719
TWDB	4,779	4,819

County-Other, Bexar County			
Source	2030	2040	2050
Table 1	397,524	464,729	435,328
TWDB	397,546	464,631	435,327

Schertz, Bexar County			
Source	2030	2040	2050
Table 1	6,270	6,912	7,602
TWDB	6,269	6,911	7,603

County-Other, Comal County						
Source	2000	2010	2020	2030	2040	2050
Table 1	37,866	50,787	70,023	93,371	118,453	144,984
TWDB	37,780	50,714	69,989	93,385	118,507	145,089

Fair Oaks Ranch, Comal County						
Source	2000	2010	2020	2030	2040	2050
Table 1	88	127	180	241	294	359
TWDB	174	200	214	227	240	254

Garden Ridge, Comal County	
Source	2000
Table 1	2,531
TWDB	2,513

County-Other, Dewitt County	
Source	2040
Table 1	11,631
TWDB	8,631

;ounty-Other, Guadalupe County	
Source	2000
Table 1	33,488
TWDB	32,159

Schertz, Guadalupe County	
Source	2000
Table 1	22,750
TWDB	24,079

County-Other, Kendall County	
Source	2020
Table 1	35,499
TWDB	35,498

Exhibit B, Table 2. Water Demand by City and Category

County-Other, Atascosa County		
Source	2000	2040
Table 2	2,240	4,041
TWDB	2,239	4,040

County-Other, Calhoun County			
Source	2010	2030	2050
Table 2	2,384	2,706	3,258
TWDB	2,385	2,705	3,257

County-Other, Dimmit County				
Source	2020	2030	2040	2050
Table 2	200	220	251	272
TWDB	217	237	266	287

County-Other, Kendall County		
Source	2000	2020
Table 2	1,778	3,924
TWDB	1,777	3,925

Irrigation, Bexar County						
Source	2000	2010	2020	2030	2040	2050
Table 2	40,003	36,879	35,320	33,827	32,397	31,026
TWDB	36,318	34,796	33,389	32,191	30,928	29,717

Irrigation, Calhoun County						
Source	2000	2010	2020	2030	2040	2050
Table 2	26,822	22,747	19,950	17,673	16,132	15,028
TWDB	22,235	16,526	14,228	9,138	7,879	6,794

Irrigation, Comal County	
Source	2050
Table 2	371
TWDB	372

Irrigation, Dimmit County						
Source	2000	2010	2020	2030	2040	2050
Table 2	10,551	10,199	9,932	9,828	9,432	9,026
TWDB	10,222	9,788	9,373	8,975	8,594	8,229

Irrigation, Wilson County	
Source	2000
Table 2	14,519
TWDB	14,521

Steam-Electric Power, Guadalupe County						
Source	2000	2010	2020	2030	2040	2050
Table 2	10,760	10,760	10,760	10,760	10,760	10,760
TWDB	0	0	0	0	0	0

Steam-Electric Power, Hays County					
Source	2010	2020	2030	2040	2050
Table 2	6,400	6,400	6,400	6,400	6,400
TWDB	0	0	0	0	0

Mining, Calhoun County	
Source	2020
Table 2	13
TWDB	12

Livestock, Gonzales County		
Source	2000	2010
Table 2	4,054	5,999
TWDB	5,999	6,334

TWDB Partial Staff Comments, Letter 2, October 23

Section I. Comments that have to be satisfactorily addressed in order to meet statute, Texas Water Development Board Rules and the Regional Water Planning Contract

Section II, Article III, item I of the Regional Water Planning Contract, requires that the adopted regional water plan and the data collected and transmitted to the TWDB for the plan be prepared in the format and according to specifications prescribed in Exhibit B to the contract. The accuracy and completeness of the tables is pivotal to the TWDB ability to complete the state-wide database to prepare the State Water Plan. Therefore, the following comments are specific to accuracy and/or completeness of the various tables identified in the contract's Exhibit B and as individually noted in the comments below.

For review purposes, TWDB staff developed annotated review worksheets that parallel the original worksheets filed with the Initially Prepared Plan [IPP]. The comments to be addressed by the RWPG are noted under the column entitled TWDB REVIEW COMMENTS.

TWDB staff highlighted selected fields in the worksheets where data entries may need correction or clarification, as noted under the TWDB REVIEW COMMENTS column.

Also, cells in bold represent revisions performed by TWDB staff. Those revisions represent random review of cells and the corrections performed by TWDB staff. Please contact TWDB staff to discuss any need for additional clarification in those specific cases.

The worksheets have been slightly modified for quality assurance purposes and to reflect the table structure needed for database development. Thus, any additional non-essential fields that were provided in the original table were moved to the far right end of the worksheet; comments or footnotes included in the original worksheet were moved to a field entitled RWPG Comments; any totals, subtotals, extra headers, etc. were deleted; and, merged fields were adjusted as needed.

TWDB staff has provided electronic copies of the complete review worksheets to Mr. Steve Raabe of the San Antonio River Authority and to Dr. Herb Grubb of HDR Inc. The worksheets show all rows and identifies all fields that will require a correction based on the TWDB review.

1. Table 3, Water Demand by Major Provider of Municipal and Manufacturing Water.

   a. Please address the comments contained in the TWDB file RegL_QA_Table3_IPP, under the column heading entitled "TWDB COMMENTS."

      Response: The comments contained in the TWDB file RegL_QA_Table3_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. These revisions include obtaining alpha numbers for eight entities, removing records in which all values were zero, and performing the corrections made by the TWDB.

   b. Please note that 108 of 234 records show a zero demand for the years 2000-2050. According to the IPP Volume 1, Chapter 2, the majority of these entries are referenced with a zero demand to reflect instances where a Major Water Provider (MWP) customer has not in the past received water from that MWP. As contained in the IPP and Exhibit B tables, the implication is that these customers would not exercise their water supply option for the entire planning period. Please verify the accuracy of this interpretation.

      Response: Entries which show a projected demand of 0 acft/yr for the planning period reflect instances where a MWP customer in the past has not obtained water from that MWP, and is not projected to exercise their water supply options during the planning period. These records have been deleted from Exhibit B, Table 3.

c. The following alpha numbers associated with Bexar Metropolitan Water District were not used in Table 3. According to TWDB reported use from the Water Use Survey database, these entities received water in 1996. Please verify if these should be excluded in Table 3:

Major Water Provider			
Name	Alpha	Recipient	1996 Reported Use (ac/ft) Water Use Survey database
Bexar Metropolitan Water District	72600	BMWD-Southside	11,953
	477401	BMWD-Northwest	3,507
	477405	BMWD-Northeast	3,669
	944493	BMWD-Windy's	548

Response: The BMWD service area is composed primarily of small subdivisions or other small water utilities. In this regional water planning effort, many of these subdivision and small water utilities have been combined into a WUG labeled "BMWD – Other Subdivisions." This WUG has been assigned an alpha number of 72601 (alpha number obtained from Craig Caldwell of the TWDB). The four entities listed above (BMWD-Southside, BMWD-Northwest, BMWD-Northeast, and BMWD-Windy's) are included in the BMWD- Other Subdivisions WUG.

d. IPP, Volume 1, Table 2-13 pages 2-52 through 2-58, indicates that if an entity was supplied by more than one MWP the total demand was placed on only one provider. Please note that each supply transaction needs to be separately identified. Please make the necessary corrections to provide an accurate and complete representation of the water demand.

Response: In the IPP, Volume I, Table 2-13 on pages 2-52 through 2-58, demand is accounted for separately by MWP. For example, East Central WSC is located under SAWS, BMWD, and CRWA. The demands listed in Table 2-13 for East Central WSC are the demands this entity is projected to place upon each individual MWP. In cases where a city's entire municipal demand has been placed on a single MWP, historical data indicate that this MWP is the sole provider for that city or other water supply entity.

2. Table 4. Current Water Supply Sources.

a. Please address the comments contained in the TWDB file RegL_QA_Table4_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table4_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. These revisions include the firm yield value of Lake Texana to be consistent with data reported for Region P. In addition to these changes, the TWDB noted instances in which the amount of water allocated from a source (Exhibit B, Table 5) was greater than the availability reported in Exhibit B, Table 4 by 1 acft. This is due to rounding in the allocation process used to distribute available supplies. These rounding errors have been corrected to the extent possible.

b. Additionally, please note that "source" and "water user group" names should be consistent from table to table. An example of an inconsistency found is the listing in Table 4 of TWDB source ID 13013 as source name ETPLATEAU AQUIFER while

Table 5, Current Water Supplies Available to the RWPG by City and Category, lists source ID 13013 as EDWARDS-TRINITY AQUIFER.

Response: The "source" name in Table 5 of "EDWARDS-TRINITY AQUIFER" used in Wilson and Uvalde Counties has been revised as "ETPLATEAU AQUIFER" in order to be consistent with other tables.

3. Table 5. Current Water Supplies Available to the RWPG by City and Category.

   a. Please address the comments contained in the TWDB file RegL_QA_Table5_IPP, under the column heading entitled TWDB COMMENTS.

   Response: The comments contained in the TWDB file RegL_QA_Table5_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. The TWDB noted instances in which the amount of water allocated from a source (Exhibit B, Table 5) was greater than the availability reported in Exhibit B, Table 4 by 1 acft. This is due to rounding in the allocation process used to distribute available supplies. These rounding errors have been corrected to the extent possible.

   b. Please note that a cross reference with the 1996 Water Use Survey, shows that the following transactions are not reflected in Table 5 as submitted. Please clarify.

Entity	Identifier	Transaction
St Hedwig	120855000	Purchased surface water from Canyon Regional (alpha 133134). 1998 used 176.8 ac-ft
Gonzales	120348000	Self-supplied groundwater from Source ID 08910. 1998 used 316.6 ac-ft.
Karnes City	120457000	Purchased surface water from El Oso water supply. 1998 used 15 ac-ft.
La Vernia	120491000	Purchased surface water from Canyon Regional (alpha 133134). 1998 used 24.9 ac-ft
Schertz	120808000	Self-supplied groundwater from 2 wells in Comal County.

   Response: All entities listed have had the opportunity to review the projected supply sources for them contained in the plan. None of these entities have responded that the supply sources contained in the IPP plan are not those they plan on utilizing during the planning period.

4. Table 6. Current Water Supplies Available to the RWPG by Major Provider of Municipal and Manufacturing Water.

   a. Please address the comments contained in the TWDB file RegL_QA_Table6_IPP, under the column heading entitled TWDB COMMENTS.

   Response: The comments contained in the TWDB file RegL_QA_Table6_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed.

5. Table 7. Comparison of Water Demands with Current Water Supplies by City and Category.

   a. Please address the comments contained in the TWDB file RegL_QA_Table7_IPP, under the column heading entitled TWDB COMMENTS.

   Response: The comments contained in the TWDB file RegL_QA_Table7_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. The TWDB noted instances in which the subtraction of the projected water demands (Exhibit B, Table 2) from the projected water supplies (Exhibit B, Table 5) differed from the amounts shown in Exhibit B, Table 7 by not more than 3 acft. This is due to rounding in the allocation process used to distribute available supplies. These rounding errors have been corrected to the extent possible.

6. Table 8. Comparison of Water Demands with Current Water Supplies by Major Provider of Municipal and Manufacturing Water.

   a. Please address the comments contained in the TWDB file RegL_QA_Table8_IPP, under the column heading entitled TWDB COMMENTS.

   Response: The comments contained in the TWDB file RegL_QA_Table8_IPP, under the column heading entitled "TWDB COMMENTS" have been addressed. Revisions primarily include distributing the projected needs for the MWP into the basins where the needs are located.

   b. Table 8 did not include the Guadalupe-Blanco River authority. Please correct the omission.

   Response: The GBRA is not included in Exhibit B, Table 8 (detail), however, the GBRA is included in Exhibit B, Table 8 (summary). As directed by staff of the TWDB, only those entities that show a projected shortage during the planning period, are to be included in the detail table. GBRA does not show a projected shortage during the planning period and is, therefore, not included in the detail table.

   c. A cross referenced review of the major water provider totals for tables 8, 6 [Current Water Supplies Available to the RWPG] and 3 [Water Demand by Major Provider of Municipal and Manufacturing Water] shows the following inconsistencies in the reporting for <u>New Braunfels Utilities</u>:

	Ac-ft in the year 2000
Table 6 totals	6,943
Table 3 totals	4,280
Table6 - Table 3	2,663
Table 8 totals	9,383

   Response: For the Initially Prepared Plan, Exhibit B Table 6 showed a current supply for New Braunfels Utilities of 13,663 acft/yr in 2000 and 6,943 acft/yr thereafter (due to the expiration of their Canyon Reservoir contract); Exhibit B, Table 3 showed a projected demand of 4,280 acft/yr in 2000; and Exhibit B, Table 8 showed the correct surplus/shortage value of 9,383 acft/yr. However, the values in these Exhibit B tables have been revised for the Regional Water Plan in response to public comment.

d. According to Table 3, New Braunfels Utilities provides service to entities located in the Guadalupe and San Antonio basin. Table 8 only lists basin 18 (Guadalupe) but appears to be based on the total need from both basins. Please revise as needed.

Response: In the Regional Water Plan, projected shortages and surpluses are apportioned to appropriate river basins based on the projected demand in each river basin for each Major Water Provider.

e. The following MWP service more than one basin; however, Table 8 only lists one basin and the reported needs appear to be based on the total need. Please revise as needed:

MWP	Basins where service is provided
BexarMet Water District	18 and 19
Canyon Regional Water Authority	18 and 19
Guadalupe-Blanco River Authority	17, 18, 19 [Table 3 also lists "various" for this MWP]
Regional Water Provider	19 and 21

Response: In the Regional Water Plan, projected shortages and surpluses are apportioned to appropriate river basins based on the projected demand in each river basin for each Major Water Provider.

7. Table 11. Potentially Feasible Water Management Strategies.

a. Please address the comments contained in the TWDB file RegL_QA_Table11_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table11_IPP under the column heading entitled "TWDB COMMENTS" have been addressed. Capital costs have been included in the table where appropriate. In instances for which the project listed is in the implementation phase, no capital costs are reported as explained in Volume I, Section 5.3.

Additional storage has been included for some entities in order to help meet peaking needs during the planning period. Such additional storage strategies may include ASR and/or additional surface storage facilities. Although quantities of additional water supply are not assigned to these facilities, they may be essential to the seasonal and daily management of future water supplies and costs have been included in the Regional Water Plan accordingly. As described in Section 6, Vol. I, the Regional water Plan also recognizes that additional year-to-year storage may be needed in the South Central Texas Region. Costs for this type of additional storage have not been included, as further study will likely be necessary to define specific strategies.

Region-wide strategies such as brush management and weather modification have also been included in the table. These strategies are not being used to meet a projected need, however, some entities have implemented these strategies and many entities are interested in pursuing funding for further investigation of their feasibility. Cost data has not been tabulated for these strategies due to uncertainties in their development and potential dependable water supply.

b. Please note that additional comments offered on Tables 12 and 13 need to be considered when revising Table 11.

Response: Additional comments have been considered.

8. Table 12. Recommended Management Strategies by City and Category.

a. Please address the comments contained in the TWDB file RegL_QA_Table12_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table12_IPP under the column heading entitled "TWDB COMMENTS" have been addressed. Capital costs have been included in the table where appropriate. In instances for which the project listed is in the implementation phase, no capital costs are reported as explained in Volume I, Section 5.3.

Additional storage has been included for some entities in order to help meet peaking needs during the planning period. Such additional storage strategies may include ASR and/or additional surface storage facilities. Although quantities of additional water supply are not assigned to these facilities, they may be essential to the seasonal and daily management of future water supplies and costs have been included in the Regional Water Plan accordingly. As described in Section 6, Vol. I, the Regional Water Plan also recognizes that additional year-to-year storage may be needed in the South Central Texas Region. Costs for this type of additional storage have not been included, as further study will likely be necessary to define specific strategies.

Region-wide strategies such as brush management and weather modification have also been included in the table. These strategies are not being used to meet a projected need, however, some entities have implemented these strategies and many entities are interested in pursuing funding for further investigation of their feasibility. Cost data has not been tabulated for these strategies due to uncertainties in their development and potential dependable water supply.

b. Please note that the total capital cost of a recommended water management strategy [WMS] must be reported in all cases. For those instances where a WMS benefits more than one water user group [WUG], then the cost has to be listed for one of the entities. Table 12 lacks a total capital cost for the following WMS:

i. 4b77, wastewater reuse
ii. 4c80
iii. 4c81
iv. 4c82
v. 4c83
vi. 4c84
vii. 4o91
viii. 4p85

Response: See response to comment 8a.

9. Table 13. Recommended Management Strategies by Major Provider of Municipal and Manufacturing Water.

a. Please address the comments contained in the TWDB file RegL_QA_Table13_IPP, under the column heading entitled TWDB COMMENTS.

Response: The comments contained in the TWDB file RegL_QA_Table13_IPP under the column heading entitled "TWDB COMMENTS" have been addressed. Capital costs have been included in the table where appropriate. In instances for which the project listed is in the implementation phase, no capital costs are reported as explained in Volume I, Section 5.3.

Additional storage has been included for some entities in order to help meet peaking needs during the planning period. Such additional storage strategies may include ASR and/or additional surface storage facilities. Although quantities of additional water supply are not assigned to these facilities, they may be essential to the seasonal and daily management of future water supplies and costs have been included in the Regional Water Plan accordingly. As described in Section 6, Vol. I, the Regional Water Plan also recognizes that additional year-to-year storage may be needed in the South Central Texas Region. Costs for this type of additional storage have not been included, as further study will likely be necessary to define specific strategies.

Region-wide strategies such as brush management and weather modification have also been included in the table. These strategies are not being used to meet a projected need, however, some entities have implemented these strategies and many entities are interested in pursuing funding for further investigation of their feasibility. Cost data has not been tabulated for these strategies due to uncertainties in their development and potential dependable water supply.

TWDB Partial Staff Comments, Letter 3, November 21, 2000

SECTION 1. COMMENTS THAT HAVE TO BE SATISFACTORILY ADDRESSED IN ORDER TO MEET STATUTE, TEXAS WATER DEVELOPMENT BOARD RULES AND THE REGIONAL WATER PLANNING CONTRACT.

1. 31 TAC §357.7 requires the regional water plan development to include evaluation of water management strategies and lists the evaluation criteria that must be considered in the analysis of these water management strategies.

   Also, 31 TAC §357.7(a)(8) requires that specific recommendations of water management strategies be described in sufficient detail to allow state agencies to determine whether future projects are consistent with the approved regional water plan.

   Additionally, the scope of work [SOW] approved by the SCT RWPG, indicates that water supply options identified as potentially feasible would be generally evaluated as per said criteria. The SOW represents that water supply options selected for final consideration as water management strategies in the alternative regional water plans and the recommended regional water plan would be evaluated in full compliance with the stated criteria.

   The following comments reflect areas where the review found potential inconsistencies or omissions in the presentation of water management strategies in the IPP. Please address the following comments as needed in order to clearly meet the referenced rules and approved SOW:

   a. L-10, Demand Reduction.

      i) IPP, Volume I, page 1.1-19, second paragraph, the statement "*The basis for this additional water conservation is to accelerate toilet retrofit (replacement of existing commodes with those that use 1.6 gallons per flush) to year 2010 in comparison to the rates used by TWDB which has this water conservation effect phased in by 2020*" is incorrect. The TWDB water demand projections start to phase in toilet retrofits in the year 2000 and reach 100% by the year 2050. By the year 2010, the TWDB's advanced conservation reflects a 60% of units retrofitted, affecting 70% of the 1990-2000 population. Please comment and make any necessary corrections in your estimates.

      Response: The statement referenced appears in Volume III, page 1.1-19. This is the first time that TWDB has provided a written explanation of the procedures used to calculate advanced water conservation, and differs from that provided verbally at an earlier date, as described in Volume III, as quoted above. The language of the text of Volume III will be modified in light of the comment. Any changes in the estimates of water supply available from this strategy would result in a reduction of quantities of management supply available, and would have no other effect upon the IPP. The calculations of additional municipal water conservation are being provided to TWDB for review (See response to comment a.iii below).

      ii) The IPP reflects the Beyond-Advanced conservation programs of aggressive public education and lawn irrigation conservation beginning in 2001 and continuing through the year 2050. The water management strategy is given full credit in 2001. Please explain the basis for this assumption.

      Response: Condition No. 9 of IPP Volume III, Page 1.1-20 is as follows: "The estimated water savings from public education (no. 7 above), and lawn irrigation (no. 8 above) would begin in 2001 and continue through

2050." The strategy is not given full credit in 2001. The strategy is begun in 2001, and continued through 2050. In Volume III, Section 1.1 and in Volume I Section 5.2 for the Plans for each entity, the quantities of demand reduction (water supply credited to conservation) are tabulated in the year 2000 column, as is the case for all other strategies, and continue for each decade thereafter at the estimated quantity for that decade. Perhaps it would be helpful to insert a statement at the beginning of No. 9 as follows: "The public education program of No. 7 above would be started in 2001 (many cities had a program in 2000) and continued through 2050. Thus, the ...."

iii) TWDB review selected the city of San Antonio for a spot review of the proposed savings. Using the Beyond-Advanced conservation measures (toilet retrofit, public education and lawn irrigation conservation) to the fullest extent possible, the TWDB reviewers could not replicate the water use savings for San Antonio as reported in IPP, Volume III, Table 1.1-5, page 1.1-23. TWDB staff calculations range from 6,000 to 16,000 ac-ft less than the amounts reported in the IPP. In order to verify and understand the reported savings, please provide the calculations showing the itemized increments due to conservation measures in excess of advanced conservation.

Response: The calculations are being provided in electronic form, with a hard copy of the matrices used in the computations.

iv) The analysis contained in the IPP, Volume III, reports this water management strategy as yielding 44,100 ac-ft/yr and 79,831 ac-ft/yr, beyond-advanced conservation municipal and irrigation savings, respectively. The information reported in IPP, Volume I, Section 5 reflects 44,572 ac-ft/yr [municipal] and 27,314 ac-ft/yr [irrigation]. Please reconcile these differences in order to clearly describe the recommended water management strategy.

Response: In Volume III, Page 1.1-31, the last sentence of the paragraph which ends at the top of the page is as follows: "The estimated additional municipal water conservation for the South Central Texas region are 38,081 acft/yr in 2000, 39,213 acft/yr in 2030, and 44,573 acft/yr in 2050 (last page of Table1.1-5). In Volume I, Table 5.2-1, Page 5-11, municipal water conservation at year 2050 is shown as 44,572 acft/yr. The difference of 1 (one) acft/yr at 2050 appears to be either a transcription error or a rounding error, and is of no consequence to the water plan. The figure of 44,100 acft/yr shown in the Option Data Sheet for Demand Reduction (Water Conservation) (L-10) (Vol. III) in the IPP has been revised to 44,572 acft/yr.

The figure of 79,831 acft/yr shown in the Option Data Sheet for Demand Reduction (Water Conservation) (L-10) (Vol. III) in the IPP represents an estimated maximum potential volume for irrigation conservation through the installation of LEPA systems in Bexar, Medina, Uvalde, Atascosa, Frio, Zavala, Dimmit, LaSalle, and Wilson Counties (see Table 1.1-8). In the development of the Regional Water Plan, this maximum potential volume was adjusted to account for Edwards Irrigation Transfers (L-15), Irrigation Demand Reduction w/ Transfers (L-10 Irr.), and counties using the Carrizo Aquifer for which LEPA applicable acres are sufficiently small that potential conservation savings may not be realized (Dimmit, LaSalle, & Wilson). As a result of these adjustments, the Plan includes 28,903 acft/yr for Irrigation Demand Reduction (L-10 Irr.) which is counted as a new supply to meet project irrigation needs (see Table 5.2-1 and appropriate County

Summaries of Projected Water Needs (Shortages) and Water Management Strategies in Section 5, Vol. I).

With respect to the 27,314 acft/yr mentioned in sentence 2 of the comment, this is the quantity of irrigation water conservation transferred to new municipal water supply for Bexar County. Derivation of the 27,314 acft/yr included in the IPP is summarized in the Bexar County Summary of Projected Water Needs (Shortages) and Water Management Strategies (Section 5.2.2, Vol. I) and in the description of this water management strategy (Section 5.2.3, Vol. I).

b. CZ-10C, Carrizo-Wilcox aquifer between San Marcos and Frio Rivers.

i) The IPP contains conflicting supply numbers and titles for this strategy: Volume III and Volume I, Table 5.1-1 describe this water management strategy as Carrizo Wilcox Aquifer between San Marcos and Frio Rivers. Volume III reports a yield of 40,000 ac-ft/yr and Volume I, Table 5.1-1 shows 75,000 ac-ft/yr; Volume I, Section 5, Table 5.2-1 reports a supply of 20,000 ac-ft/yr and refers to this strategy as Carrizo Wilcox-Wilson and Gonzales. Please reconcile these differences in order to clearly describe the recommended water management strategy and the cost associated with it.

Response: The SCTRWPG has considered new water supplies from the Carrizo Aquifer in a range of quantities and with respect to the rules and regulations of groundwater districts and has included a new supply of 16,000 acft/yr to be obtained from the Carrizo Aquifer in Wilson and Gonzales Counties. Although the new wellfields are expected to be located "between the San Marcos and Frio Rivers," the SCTRWPG elected to change the name of this strategy because Wilson County is represented by the Evergreen UWCD and Gonzales County is represented by the Gonzales County UWCD. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.2. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the agricultural resources of the region. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of

voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

c. CZ-10D, Carrizo-Wilcox aquifer between Gonzales and Bastrop.

i) The IPP contains conflicting supply numbers and titles associated with this strategy. Volume III, and Volume I, Table 5.1-1 report 220,000 ac-ft/yr and refer to the strategy as the Carrizo-Wilcox aquifer between Colorado and Frio rivers. Volume I, Table 5.2-1 refers to this strategy as Carrizo Aquifer-Gonzales and Bastrop with a supply of 27,500 ac-ft/yr. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The SCTRWPG has considered new water supplies from the Carrizo Aquifer in a range of quantities and with respect to the rules and regulations of groundwater districts and has included a new supply of 27,500 acft/yr to be obtained from the Carrizo Aquifer in Gonzales and Bastrop Counties. Although the new wellfields are expected to be located "between the Colorado and Frio Rivers," the SCTRWPG elected to change the name of this strategy because Gonzales County is represented by the Gonzales County UWCD and Bastrop County is represented by the Lost Pines GCD. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Sections 5.3.5 and 5.3.11. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the agricultural resources of the region. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

d. G-15C, Canyon Reservoir, river diversion.

i) The text and graphs of contained in the IPP, Volume III, describe this option as providing water to Bexar County. This description conflicts with that provided in the IPP, Volume I, Section 5. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The SCTRWPG has considered the utility of this management strategy as a potential new supply to either Bexar County or Comal County and has recommended its implementation to meet projected needs in Comal County. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.5. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) The title for this strategy in Volume III "Canyon Lake water released to Lake Nolte, treated water to distribution system or recharge zone" which is a more detailed title that the one used in Volume I, Section 5. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The description of this management strategy in Section 5.2.3 of Vol. I reflects the recommendation of the SCTRWPG regarding the implementation of this management strategy. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

iii) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. Please note that this strategy must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategy. Please ensure that the plan reflects and describes this analysis.

Response: Implementation of this management strategy as technically evaluated and recommended by the SCTRWPG in the Adopted Regional Water Plan does not constitute an interbasin transfer as new supplies are assigned to Comal County. Similarly, implementation of this management strategy as technically evaluated in each of the five alternative plans would not constitute an interbasin transfer as new supplies were assigned to Comal, Hays, and/or Guadalupe Counties.

iv) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

v) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

e. SCTN-3c, Simsboro Aquifer.

i) The description provided in IPP, Volume III refers to 75,000 ac-ft/yr while the supply reported in Volume I, Section 5, Table 5.2-1 is 55,000 ac-ft/yr. Please resolve this apparent inconsistency to clearly describe the recommended water management strategy.

Response: The SCTRWPG has considered new water supplies from the Simsboro Aquifer in a range of quantities and with respect to contractual agreements between SAWS, Alcoa, and CPS. The management strategy is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.2. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan. A table summarizing the projected pumpage associated with this management strategy by county by decade has been added to Section 5.2.4 of Vol. I of the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in Volume III, lacks a discussion regarding third party impacts associated with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

f. SCTN-16 [a b. and c] Lower Guadalupe River diversions.

i) IPP, Volume I, Section 5 shows SCTN-16 as a water management strategy with a yield of 94,500 ac-ft/yr. This is 500 ac-ft/yr more than the closest of the various SCTN-16 analysis included in the IPP, Volume III [SCTN-16c]. Please correct or explain as appropriate to clearly describe the recommended water management strategy.

Response: The recommended management strategy will provide a dependable supply of 94,500 acft/yr and is described in Section 5.2.3, generally located in Figure 5.2-1, and costs are shown in Section 5.3.2. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

ii) Please enhance the description of the proposed off-channel storage associated with these strategies to facilitate future determinations of consistency of proposed projects with the recommendations of the regional water plan.

Response: The recommended management strategy includes approximately 50,000 acft of off-channel storage to be located somewhere in Refugio, Victoria, or Calhoun Counties proximate to diversion facilities near the pool created by the Guadalupe River Saltwater Barrier. Technical evaluations of this management strategy as included in the Adopted Regional Water Plan have assumed that this off-channel storage will be in the form of reservoirs created by two "ring-dike" embankments and having little, if any, contributing drainage area. As with transmission pipelines and many elements of the Adopted Regional Water Plan, specific facility locations will be determined in permitting and final design. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

iii) IPP, Volume III, page 3.2-3 assumes that the proposed diversions do not constitute an interbasin transfer and that water rights committed to such diversion would retain their current seniority relative to others. This assumption is incorrect. Please address the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers and include the revised evaluations in the adopted regional water plan. . Please note that this strategy must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategy. Please ensure that the plan reflects and describes this analysis.

Response: The TWDB has, by rule, established the river basin boundaries for Texas and advised that the San Antonio River Basin extends to the confluence with the Guadalupe River. As the Guadalupe River Saltwater Barrier forms a pool that extends for several miles above the confluence of both the Guadalupe and San Antonio Rivers, the SCTRWPG has assumed that diversion facilities for this management strategy will be located in the San Antonio River Basin and the proposed diversions will not constitute an interbasin transfer. As with transmission pipelines and many elements of the Adopted Regional Water Plan, specific facility locations will be determined in permitting and final design. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

iv) The analysis of these strategies contained in IPP, Volume III, lack a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

v) The analysis of these strategies contained in the IPP, Volume III, lack a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

g. <u>New Colorado River diversion</u>.

i) The IPP lacks an evaluation of this option as required under 31 TAC 357.7(A)(7) and a detailed description as required in 31 TAC 357.7(A)(8) for recommended water management strategies. Please address these deficiencies in order to comply with the referenced rules.

Response: The SCTRWPG has, with certain qualifications, adopted this management strategy and its associated facilities necessary to provide for a new supply of 150,000 acft/yr as proposed by the Lower Colorado River Authority (LCRA) and Region K. Potential sharing of costs for some of these associated facilities is a subject of on-going negotiations. The estimated costs for purchase of water from the LCRA shown in the RWP are based on LCRA's current in-basin rate of $105 acft/yr plus a 25 percent out-of-basin surcharge. Ultimate costs for purchase of water will be a subject of negotiation. The SCTRWPG is under the impression that evaluations of this option pursuant to the referenced rules have been completed by Region K. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan. (See footnote on page 5-69).

ii) In view of the interregional aspect of this water management strategy, please take note of the following TWDB staff comment on the Region K IPP provided to that region:

> *Texas Water Code §16.053(a) and 16.053(e)(5)(F) require regional water planning to protect appropriate environmental flow needs of rivers, bays, and estuaries. TWDB rule §357.5(e)(1) provides that water management strategies be evaluated based on the consensus environmental planning criteria or on site-specific studies. Therefore,*

water available through each management strategy should be adjusted to reflect passage of sufficient flows for environmental needs. Chapter 5 of the IPP discusses some of the anticipated flow reductions from the recommended off-channel reservoir project, but does not show the adjustment or affect on project yields from the required passage of appropriate environmental flows. Please include this analysis in the appropriate sections of Chapter 5, which discuss the off-channel reservoir project.

Response: The SCTRWPG has been informed that evaluations of this option have been completed by Region K in accordance with applicable law. The SCTRWPG is also cognizant of various comments and concerns regarding potential effects of this option on instream flows and freshwater inflows to bays and estuaries. As the quantity of water which may ultimately be made available by the LCRA and Region K is uncertain at this time, the SCTRWPG has included the originally proposed quantity of 150,000 acft/yr in the RWP. (See footnote on page 5-69).

iii) Please include a description of the proposed off-channel storage associated with this strategy to facilitate future determinations of consistency of proposed projects with the recommendations of the regional water plan.

Response: The recommended management strategy includes approximately 100,000 acft of off-channel storage to be located somewhere in Wharton and Matagorda Counties. Estimates of cost for this management strategy as included in the Adopted Regional Water Plan have assumed that this off-channel storage will be in the form of reservoirs created by four "ring-dike" embankments and having little, if any, contributing drainage area. As with transmission pipelines and many elements of the Adopted Regional Water Plan, specific facility locations will be determined in permitting and final design. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

h. Purchase water from major provider. The IPP lacks an evaluation of this option as required under 31 TAC 357.7(A)(7) and a detailed description as required in 31 TAC 357.7(A)(8) for recommended water management strategies. Please address these deficiencies in order to comply with the referenced rules.

Response: Water purchased from a Major Provider and/or the Regional Water Provider(s) for Bexar County under this option will be developed through the implementation of one or more of the other management strategies in the RWP. Hence, the required evaluations for this management strategy have been completed in the evaluations of the management strategies from which the supply is to be developed.

i. SAWS Recycled water program. The IPP lacks an evaluation of this option as required under 31 TAC 357.7(A)(7) and a detailed description as required in 31 TAC 357.7(A)(8) for recommended water management strategies.

Response: This option represents the continued implementation and expected future expansion of the SAWS Recycled Water Program. Costs for this option, based on actual costs for implementation to-date, are included in the RWP. Explanatory text has been added to the description of this management strategy in Section 5.2.3 of Vol. I of the Adopted Regional Water Plan.

j. SCTN-17, desalination of seawater.

i) The analysis contained in the IPP, Volume III, indicates that an interbasin transfer analysis is not applicable for this strategy. That assumption is incorrect. Please address this deficiency and include the revised evaluations in the adopted plan.

Response: Table 1.10-9 in Volume III has been revised pursuant to this comment. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

ii) The analysis of this strategy contained in Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

k. C-17A, Colorado River in Colorado County - Buy stored water and irrigation rights; firm yield, C-17B, Colorado River in Wharton County - Buy irrigation rights and groundwater; firm yield and, C-13, Colorado River at Bastrop - Purchase of stored water - Firm yield.

i) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers.. Please note that these strategies must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategies.

Response: TWC 11.085(k)(1) involves consideration of the "need for the water in the basin of origin and in the proposed receiving basin." The RWPs for both the basin of origin (Colorado, Region K) and the proposed receiving basin (Guadalupe – San Antonio, Region L) identify the respective needs for the water. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7),

including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

ii) The analysis of these strategies contained in IPP, Volume III, lack a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of these strategies contained in the IPP, Volume III, lack a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

l. S-15C, Cibolo reservoirs, firm yield.

i) The analysis of these strategies contained in IPP, Volume III, lack a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of these strategies contained in the IPP, Volume III, lack a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

m. L-18c, Edwards aquifer recharge from natural drainage - Type 2 projects (Program 2C).

i) The analysis of this strategy contained in Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

n. SCTN-6a, Edwards aquifer recharge enhancement with Guadalupe river diversions at Lake Dunlap.

i) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. Please ensure that the plan reflects and describes this analysis.

Response: TWC 11.085(k)(1) involves consideration of the "need for the water in the basin of origin and in the proposed receiving basin." These needs are addressed in the RWP. Water available for diversion, with the exception of enhanced springflow, has been computed subject to senior water rights and Consensus Environmental Criteria. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural

and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

o. <u>SCTN-8, Trinity aquifer optimization.</u>

i) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

p. <u>G-30, Guadalupe River diversion near Comfort to recharge zone via Medina Lake.</u>

i) The IPP lacks the required consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers. Please note that this strategy must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the strategy. Please ensure that the plan reflects and describes this analysis.

Response: TWC 11.085(k)(1) involves consideration of the "need for the water in the basin of origin and in the proposed receiving basin." These needs are addressed in the RWP. Water available for diversion has been computed subject to senior water rights and Consensus Environmental Criteria. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "interbasin transfer issues," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

ii) The analysis of this strategy contained in the IPP, Volume III, lacks a discussion of the strategy's impact on threats to the region's agricultural resources. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "impacts on agricultural and natural resources," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

iii) The analysis of this strategy contained in IPP, Volume III, lacks a discussion regarding third party impacts anticipated in association with this strategy. Please ensure that the plan reflects and describes this analysis.

Response: Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), including "third-party impacts of voluntary redistribution of water," have been included in the Adopted Regional Water Plan.

In the next planning cycle, the RWPG will conduct additional studies on the socio-economic effects of implementing the Regional Water Plan.

4. TWDB staff committed[1] to accept water availability for the Edwards aquifer as 340,000 acre-feet per year after 2012 in the Regional Water Plan if it [the plan] includes actions to be taken to ensure that the required level of protection to the endangered species at San Marcos and Comal Springs will be maintained during a drought of record. IPP, Volume I, figures 5.2-26 and 27, show multiple instances where the spring flows go below 150 and 100 cfs, at Comal and San Marcos, respectively. In the case of Comal springs, figure 5.2-26 includes periods where the spring would stop flowing altogether. The review acknowledges the note included in the referenced figures indicating that "...the South Central Texas Regional Water Plan includes management supplies believed sufficient to sustain discharge at Comal Springs subject to drought of record conditions....". Please supplement this information with an explicit description of the specific actions that will be taken to ensure the protection of the endangered species at Comal and San Marcos springs.

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[1] Correspondence from Dr. Tommy Knowles to Mr. Greg Ellis, copied to the South Central Texas Regional Water Planning Group, dated November 16, 1999.

Response: Sub-section 3.3 Drought Response in Vol. I of the Adopted Regional Water Plan summarizes the recommendations of the SCTRWPG regarding actions to be taken to ensure that the required level of protection to the endangered species at San Marcos and Comal Springs will be maintained during a drought of record.

5. The Volume III analysis of water management strategies that benefit the regional demand center include distribution costs that may be duplicative when those strategies are combined into one single plan. Please explain how this issue was handled in the IPP.

   Response: Distribution costs mentioned in the comment were not duplicated. In Volume I, distribution costs were calculated based on the total volumes of water to be distributed within each demand center with due consideration of economies of scale as reflected in the Cost Estimating Procedures (Appendix A, Vol. I). Additional explanatory text will be added to the Plan.

6. Please note that 31 TAC §357.11(b) requires the regional water planning group to submit in a timely manner to the executive administrator information on any known interregional conflict between regional water plans. Please discuss if the plan to be adopted and submitted to the TWDB by January 5th, 2001, is affected by an interregional conflict, and explain any efforts the RWPG has taken to resolve the conflicts.

   Response: There are no known interregional conflicts at this time. Coordination meetings have been held with Regions J and K for the purpose of resolving differences. The results are documented in Volume I of the Plan (Subsections 5.2.7 Special Water Resources, and 5.2.3).

SECTION 2. COMMENTS/SUGGESTIONS FOR IMPROVEMENTS TO THE REGIONAL WATER PLAN.

1. The Edwards Aquifer Authority has issued a notice of proposed initial regular permits. Given the significance of the Edwards aquifer to the South Central Texas Regional planning area, the plan may benefit from a brief discussion of this recent development and its impact to the region.

   Response: According to Mr. Greg Ellis, General Manager, EAA, when asked in open meeting of the SCTRWPG on November 9, 2000 if the action cited above would affect the IPP, the response was NO. Given that EAA has issued notice, and that the process will not be concluded prior to the due date of the Regional Plan, such a discussion may be premature, and at worst, erroneous. Therefore, such a discussion is not included.

TWDB Partial Staff Comments, Letter 4, December 12, 2000

SECTION 1. COMMENTS THAT HAVE TO BE SATISFACTORILY ADDRESSED IN ORDER TO MEET STATUTE, TEXAS WATER DEVELOPMENT BOARD RULES AND THE REGIONAL WATER PLANNING CONTRACT

1) 31 TAC §357.7(a)(8) requires that specific recommendations of water management strategies be described in sufficient detail to allow state agencies to determine whether future projects are consistent with the approved regional water plan. Volume I, Section 5, figures 5.2-3 and 5.2-4 present summary costs of the regional water plan. Volume III presents cost information for water management strategies; however, a cross-reference of the Volume III cost evaluations with the summary information provided in Volume I, Section 5 could not be accomplished. Therefore, in order to clearly address the referenced rule please include in the plan a breakdown of the plan's cost with identification of the individual cost contribution of the recommended water management strategies.

   Response: The costs are presented for each water management strategy included in each of the alternative plans that were considered and in the adopted plan, along with the evaluations pursuant to 31 TAC Section 357.7(a)(7) (See Volume I, Table 5.2-25, for the analyses of the adopted plan, Volume II, tabular summaries for each alternative plan that are included at the end of alternative plan sections, and Exhibit B, Table 12).

2) Senate Bill 1 requires future projects to be consistent with the regional water plans to be eligible for Texas Water Development Board (TWDB) funding and Texas Natural Resource Conservation Commission (TNRCC) permitting. The provision related to TNRCC is found in Texas Water Code §11.134. It provides that the Commission shall grant an application to appropriate surface water, including amendments, only if the proposed appropriation address a water supply need in a manner that is consistent with an approved regional water plan. TNRCC may waive this requirement if conditions warrant. For TWDB funding, Texas Water Code §16.053(j) states that after January 5, 2002, TWDB may provide financial assistance to a water supply project only after the Board determines that the needs to be addressed by the project will be addressed in a manner that is consistent with that appropriate regional water plan. The TWDB may waive this provision if conditions warrant.

   Before finalizing the regional water plans, the Regional Water Planning Groups (RWPG) should consider the scope of their plan against the variety of proposals that could be brought before TNRCC and TWDB and ensure the Group's intentions are clear to these agencies. For example, TNRCC considers water right applications for irrigation, hydroelectric power, and industrial purposes, in addition to water right applications for municipal purposes. It also considers other miscellaneous types of applications, such as navigation or recreation uses. Many of these applications are for small amounts of water, often less than 1,000 acre-feet per year. Some are temporary. In order to ensure these small applications are consistent with the regional water plan, the RWPG should consider adding specific language to their plans indicating that the surface water uses that will not have a significant impact on the region's water supply are consistent with the regional water plan even though not specifically recommended in the regional water plan.

   TWDB receives applications for financial assistance for many types of water supply projects. Some involve repairing plants and pipelines and constructing new water towers. The RWPG should consider adding specific language to their regional water plans to indicate that the water supply projects that do not involve the development of or connection to a new water is consistent with the regional water plan even though not specifically recommended in the regional water plan.

   Response: At its regularly scheduled meeting on December 6, 2000, the SCTRWPG discussed this suggestion and based upon the information that both TNRCC and TWDB

may waive the requirements cited above, decided not to consider language suggested by this TWDB comment. During the discussion, the point was made that the number and range of types of potential cases that may arise are so unpredictable that the RWPG is of the opinion that each should be considered by the agencies on their own merits, and that the Legislature foresaw this situation and provided for it. Thus, no specific language was added to the plan.

3) Task 6 of the technical scope of work [SOW] approved by the SCT RWPG, indicates that "each potential Regional Water Management Alternative Plan must and will be subjected to the analyses of the Criteria specified in TWDB's Rules (Appendix C)." Appendix C list the evaluation criteria described in 31 TAC §357.7(a)(7).

Please supplement the summary statements contained in Sections 2 through 6 of the IPP, Volume II, entitled Technical Evaluations of Alternative Regional Water Plans, to clearly address the following requirements:

a) 31 TAC §357.7(a)(7)(A) requires the evaluation of the quantity, reliability, and cost of water delivered and treated for the end user's requirements. To address this requirement, please provide a breakdown for each one of the alternative regional water plans of the cost of water management strategies and any other costs reflected in the cost comparison contained in the IPP, Volume II, Section 7.

b) 31 TAC §357.7(a)(7)(D) requires evaluations of impacts of water management strategies on threats to agricultural and natural resources of the regional water planning area. Please ensure that the alternative plans reflect and describe this analysis.

c) 31 TAC §357.7(a)(7)(G) requires the evaluations to include consideration of the provisions in Texas Water Code, §11.085(k)(1) for interbasin transfers; and (H) consideration of third party social and economic impacts resulting from voluntary redistributions of water. Please note that water management strategies involving interbasin transfers must be evaluated in adherence to all interbasin transfer requirements; please discuss how this aspect of the evaluation was accomplished in the analysis of the relevant strategies. Please ensure that the alternative plans reflect and describe this analysis.

Response: A summary was added in which the analyses are presented (See Volume I, Table 5.2-25, for the analyses of the adopted plan, Volume II, tabular summaries for each alternative plan that are included at the end of alternative plan sections, and Exhibit B, Table 12).

4) TWDB rules [§357.5(i)] and Phase I, Task 3 (G) in the scope of work requires an evaluation of the potential for emergency transfers of surface water. Please include in the plan a description of what consideration was given by the planning group to this rule and what decision was made.

Response: Section 3.4 Potential for Emergency Transfers of Surface Water has been added.

5) The SCT Technical SOW, Task 1, Description of the Planning Region, indicates that the description will include a summary of water availability requirements promulgated by a county commissioners court in accordance with Texas Water Code, Section 35.019. This summary could not be located within the IPP. Please ensure that the item is included in the plan.

Response: Section 1.11 Water Availability Requirements Promulgated by a County Commissioners Court, has been added.

6) The SCT Technical SOW, Tasks 4(B), Identification and evaluation of water supply options, 5, Formulation of regional water management alternative plans, and 6, Evaluation of regional water management alternative plans formulated in task 5, refer to the use of a selection criteria established in the Public Participation Process. Volume I, Section 6.5, Evaluation Criteria, describes this criteria. However, the review could not locate the comparison of water supply options and/or water management strategies and alternative water management plans on the basis of the referenced criteria. Please include these evaluations in the adopted plan.

Response: The procedures are described in Volume I, Sections 7.1 and 7.2, and in the Introduction to Volume III.

7) On April 19, 2000, the TWDB authorized funding for a study entitled "Investigation of Joslin Steam Electric Station for Co-Location of A Desalination Facility" by the Lavaca Regional Water Planning Group in conjunction with Regions L and N Planning Groups". The documentation for this application indicated that the SCT RWPG supported the application. The SCT RWPG required that HDR, in its capacity as technical consultant for the SCT region, be a participant in the study to ensure that the project was evaluated in a manner consistent with the protocol adopted by the SCT RWPG. Also, it noted that in order for the SCT RWPG to consider the results of the study it in the preparation of its plan the study should be competed by July 1, 2000.[2] The study was completed in June 2000 with the required participation of HDR.

A discussion or reference to this study could not be located in the IPP; nor is it listed in Volume I, Section 5, Table 5.1-1, Water Supply Option Summary. Please include in the plan a discussion of this project and the RWPG's decision with regards to the project's feasibility.

Response: Section 5.2.3, Desalination of Seawater (SCTN-17) was expanded to address this comment.

8) The SCT Technical Scope of Work, task #1, indicates that the description of the area will include a summary of existing Certified Groundwater Conservation District Management Plans. This is consistent with 31 TAC §357.5 (k)(1)(C). The review could not locate a discussion or reference to the TWDB certified groundwater management plan of Bexar Metropolitan Water District. Please correct as needed.

Response: The Bexar Metropolitan Water District Groundwater Management Plan is summarized in Vol I, Subsection 1.10.4.4).

9) 31 TAC §357.7(a)(7)(A) requires the evaluation of the quantity, reliability, and cost of water delivered and treated for the end user's requirements. Volume I, Section 5, Sub-section 5.2.3, Water Management Strategies, includes SCTN-1a, Aquifer Storage and Recovery [ASR]. Volume III includes analysis of two ASR strategies. Please note the following:

a) The evaluation of the ASR strategies do not address the reliability and cost of the strategies in terms that can be equitably compared with other strategies. Please complete the analysis to address these issues.

Response: Volume I, Section 5.2 has been expanded to provide further information. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), have been included in the Adopted Regional Water Plan.

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2 Correspondence from Ms. Evelyn Bonavita to Mr. Craig D. Pedersen, dated April 3, 2000.

b) The proposed sites for the ASR project shown in the Volume III, SCTN-1a, are located in northern Atascosa and northeast Wilson counties. The description in Volume I indicates that the site is located in southern Bexar County. Please correct the references as appropriate.

Response: In Volume I, Section 5.2, further explanation is given. Summary tables including each water supply option comprising each alternative plan and the adopted plan addressing each of the required elements pursuant to TAC 357.7(a)(7), have been included in the Adopted Regional Water Plan.

10) Volume I, Section 1.1, Background, the second paragraph states "Dependable supplies from Canyon Reservoir for municipal and industrial customers are a function of springflows from the Edwards Aquifer." The Edwards aquifer springs that contribute to the Guadalupe River are located below Canyon Reservoir. Please revise the statement to more accurately reflect that dependable supplies from the Guadalupe River below Canyon Reservoir are a function of springflows from the Edwards aquifer.

Response: Dependable supplies from Canyon are presented accurately in Vol. I. The point is, when spring flow declines to certain levels, it becomes necessary to pass through inflows to Canyon to meet downstream water rights that would otherwise have been satisfied from streamflow, a part of which would have been from spring flow.

11) Volume I, Section 1.2.4.1, Water Resources, omits the Edwards-Trinity (Plateau) aquifer from the list of aquifers in the South Central Texas Region. Please revise the section to include this aquifer.

Response: The Edwards-Trinity (Plateau) aquifer is included in the Regional Water Plan as Subsection 1.7.1.7, and has been included in the aquifer list in Section 1.2.4.1.

12) Volume I, Section 3.3, Methodology to Calculate the Water Supplies Available to the South Central Texas Region and Methodology for Calculating Water supplies Available for Water User Groups; the specific details (saturated thickness and well capacities) by which groundwater availability (excepting the Edwards aquifer) was calculated for all user groups, was not found in this section. Please provide that information.

Response: This information is found in Vol. III, Sections 6.5, 6.6, and 6.7. Reference to the sections has been included in Vol. I, Section 3.3.

13) Volume I, Section 1.7.1.3, Trinity Aquifer. This section lacks a discussion of the water-level declines in the Trinity aquifer and the significant potential for new urban development to cause additional water-level declines within the South Central Texas Region. The report lacks a discussion or a reference to the findings of Mace and other (2000) regarding the Trinity aquifer. This report was conducted with the participation of the SCT RWPG. Its purpose was to provide the regional planning process with a tool for its consideration and analysis of the Trinity aquifer during the present round of regional planning. For technical completeness of the plan, please include in the report a discussion of this topic.

Response: The text of Section 1.7.1.3 mentions the stress that rapid development is placing upon the Trinity Aquifer in the South Central Texas Region, and a new Section 1.11 "Water Availability Requirements Promulgated by a County Commissioners Court," has been added to Volume I. Prior to the completion of a report by Mace and others (2000) regarding the Trinity Aquifer, the technical consultant used TWDB estimates of water available from the Trinity Aquifer in the individual counties of the South Central Texas Region.

14) Volume I, Section 6.5, Evaluation Criteria, includes a reference to a Section 6.2.3 which is not located in the plan. Please revise the plan as appropriate.

Response: The reference cited should have been Section 6.3.3. A correction has been made in the text.

15) In order to provide clarity and allow for verification of references, please include a bibliography in your final plan.

Response: A list of references is included in the Plan.

SECTION 2. COMMENTS/SUGGESTIONS FOR IMPROVEMENTS TO THE REGIONAL WATER PLAN

1) In Volume I, Section 1.10.1.3, Texas Clean Rivers Program does not identify current relevant program activities within the South Central Texas Planning Region. Please consider expanding this section to better describe the current program status within the region.

Response: The section was expanded to include information about the CRP being carried on by GBRA, SARA, and NRA, in partnership with the TNRCC in the South Central Texas Region.

2) Volume I, Section 1.7.1 Groundwater.

a) The citation for the source of data for this section is given as "Information obtained from the TWDB." Specific citations of the source of information should be given for each instance in the report where outside information has been used.
Response: The citations were reviewed, and made more specific.

b) The aquifers are discussed in apparently random order. Please consider presenting this information in either ascending or descending order by the age of the geologic units to add clarity to your presentation.
Response: In Section 1 of the planning report, the aquifers are presented in the order of importance insofar as quantity of water supplied is concerned, with major aquifers listed first. The Edwards Trinity (Plateau) Aquifer has been included among the list of major aquifers.

3) Volume I, Section 1.7.1.1 Edwards Aquifer.

a) No description of the water quality or down-dip extent of fresh water in the aquifer was included in this section. Please consider expanding the current description to include this item.
Response: Language was added in Section 1.7.1.1 to address this comment.

b) Please consider a more recent reference such as Rose (1974), Barker and Ardis (1996) for more widely accepted stratigraphic nomenclature, especially with respect to the use of terms such as Comanche Peak, Edwards and Georgetown.
Response: The Baker and Ardis (1996) reference is used.

4) Volume I, Section 1.7.1.2 Carrizo-Wilcox Aquifer.

a) Please consider expanding the description to include a discussion of the water quality or down-dip extent of fresh water in the Carrizo-Wilcox aquifer.
Response: Language was added to Section 1.7.1.2 to address this comment.

b) The range of aquifer net sand thickness is offered in a manner that misrepresents the down-dip thickening of the aquifer. Please consider using a more descriptive range of thickness or location to illustrate this topic.
Response: The wording of the sentence was revised to address this comment.

c) The subdivisions of Wilcox Group portion of the Carrizo-Wilcox aquifer were not discussed in this section.
Response: Language was added to Section 1.7.1.2 to address this comment.

5) Volume I, Section 1.7.1.3 Trinity Aquifer.

a) The stratigraphic nomenclature used in this section is not appropriate for use in the South Central Texas Region. Please consider revising this section to better reflect the conditions of the region.
Response: Section 1.7.1.3 was revised to address this comment.

b) For completeness, please consider adding a discussion of the subdivisions of the Trinity aquifer into upper, middle and lower units in this section.
Response: Section 1.7.1.3 was revised to address this comment.

c) The Sligo limestone member of the Travis Peak Formation was omitted from the discussion of water bearing units in the Trinity aquifer.
Response: Section 1.7.1.3 was revised to address this comment.

d) The thickness of the Trinity aquifer in the South Central Texas Region was not included in this section.
Response: Section 1.7.1.3 was revised to address this comment.

e) For completeness, please consider adding a description of the water quality or extent of fresh water in the Trinity aquifer in this section.
Response: Section 1.7.1.3 was revised to address this comment.

f) For completeness, please consider adding a discussion of the anhydrite beds of the upper Trinity aquifer and the effect it has on Trinity aquifer water quality.
Response: Section 1.7.1.3 was revised to address this comment.

g) The inclusion of significant portions of the Trinity aquifer in the Hill Country Priority Groundwater Management Area was not discussed in this section. Please consider expanding the discussion to address this topic.
Response: Section 1.7.1.3 was revised to address this comment (See response to Comment Number 4 of "must do" section above).

6) Volume I, Section 1.7.1.4 Gulf Coast Aquifer.

a) There was no discussion of water quality or down-dip extent of fresh water in the Gulf Coast aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to include an indication that water quality in the Gulf Coast Aquifer tends to decline nearer the gulf coast due to increased chloride content.

b) There was no discussion of trends in water levels in the Gulf Coast aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

c) There was no discussion of well yields in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to include information about well yields.

7) Volume I, 1.7.1.5 Sparta Aquifer.

a) There was no discussion of water quality or down-dip extent of fresh water in the Sparta aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: In Volume I, the Sparta Aquifer is presented in Section 1.7.1.6. The text of 1.7.1.6 was expanded to include information to address this topic (Also, see Section 1.8.1.6).

8) Volume I. Section 1.7.1.6 Queen City Aquifer.

a) There was no discussion of water quality or down-dip extent of fresh water in the Queen City aquifer included in this section. Please consider expanding the discussion to address this topic.
Response: In Volume I, the Queen City Aquifer is presented in Section 1.7.1.7. The text of 1.7.1.7 was expanded to include information to address this topic (Also, see Section 1.8.1.7).

9) Volume I, Section 1.7.1.7 Edwards-Trinity (Plateau) Aquifer.

a) There was no discussion of water quality or extent of fresh water included in this section. Please consider expanding the discussion to address this topic.
Response: In Volume I, the Edwards Trinity (Plateau) Aquifer is presented in Section 1.7.1.5. The text of 1.7.1.5 was expanded to include information to address this topic (Also, see Section 1.8.1.5).

b) There was no discussion of the aquifer thickness in this section. Please consider expanding the discussion to address this topic.
Response: The text was expanded to include information about aquifer thickness in the region.

c) The discussion states that the aquifer occurs "east of the Pecos River", however, the extent of the Edwards-Trinity (Plateau) aquifer includes areas both east and west of the Pecos River. Please revise the section as needed.
Response: The text was revised.

d) Please consider a more recent reference such as Rose (1974), Barker and Ardis (1996) for more widely accepted stratigraphic nomenclature, especially with respect to the use of terms such as Comanche Peak, Edwards and Georgetown.
Response: The Baker and Ardis (1996) reference is used.

10) Volume I, Section 1.7.1.8 Groundwater Availability. The citation for the source of data in Table 1-11 is given as "TWDB 1998", however, the bibliography section of the report could not be located to determine the specific source of information.
Response: The reference was revised to indicate staff member(s) who supplied the data.

11) Volume I, 1.8.1.1 Edwards Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: This topic is discussed in Section 1.7.1.1 and is cross referenced in Section 1.7.1.8.

b) No discussion of the mineral species associated with water quality issues was included. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

12) Volume I, Section 1.8.1.2 Carrizo Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) The water quality of the subdivisions of Wilcox Group portion of the Carrizo-Wilcox aquifer was not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

c) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

13) Volume I, Section 1.8.1.3 Trinity Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

14) Volume I, Section 1.8.1.4 Gulf Coast Aquifer Water Quality. The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.

Response: The text was expanded to address this topic.

15) Volume I, Section 1.8.1.5 Sparta Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

16) Volume I, Section 1.8.1.6 Queen City Aquifer Water Quality.

a) The location of the down-dip extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

17) Volume I, Section 1.8.1.7 Edwards-Trinity (Plateau) Aquifer Water Quality.

a) The location of the extent of fresh water is not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The text was expanded to address this topic.

b) This section would benefit from quantitative referencing of ionic species or other quality parameters in the discussion of water quality in the aquifer.
Response: The text was expanded to address this topic.

18) Volume I, Section 3.1.2 Carrizo-Wilcox Aquifer. The subdivisions of Wilcox Group portion of the Carrizo-Wilcox aquifer were not discussed in this section. For completeness, please consider expanding the discussion to address this topic.

Response: The text was expanded to address this topic.

19) Volume I, Section 3.1.3 Trinity Aquifer.

a) The subdivisions of the Trinity aquifer into upper, middle and lower units are not discussed in this section. For completeness, please consider expanding the discussion to address this topic.
Response: The section was expanded to include these subdivisions of the aquifer.

b) The Trinity aquifer does not occur in Wilson County or supply water to that area. Please revise the report as appropriate.
Response: The correction was made.

20) Volume I, Section 3.1.7 Edwards-Trinity (Plateau) Aquifer. The discussion states that the aquifer occurs "east of the Pecos River", however, the extent of the Edwards-Trinity (Plateau) aquifer includes areas both east and west of the Pecos River. Please revise the report as appropriate.

Response: The suggested revision was made.

21) Volume I, Section 3.1.8 Groundwater Availability in the South Central Texas Region. The citation for the source of data in Table 3-1 is given as "TWDB 1998", however, the bibliography section of the report could not be located to determine the specific source of information. Please revise the report to include complete reference and a bibliography.

Response: Reference was revised to give name of file from which data were obtained.

7.2.4.8.2 Public Comments and South Central Texas Regional Water Planning Group Responses

Public comments have been organized in a database and sorted into 39 issue areas. The numbering of the issues corresponds to the grouping of public comments by Moorhouse Associates. A 39th issue area has been added for the response to Region K's comments. HDR has integrated responses to technical issues into the other categories, and issue area 38 now includes those technical questions not covered elsewhere. The final text has to be incorporated into the Regional Water Plan as a section of Chapter 7. In addition, HDR will modify other sections of the Plan to reflect policy agreements that were made at the meeting on November 9th and that are incorporated in the draft text below.

Issue 1. Recharge and Recirculation. Various comments urge the inclusion of additional recharge options, such as small recharge dams, and the inclusion of the Recharge and Recirculation System for the Edwards Aquifer as a strategy for implementation. These comments question the status of this alternative in the Initially Prepared Plan (IPP) and ask that it have the same status as the other water management strategies, such as brush management and rainwater harvesting, that require additional research before implementation. Several request specifically that the footnote requiring amendment of the plan before implementation of the Recharge and Recirculation System (found at IPP, ES-25) be removed. One commenter asserts that the plan contains recharge projects to the Edwards Aquifer that are inefficient due to losses to spring flows, and urges control of spring flows. Another comments that the Lower Guadalupe River Diversion (SCTN-16) should be evaluated in an unbiased manner for its advantages as compared to the Edwards Aquifer Recharge & Recirculation System proposal (EA R&R). Some commenters feel that the plan ignores cheaper, more reliable supplies within the region, like recharge & recirculation. One commenter believes that enhanced springflows resulting from recharge enhancement and/or recirculation are subject to downstream water rights.

Response

- The South Central Texas Regional Water Planning Group has revised the Regional Water Plan to discuss fully its intentions and reasoning for including the Edwards Aquifer Recharge and Recirculation System in the Plan for purposes of research, but requiring an amendment to the Plan before implementation of this strategy. The footnote referred to in the comments has been replaced by a discussion incorporated into the main body of the text in Section 5.2 and in the Executive Summary.

- The footnote (IPP, ES-25) requiring an amendment to the Regional Water Plan before implementation of the Edwards Aquifer Recharge and Recirculation System read: "Management strategy is included as part of the Regional Water Plan, but may not be implemented unless the Plan is specifically amended to allow implementation."
- In previous versions of tables displaying the management strategies, there had been a line separating strategies included in the Plan from strategies needing further research. Strategies above the line were clearly included in the Plan, but there was confusion over the status of the strategies "below the line."
- Some members of the RWPG wanted the line removed and the strategies below it included in the Plan in order to make it clear that those strategies were "consistent" with the Plan and thus eligible for State funding.
- Other members of the RWPG agreed to remove the line only if it were clear that the Recharge and Recirculation System was included in the Plan for purposes of research funding, but not implementation.
- That condition for removing the line was discussed and agreed to during the RWPG meetings of July 25th and August 3rd. The agreement was later presented in the draft Initially Prepared Plan as a single list of strategies "requiring further study and funding in order to determine the quantity of dependable supply made available during severe drought, feasibility, and/or cost of implementation". In this list, the Edwards Aquifer Recharge & Recirculation System has an asterisk that refers to the footnote language quoted above. The RWPG approved this form of the agreement at its meeting of August 17, 2000, when the IPP as a whole was approved for release to the public.
- The Regional Water Planning Group has carefully reconsidered this issue in light of its fundamental importance to many interests. On the one hand, the Recharge and Recirculation System is viewed as experimental at best and dangerous at worst by several members of the RWPG. First, communities dependent on springflow from the Edwards formation to meet needs in the Guadalupe basin point to computer model runs showing

potential aquifer drawdowns to levels far below its historic lows in the San Antonio area and the consequent potential for drying up the springs "most of the time." The downstream Guadalupe Basin interests state that they cannot accept a regional plan that jeopardizes this essential source of water. They want to see a clear demonstration that implementing Recharge and Recirculation will neither damage the springs nor result in the migration of the bad water line potentially tainting municipal wells. Environmental groups wanting to protect endangered and threatened species at the springs also find the risk associated with what is regarded as an unproven technology to be unacceptable. They are also concerned about the potential damage to species and habitat in the bays and estuaries if flood flows are diverted for other purposes during wetter periods. Utility managers, citing their requirements under Certificates of Convenience and Necessity to provide reliable supplies for municipal uses, are concerned that the lack of experience with this technology and the adverse results of computer model runs conducted by the Technical Consultant raise too many questions about the strategy for it to be recommended for implementation. On the other hand, some members of the RWPG believe that the computer modeling done to date does not present an accurate picture of the system's effects and capabilities. They believe the modeling is unfair in presenting results for a time period beginning with the drought of record, and they compare this to modeling the yield of a reservoir built early in the drought of record – there would be no yield for many years. Although this belief is not accurate with respect to the way the strategy was modeled, i.e., the modeling was based on beginning conditions of a full aquifer, substantial start up time may be needed to give realistic results. Others fear that implementation of some of the water management strategies included in the plan would preclude implementation of Recharge and Recirculation at a later time. They focus, in particular, on the need to include in the plan the strategy of Lake Dunlap diversions to the recharge area of the Edwards Aquifer (see Issue 2 below). If the strategy of diverting water from the Guadalupe at the Saltwater Barrier is implemented first, they fear that the Dunlap diversions would be impossible. That would mean that a major component of Recharge and Recirculation would be gone, damaging the chances of ever implementing this strategy.

- All these interests nevertheless agree that the Recharge and Recirculation strategy may hold great promise and that optimizing use of the Edwards Aquifer is a cornerstone of water policy for the Water User Groups dependent on this underground source. They all support inclusion of this strategy in the Regional Water Plan for purposes of assuring continued research. They agree that implementation of the strategy would require an amendment of the Regional Plan. The amendment process can occur at any time after formal approval of the Regional Water Plan and requires a public hearing after a 30-day notice period.

- The members of the South Central Texas Regional Water Planning Group have further agreed that the Recharge and Recirculation strategy must move as expeditiously as possible through the necessary phases of research to resolve uncertainties about how it would work in practice. To this end, the Planning Group members agree to support the accelerated research effort in the manner appropriate to each, whether by providing funding, reviewing research findings, offering in-kind services or other means. The goal of this effort is to conclude the research as soon as practicable, possibly within a three-year period and in any case in time for reviewing results for possible inclusion of this strategy in the next planning cycle. In this way, the Regional Water Planning Group intends to maintain its consensus approach to planning with careful regard to all interests it represents across the South Central Texas Region.
- Control of flow from Comal, San Marcos, and other springs emanating from the Edwards Aquifer is not a strategy on which the SCTRWPG could reach consensus and include as a specifically identified management strategy in the Regional Water Plan. The Recharge and Recirculation Alternative Plan did include elements that influence spring discharge, and elements that involve storage effects associated with recharge enhancement west of the Knippa Gap.
- Small recharge dams are included in the Plan.
- SCTN-16 and the proposed Edwards Aquifer Recharge & Recirculation System have both been technically evaluated in an unbiased manner and both are included in the RWP. The RWP recognizes that additional study, much of which is already underway, is needed before the EA R&R System may be more explicitly defined and relied upon as a dependable source of water supply during drought.

- The SCTRWPG has included Edwards Aquifer Recharge & Recirculation Systems in the plan and has recommended that state funding be made available to cooperatively support the refinement and implementation of this and other management strategies. Detailed technical evaluation of the Recharge & Recirculation Alternative Plan raised significant concerns including: 1) Simulated aquifer levels in Bexar County some 75 feet lower than the historical minimum; 2) Necessity to change existing law to allow groundwater export from Uvalde and Medina Counties; 3) Adequacy of existing Edwards Aquifer model(s) to accurately simulate proposed operations; and 4) Greatest initial annual costs and greatest reductions in freshwater inflows to the Guadalupe Estuary of the Alternative Regional Plans considered.
- The SCTRWPG acknowledges public concern about these strategies and will address the issues surrounding enhanced springflows and downstream water rights when additional modeling of recharge and recirculation strategies is being planned.

Issue 2. Augmentation of Springflows (includes 20. Lake Dunlap). Some commenters propose inclusion of water management strategies to augment springflow during drought periods. One asserts that augmentation has worked in the Comal River, citing pumping during the drought of record. Another commenter proposes litigation as a strategy for protecting pumping levels. Other proposals include: 1) drilling wells in relative proximity to the springs as sources for augmentation water and 2) using Guadalupe River diversions as sources for augmentation water.

Response

- Augmentation is included in the Aquifer Optimization Studies now underway and jointly funded by EAA, SAWS and other water agencies.
- The comments suggesting inclusion of SCTN 6a (Guadalupe River Diversions from Lake Dunlap to the Edwards Aquifer for Spring Augmentation) have been carefully considered as a way of keeping open for future development an option that is important to the Recharge and Recirculation strategy discussed above. Some commenters have said that failure to include this option now would preclude its implementation in the future because

the water will have been used for other options, including Guadalupe River Diversions farther downstream at the Saltwater Barrier.

- Augmentation strategies using diversions from the Guadalupe River (such as SCTN 6a) would affect other strategies now included in the Initially Prepared Plan as well as downstream water rights. This would necessitate additional technical work and adjustments to the Plan as a whole.
- Some members of the RWPG feel strongly that augmentation needs to have scientific study completed before it can be included in the Plan for implementation. Some members believe that this option is regarded by Water User Groups in the Guadalupe Basin as "the poison pill" that would make it impossible for them to support the Regional Water Plan. The perception, these members assert, is a strong one that cannot be overlooked in the context of a consensus process. These members of the RWPG believe that the Plan as it is now presented was the result of a compromise and should stand without change in this regard. (See discussion under Issue 1.)
- The Regional Water Planning Group believes that the expedited research covering the Recharge and Recirculation strategy will also determine the feasibility of augmentation and the impacts of implementation on downstream water rights.

Issues 3, 17 & 27. Goliad Reservoir, Cibolo Reservoir & Reservoirs in General. This group of comments supports the absence of major reservoirs from the Initially Prepared Plan and urges that the potential reservoir sites that have provoked strong negative reactions be eliminated from any further consideration. Questions were also raised about the inclusion of additional storage, since there is strong opposition to surface water.

Response

- The RWPG has no mechanism for eliminating consideration of reservoir sites "for all time." Future RWPG's or other entities could consider any undeveloped potential site in the future.
- The IPP includes consideration of regional storage options that are necessary for the efficient operation of the system of new water management strategies, for increased reliability of supply in case future droughts are more severe than the drought of record for

which supplies were calculated, and for creation of opportunities to increase yield and dependability through systems operation of the several sources of supply. The Plan recommends consideration initially of such options as the use of existing reservoir storage capacity and off-channel structures and indicates that consideration of new reservoir construction should be viewed as a last resort.

Issues 4 & 23 (in part). Growth Management (Local Governmental Code/County Authority). ***These commenters propose that the Regional Water Plan include more measures to regulate growth, control development over aquifer recharge zones and protect natural resources, aquifers and rivers from pollution. They cite uncontrolled growth of the greater San Antonio area as having many adverse effects, especially on rural counties that become "donors" of water, thus limiting their growth and undermining the agricultural economy. Others argue for increasing county authority to manage growth, creating a new management entity controlled by local residents for regulating water or curtailing the growth of San Antonio.***

Response

- The SCTRWPG has included policy and legislative recommendations that would further protect natural resources, enhance county authority to manage growth and bring new scrutiny to the impact of growth on the sustainability of resources and on the quality of life.
- The State planning rules require the Regional Water Planning Groups to recommend water management strategies that meet identified water needs. As defined in the rules, water "need" means the difference between projected demand and available supply.
- The Planning Group does not have leeway under TWDB rules to reduce the projected demand, though it can find, as the SCTRWPG did in the case of projected agricultural demand, that there are no feasible strategies to meet the needs. "Feasibility" in this case means that the Group did not identify any water management strategies capable of delivering water at a cost agricultural producers could afford under current conditions.
- Within this planning context, the Group is not permitted to recommend strategies to restrict growth in water demand. It has recommended a series of advanced conservation measures to reduce the impact of growth on water resources.

- Existing environmental laws address pollution issues. The SCTRWPG has no authority to impose any regulations to the effects suggested in some of the comments. However, the SCTRWPG is recommending that the Texas Legislature enact or amend laws to give counties more regulatory authority over development affecting demands for water.

Issues 5, 15, & 28. Rainwater Harvesting, Brush Management & Weather Modification. Several commenters support these "additional strategies" that require further research, indicating that they are preferable to structural projects. Some assert that adequate data now exists to support early implementation, especially of brush management. EAA recommends referencing current efforts to quantify results of these strategies.

Response

- Regarding comments that existing data already are available to support early implementation of brush management, the Technical Consultant determined that the available data was not adequate to establish firm water yield under drought of record conditions.
- Weather modification is already in use in the region, but the planning rules require that the strategy have a definite quantity of water it would yield under conditions of the drought of record. That data has not yet been obtained.
- References to ongoing studies regarding brush management and weather modification are added to the SCTRWP in the descriptions of these management strategies. It is the intent of the SCTRWPG to use information from these and other pertinent studies in the next planning cycle.
- Rainwater Harvesting is included in the Plan on the same basis as brush management and weather modification. The RWPG believes this technique may provide a significant source of supply for the region. To comply with TWDB planning rules, the RWPG must complete further research to quantify the firm yield this strategy would provide under drought of record conditions. Despite the absence of data that would permit the RWPG to propose these strategies to meet the needs of specific Water User Groups, all three strategies are included in the Regional Water Plan in order to facilitate State and local funding of research efforts.

Issues 6 & 7. <u>Infrastructure & Conservation/Recycling/Reuse</u>. Many commenters support conservation, and several characterize San Antonio as an area that wastes water. Other commenters oppose large expenditures for conservation, claiming that there is no proof of their cost-effectiveness. Some commenters strongly opposed enforcement of conservation methods as too much government meddling in private affairs. Suggestions were made to outlaw St. Augustine Grass, and to collect air conditioning condensate. One commenter recognized that Region L is the only region to adopt "advanced conservation" assumptions in projecting water demand, but questions why some municipalities should need so much more water per person than others in the same region and recommends adoption of consistent conservation goals for all entities. Another commenter expresses the view that per capita water use in Bexar County should be reduced to 125 gallons per day.

<u>Response</u>

- The RWPG agrees with most of the comments supporting conservation measures. It is important to note the full scope of conservation measures now included in the Plan.
- The Plan uses water demand projections prepared by TWDB that reflect conservation assumptions. The "expected" scenario for conservation used by TWDB incorporates the assumption that new construction will follow state and federal law and use low-flow toilets and other water saving features.
- The SCTRWPG Plan uses the water demand projections based on the TWDB "advanced conservation" scenario that results in approximately 7.5 percent less water demand in 2050 than would be shown under the State's "expected conservation" scenario, and a reduction in per capita water demand of 15 percent between year 2000 and 2050. The advanced scenario assumes not only state and federal requirements for plumbing fixtures used in new construction but also when retrofitting to replace older fixtures. The IPP also includes an Advanced Conservation water management strategy that further reduces municipal demand by about 8.6 percent of the projected water demand of the municipal water user groups in 2050. The measures needed to reach these goals have been agreed to by SAWS, the urban demand center's largest water provider, and many are now being implemented. In addition, the Plan identifies Municipal Water User Groups in the South Central Texas Region with relatively high per capita water usage rates and urges their

adoption of conservation measures. To stimulate wide adoption of such measures, especially among smaller cities, the Plan includes Water Conservation Planning Guidelines that describe each of the available technologies.

- Water Reuse is included in the Plan as a water management strategy for municipal water user groups and would meet approximately 15 percent of the year 2050 identified municipal needs.
- Water utilities of Bexar County, including San Antonio have a very aggressive water conservation program and are implementing reclaimed water use programs to meet 20 percent of future needs. Per capita water use in Bexar County is among the lowest in the South Central Texas Region, and the goal of SAWS is to reduce average day per capita use within its system to 135 gallons per person per day by about 2040. The RWP reflects a City of San Antonio per capita water use goal of 146 gallons per day during drought conditions (Table 1.1-4, Vol. I). Since water demand during drought can be expected to exceed average demand by more than 15 percent, a drought demand of 146 gpcd is consistent with the Sierra Club recommendation of 125 gallons per person per day.
- SCTRWPG does not have authority to prohibit the use of any particular species of plants, but in water conservation planning recommends drought tolerant landscaping plants and grasses.
- Collection of air conditioning condensate is not identified as a viable option to meet needs of population concentrations, but can be included as a water conservation technique in Section 6 of the Regional Water Plan.
- The Texas water planning process uses data as reported by each individual water using entity; i.e., water demands of municipalities are computed using each respective municipality's own data. Likewise, water conservation is based on each municipality's data. The plan is consistent in that it considers each case on its own basis, and has included conservation potentials based upon the entity's data.

Issues 8 & 9. <u>Groundwater/Carrizo & Groundwater/General</u>. Like many of the comments concerning reservoirs, several expressed deep concern that rural groundwater resources in the Carrizo-Wilcox, Trinity and Gulf Coast aquifers might be depleted to satisfy urban demand.

Irrigators in the western Edwards Aquifer area and farm operators in the Winter Garden area, who are supported by water from the Carrizo formation, fear that impacts of the Plan will severely impair their economic base. Region K cites inconsistency between Regions L and K as to groundwater supply availability from Bastrop County to Region L. Commenters from Wilson County expressed concern that planned pumpage from the Carrizo Aquifer could result in migration of oil and/or salty water into wells, and dry up wells in the outcrop. Another commenter asserts that water needs must be addressed on a permanently sustainable basis, and that the Plan fails to accomplish this, since water level declines are anticipated in the Carrizo Aquifer.

Response

- The Plan 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 6.3.5 of Vol. I. of the RWP.
- The Plan uses the groundwater availability figures provided by the Evergreen Underground Water Conservation District and by the Gonzales County Groundwater District Conservation regarding potential withdrawals from the Carrizo-Wilcox aquifer.
- The districts have the authority to issue permits and will consider possible restrictions and conditions during the permit review process.
- The RWPG believes that some comments received with respect to the Initially Prepared Plan should more properly go to the Edwards Aquifer Authority. Comments about "stealing" rather than buying water refer to the EAA permitting rules rather than the IPP.
- After meeting with representatives from SAWS, Mr. Burke of the Lost Pines Groundwater Conservation District agreed to recommend to Region K that Region K increase Bastrop County groundwater availability from 5,000 acft/yr to 5,450 acft/yr for the time period 2000 to 2050. Region K adopted this recommendation. As a result, the first decadel point at which the Region L RWP reflects groundwater development in Bastrop County in excess of Region K's estimate of availability is 2030. Pumpage from Bastrop County under Region L management strategy Carrizo Aquifer-Gonzales and Bastrop (CZ-10D) is

not planned to begin until 2040. Regions L and K agreed to footnote the years where the discrepancy exists and wait on the upcoming Groundwater Availability Model to determine the availability for Bastrop County.

- The following paragraph has been added to the description of the Simsboro Aquifer (SCTN-3c) Water Management Strategy in Volume I, Section 5.2.3 of the South Central Texas Regional Water Plan.

> "Projected pumpage associated with this management strategy is consistent with the Brazos G Initially Prepared Regional Water Plan (Milam and Lee Counties) for the entire 50-year planning period. Projected pumpage in Bastrop County after 2020, however, exceeds the current estimate of available supply adopted by the Lower Colorado Regional Water Planning Group (Region K). Periodic discussions between representatives of the South Central Texas and Lower Colorado Regions have focused on concerns regarding potential water level declines in the outcrop of the Simsboro Aquifer, three different groundwater models of the area, mitigation of impacts to affected wells, and equitable treatment of property owners within a groundwater district. Differences between Region L's projected pumpage and Region K's estimate of available supply are more than 20 years from the present while development of new Carrizo (Simsboro) Aquifer Groundwater Availability Models (GAMs) under Texas Water Development Board direction is to be completed by about 2002. Hence, it has been agreed that discussions will be more productive upon completion of the GAMs at which time additional scientific information will be available to both regions."

- It is assumed that similar and consistent language will be added to the Lower Colorado Regional Water Plan at the appropriate location.
- Simulations of the effects of Carrizo Aquifer pumpage from Wilson and adjacent Counties indicate that water levels will remain well above the top of the formation in all but the shallowest of outcrop wells. Care in the installation of new wells, proper maintenance of existing wells, long-term monitoring of water levels and water quality, as required by groundwater conservation districts, can provide information needed to respond to threats of migration of oil and salty water into wells.
- Groundwater modeling runs performed by HDR as part of this planning effort, produced simulated drawdowns in Wilson County of up to 75 feet, maintaining water levels within 100 to 200 feet of the surface. This information, however, is not intended to remove the

need for more detailed groundwater modeling studies to provide more accurate projections of groundwater level impacts resulting from proposed or projected pumping levels.

- The SCTRWPG has adopted a goal of groundwater sustainability as described in Section 6.3.5 of Vol. I of the RWP. The simulated 50-year water level decline or drawdown associated with the Carrizo Aquifer – Gonzales & Bastrop Counties (Option CZ-10D) as included in the RWP is less than 60 feet (Figure 5.2-36, Vol. I).

Issue 10. <u>Desalination</u>. There are widely divergent views in the comments on desalination. Some express concern that the option is effectively ignored since it does not come into use until 2040. Others oppose desalination because of its environmental impacts and/or because of potential impacts on Victoria and other communities near the mouth of the Guadalupe River. Still others believe desalination of seawater to be the only viable and permanent solution to San Antonio's current and future water needs.

<u>Response</u>

- The SCTRWPG recognizes the potential of seawater as a long-term source of water supply. However, as indicated in the RWP, there are a number of less costly and more geographically proximate water management strategies that should be developed prior to desalination of seawater.
- This water management strategy is in the plan, to begin meeting needs in 2040. That date for implementation was chosen in the expectation that further research and development over the next 30-40 years will make the strategy more cost-effective.
- All environmental and third-party impacts will be studied before implementation occurs, and there will be many opportunities to raise these issues during both the research and permitting phases.
- The SCTRWPG has also recommended that the State fund demonstration projects of desalination, among - other alternative technologies.

Issue 11. <u>Authority/Study Process/Boundaries/Representativeness of RWPG</u>. Many comments touch on procedural aspects of the regional water planning process. Some commenters found fault with the representativeness of the RWPG, saying that the "public" interest needed to

have more than one representative and that the rural public interest is not adequately considered. Others assert that the process has used inaccurate and/or incomplete data, especially about agriculture and that it was important to have additional sources of technical information available, particularly for lay members of the Planning Group itself. Other commenters assert that the planning process is flawed since it does not provide enough socio-economic impact analysis, especially of the impact of meeting urban water needs on the rural areas. One comment asserts that the plan does not meet committee's evaluation criteria (economics, flexibility, fairness, water quality, feasibility, efficiency, compatibility, reliability, and environment). Other criticisms of the process are that the evaluation criteria defined by the RWPG were not applied to some of the major water management strategies, that the consensus process was compromised by side-bar agreements and that the boundaries of planning regions in some cases have created barriers to cooperation.

Response

- The SCTRWPG has already made recommendations to TWDB on the planning process during the public comment period in October, 2000. The Regional Water Plan includes additional measures that would improve many aspects of the regional water planning process.
- One recommendation calls for a boundary change for the South Central Texas Region by adding the portion of Blanco County within the Guadalupe River Basin. This change would conform to the planned pattern of water supply to the area. That is the only boundary change agreed to by the RWPG. The Group has also recommended to TWDB that the regional planning boundaries not be viewed as barriers but as opportunities for cooperation.
- The RWPG has recommended that the planning groups have more and earlier involvement in the development of TWDB's water demand projections and has proposed that TWDB give greater flexibility to planning groups for responding to local water plans for future growth.
- The RWPG has discussed the issue of representation several times and believes that the present membership well represents the breadth of interests and the geographical scope of

the South Central Texas Region while keeping the numbers of voting members to a workable level.

- The RWPG has proposed including in the study plan for the next planning cycle additional training and information resources for members in order to establish greater access to information on which members can base their decisions.
- The Group has also recommended inclusion of more socio-economic analysis in future planning. At present, TWDB rules provide for such analysis in three areas: 1) consideration of the impact of not meeting the identified needs for water; 2) consideration of third party impacts of voluntary water transfers; and 3) consideration of economic impacts of interbasin transfers.
- The SCTRWPG has recommended, as have most of the regional water planning groups, additional State funding for the development of basic ground and surface water data and for enhancement of systems to facilitate access to State water data for planning purposes.
- Regarding the use of the RWPG evaluation criteria, the criteria were never intended to be applied to water management strategies on a stand-alone basis, but rather to serve as tools for evaluating the integration of strategies into alternative regional water plans. The criteria were applied to each of the alternatives. Please refer to Section 7.1 (Vol. I) for additional information on the evaluation criteria.

Issue 12. Endangered Species Protection. Some commenters criticize the RWPG for not considering a "water management strategy" of litigation to challenge the application of the Endangered Species Act in the circumstances found in the Edwards Aquifer and the springs. Other commenters say that the IPP does not adequately consider impacts on endangered species, particularly with reference to habitat needs of the springs and in the bays and estuaries.

Response

- The Regional Water Plan is required to be developed under existing law. Federal and state law protection of springflows for endangered species calls for maintaining minimum rates of flow, the precise levels of which are still under investigation.

- The RWPG is also required to meet the identified water needs under existing law, and, in this case, that means identifying alternative water management strategies under conditions of the drought of record when the application of State and Federal law requires reductions in pumping from the Edwards Aquifer. The TWDB rules do not allow the RWPG to project the elimination or reduction of the identified need or shortage through litigation.
- The Initially Prepared Plan complies with TWDB rules regarding the evaluation of environmental impacts, including impacts on threatened and endangered species and on aquatic habitats in the bays and estuaries. Impacts have been evaluated according to the State's Consensus Environmental Criteria, which have been developed jointly by the Texas Water Development Board, the Texas Natural Resource Conservation Commission, and the Texas Parks and Wildlife Department. The rules require a reconnaissance-level study, however, not the in-depth review that would be necessary at such time as a particular strategy is presented for consideration by a regulatory agency.
- The SCTRWPG has addressed the issue of spring flows and inflows to bays and estuaries to the extent possible at this time. Refer to Section 6.3.6 Protection of Edwards Aquifer Springflow and Downstream Water Rights in Vol. I.

Issue 13. Population/Water Demand Projections. There are many comments criticizing the accuracy of population and water demand projections, especially from the more rural counties of the region. Some commented that water demand projections are too low, while one commented that projections for his city are too high.

Response

- Population and water demand projections will be revised based on the 2000 census in the next planning cycle, beginning next year.
- 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 for comment, and proposed revisions for this region were considered and accepted by the TWDB.
- 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 to become more active in reviewing the data and requesting modifications.

- The SCTRWPG does not disagree with complaints about the accuracy of TWDB data and hopes that more active involvement of all concerned will result in more accurate data in the next cycle of planning.
- Some comments reflect confusion about the TWDB planning terminology. The word "needs" in this context refers only to the shortage of water identified when available supplies are compared to the projected water demands. "Demands" is the term that refers to the entire quantity of future water use. Problems with the water demand data provided by TWDB should be addressed by the increased involvement of counties, cities and regional planning groups in the State process.
- Water demand projections in this Plan reflect the impact of advanced water conservation. Emphasis is upon increasing efficiency of water use in order to hold down the need for additional water supplies.

Issues 14 & 18. <u>Third Party Impacts to Economy & Ag. Water Rights Transfer</u>. As noted in relation to other issue areas, several commenters criticize the Initially Prepared Plan for its treatment of agriculture and rural areas. Many of the comments project major negative indirect economic and social impacts of the Plan and decry the absence of detailed analysis of such impacts. Some commenters predict disastrous impacts from particular water management strategies. One commenter inquired as to why irrigation cannot afford new water when irrigators are selling what they have? Another commenter states that analysis of economic feasibility of meeting irrigation needs is erroneous with respect to vegetables, and that additional consideration needed of impact of this plan upon future economic viability of rural areas.

<u>Response</u>

- The Regional Water Planning Group did not meet identified agricultural needs, with the exception of the advanced conservation strategy for irrigation, because it found that agricultural producers, under current conditions, could not afford the price of the water management strategies that were evaluated. The TWDB projects a long-term decline in water use by agriculture in this region for varied reasons that go beyond the scope of water planning and include the diminishing role of federal subsidies, rising costs of farm inputs, and international market conditions for the major crops of this region.

- The SCTRWPG included weather modification, brush management, and irrigation water conservation strategies, all of which are believed to have potentials to increase water supplies of the region, and thereby would be of assistance to all water user groups.
- SCTRWPG included the social and economic impacts of projected irrigation and other water shortages in Section 4.3 of the Regional Water Plan, Tables 4-24 through 4-28.
- The decisions about water permitting and the availability of groundwater for agriculture are made by the appropriate groundwater district, and each district will determine the amount of supply available for new well permits, restrictions on water production, and other matters, as authorized by State law. The Regional Water Plan emphasizes its respect for the rules and regulations of the districts and will stay in close communication with them during the next planning cycle. Rural economic and social impacts of new permits are likely to be considered at that stage.
- Some commenters want to see more comprehensive economic and social impact analysis of the water management strategies, most of which meet municipal needs, on the rural and agricultural economy and way of life. At present, the TWDB rules do not require such analysis for all strategies. The rules do require analysis of third party impacts for all strategies involving the voluntary transfer of water. This analysis is incorporated in the evaluations of the relevant water management strategies. The TWDB also carried out a socio-economic impact analysis of not meeting the defined needs for all Water User Groups and found that the South Central Texas Region could forego hundreds of thousands of jobs and billions of dollars in income if the projected water needs were not met.
- The RWPG has adopted a recommendation to the State requiring additional socio-economic analysis and also is reviewing proposals to add this analysis to the scope of work for planning activities in the next planning cycle.
- Some commenters urge that more Edwards water be transferred to municipal use than the IPP projects, but others believe that the transfers will undermine the rural economy. The

amount of Edwards Aquifer water that can be transferred from agricultural to urban use is limited both by the Edwards Aquifer Authority Act, which allows the transfer of no more than 50 percent of an irrigation right to municipal use, and by market forces. The Regional Water Plan projects an amount of transfer that balances two factors, the existence of a voluntary water market that enables irrigators to make their own decisions about the best return on their groundwater permits and the potential damage to the agricultural economic base of rural counties if too much irrigation water is shifted to municipal use. The Plan projects the transfer of approximately 82,000 acft, an amount that appears feasible based on past experience with the local water market. Recent estimates, however, indicate that as much as 140,000 acft could be available for transfer out of irrigation. The SCTRWPG believes the transfer of that full amount could have unacceptable socio-economic impacts on agricultural areas. The following information illustrates current and historic levels of irrigation water use in the Edwards Aquifer Area. Both 1998 and 1999 were considered "dry" years for agriculture in the Edwards Aquifer Area. EAA began metering irrigation usage in 1997. Metered irrigation usage in 1999 was 113,600 acft. The historic high on record (1955—1999) is 203,100 acft and occurred in 1985. The 5-year average (1995—1999) is 119,960 acft/yr, and the 10-year average (1989—1999) is 106,210 acft/yr.

- One commenter addresses the third party impacts of desalination and the diversion of Guadalupe River flows at the Saltwater Barrier. The impacts of these projects will be reviewed thoroughly when project permit applications are submitted. In particular, TNRCC will review availability of surface water, impacts on bays and estuaries, the economic impact on the area proximate to the source of supply, and many other factors. If and when permit applications are submitted, there will be opportunity to address these issues in the TNRCC forum.
- Some irrigation farmers who are entitled to irrigation permits for the use of Edwards Aquifer water are finding that the financial returns from the lease or sale of parts of these permits exceed the financial returns from using the water to grow and sell crops. The estimated cost of new water that would have to be obtained at distances of hundreds of miles away are many times greater than the estimated financial returns from the use of such water in irrigation in the South Central Texas Region now or in the foreseeable future. In addition, it should be noted that returns from the lease or sale of irrigation water

can be used to install water conservation equipment and thereby increase the efficiency of water use and contribute to maintaining irrigation production that is important to the local economies.

- Data used in the analysis of economic feasibility of meeting irrigation needs were obtained from official sources, including the Texas Agricultural Extension Service at Uvalde and the TWDB irrigation files.
- The SCTRWPG believes that this Plan includes strategies with significant positive benefits to rural areas in the form of increased water conservation on farms, increased rainfall through weather modification, increased livestock and water production from brush management, and a cash market for water that is voluntarily transferred from rural areas to municipal demand centers. The SCTRWPG feels that these benefits should be computed and used in the deliberations of future regional water planning.

Issue 16. Irrigation Technology Center. Comments urge RWPG support of State funding for this proposed center that would provide access to urban and rural irrigation conservation technologies.

Response

- Responding to comments regarding the proposed Irrigation Technology Center described in a brochure from the Texas A&M University System, the RWPG has adopted a recommendation to the Legislature advocating funding for a center in the region as well as funding for existing centers at the University of Texas at San Antonio and the Southwest Texas State University in San Marcos.

Issue 19. Recharge - General. In addition to comments already addressed under Issue 1, commenters in this group raise a series of specific questions, which are addressed below.

Response

- Commenters state that the County of Uvalde has already built recharge structures in areas that option L-18 is to place them. The RWPG supports past work of the County of Uvalde to recharge the aquifer and believes that the proposed structures in L-18 would further enhance recharge in the area and would not interfere with existing structures.

- One comment opposes building recharge structures in areas that are candidate perennial Ecologically Unique Stream Segments, as identified by the Texas Parks & Wildlife Department. The RWPG has opened a dialogue with the TPWD regarding potential conflicts between planned recharge structures and the resource characteristics identified by TPWD as leading to their recommendations of designation as an Ecologically Unique Stream Segment (Section 8, Vol. 2). Most of the recharge dam sites are not in conflict with the identified resources. For recharge dam sites at which perennial streamflow is indicated, Consensus Environmental Criteria were applied.
- The RWPG agrees with many commenters that recharge of the Edwards Aquifer is an important strategy, but sees it as one among many important strategies that will be necessary to meet the identified needs of the municipal water user groups.

Issue 21 <u>Public Education</u>. Numerous comments address the need for water education programs, especially in the schools.

<u>Response</u>

- The RWPG agrees with comments about the importance of educating the public about water conservation, the Edwards Aquifer, and other water issues specific to this region. The group has adopted a recommendation to the Legislature for funding a statewide water education program that would include region-specific materials.
- The advanced conservation strategy (L-10) and the conservation planning guidelines attached to the report include public education as one component.

Issue 22a. <u>Costs – General</u>. Comments on cost focus on two areas: 1) the presentation of cost data in the IPP is said to be confusing and misleading; and 2) the cost of the proposed plan is excessive and will place undue hardship on the San Antonio area ratepayers. One commenter objects to the idea of having to incur costs in the present in order to reserve water to meet future needs. One commenter feels that the Plan relies too heavily on expensive, out-of-region projects.

Response

- The issues of who pays for projects and how much they pay are beyond the scope of the planning study. The TWDB rules require that costs of a project from a source to a Water User Group be calculated. Issues of how that cost is paid and by whom depend on whether the relevant water providers agree to implement a given project, how they agree to share costs and how those costs are then distributed to different classes of ratepayers. These are implementation issues rather than planning issues. However the basic principle reflected in the Regional Water Plan is that the water user pays the cost.
- Some commenters state that cost effective measures within the Region should be used before going outside the Region for water. The RWPG believes that use of water from adjoining regions must be planned now since sufficient water within the Region does not currently meet all identified needs under drought of record conditions. The Plan can be modified if further research shows that these needs can be met from cost-effective and environmentally sound strategies entirely within the Region.
- Some commenters identify "local" options as "inexpensive" and "distant" options as "expensive." For example, there are many factors besides the distance between the source of water and the Water User Group that affect cost and planning decisions. Legal constraints on availability, feasibility questions, and impacts on the environment or on other water users are among many factors that can make water strategies using local sources as expensive as those using more distant water sources. The RWPG believes that any combination of water management strategies, given current legal constraints, will cost a great deal. One of the purposes of long-range planning is to disclose to water providers and to the public the costs of meeting the needs for water.
- Regarding comments that the Regional Plan's costs are "hidden" or "misleading," the IPP presents a cost per acft in a uniform manner wherever possible. The annual operating costs are given at the decadal years (2010, 2020, etc.), and all cost assumptions are presented in a technical appendix. A determination about whether the portion of the plan to be implemented by any one water provider and its customers is "too expensive" will be made during the implementation phase.

- Some commenters state that the Regional Plan is the "most expensive of any plans considered by the committee." There were two alternative plans considered by the Regional Water Planning Group that had a higher average cost per acft over the 50-year planning horizon. During the more immediate planning horizon extending through 2030, the RWP is less costly than any of the Alternative Plans considered. More significantly, the RWP provides approximately 150,000 acft/yr more water than the alternatives considered earlier in the planning process. This additional amount is necessary to provide adequate supplies in light of possible drought condition reductions in the assumed planning level of Edwards Aquifer pumping for the Region. The Plan also includes strategies that may be necessary if other options prove not to be implementable. In other words, the final implementation may not include every listed strategy.
- The SCTRWPG recommends that those who are projected to need additional water begin discussions with potential suppliers to ensure that quantities needed can be obtained in a timely fashion.
- Only about 30 percent of the new water supplies identified in the RWP for development within the next 50 years originate outside of the planning region. The RWP generally reflects priority implementation of the least costly water management strategies utilizing water originating within the planning region.

Issue 22b. <u>Costs – Specific</u>. Questions were asked about present cost, per acft, for SAWS to produce and deliver water to the ratepayer/customer in San Antonio, cost, per acft, that Alcoa and LGBRA(sic) will charge for water to the terminus at the Lower Guadalupe River Diversion Project, cost, per acft, that Alcoa will charge for water at the pipeline terminus at the Simsboro project, cost, per acft, that LCRA will charge for water at the new Colorado River Diversion Project, and costs in comparison to WSC and SUDS? A comment was made that the discounted cost for the City of San Antonio is $10 billion, and that this is too high for a city with 20 percent of its population living in poverty. Another commenter states that the plan maximizes energy requirement by bringing major amounts of water from sea level to population center. .

Response

Response

- The present cost for the San Antonio Water System (SAWS) to produce and deliver water from the Edwards Aquifer to a typical residential ratepayer in San Antonio is about $1.23/1000 gallons or $400/acft.
- The purchase price for water that may be obtained from the Guadalupe-Blanco River Authority (GBRA) at the Guadalupe River Saltwater Barrier is under negotiation at this time. GBRA presently sells stored water from Canyon Reservoir at a rate of $69/acft/yr. Note that the costs of diversion, storage, transmission, treatment, distribution, and other facilities necessary to provide water to the typical residential ratepayer will greatly exceed the cost for purchase of water.
- Pursuant to the current agreement between SAWS and the Aluminum Company of America (Alcoa), water will be provided to SAWS for a price ranging from $50/acft/yr to $130/acft/yr.- Note that the costs of transmission, treatment, distribution, and other facilities necessary to provide water to the typical residential ratepayer will greatly exceed the cost for purchase of water.
- The purchase price for water that may be obtained from the Lower Colorado River Authority (LCRA) at one or more locations on the Colorado River is under negotiation at this time. LCRA presently sells stored water from the Highland Lakes System at an inbasin rate of $105/acft/yr. However, this may not be the negotiated price for Colorado River water to the South Central Texas Region. LCRA has indicated that it plans to include in the ultimate price of water, financial considerations for mitigation that could be equal to the price of water, e.g.; mitigation costs may be 100 percent of the price of water that is ultimately negotiated. Note that the costs of diversion, storage, transmission, treatment, distribution, and other facilities necessary to provide water to the typical residential ratepayer will greatly exceed the cost for purchase of water.
- SCTRWPG does not have information about costs of individual WSC/SUD supplies. Average cost of SCT Regional Plan is $1.89 per 1,000 gallons of treated water at the wholesale delivery point.
- The costs of water of the Regional Water Plan were calculated according to TWDB Rules, which specified that all elements were to be calculated in second quarter 1999 prices, with

an interest rate of 6 percent for calculating debt service, and that facilities were to be amortized over 30 years, except off-channel and storage reservoirs, which were to be amortized over 40 years. These cost calculating rules were specified so that each option being considered would be evaluated and compared on an equal basis, insofar as costs are concerned. Capital or project costs for the projects (management strategies to provide the additional water to meet the projected needs of Bexar County) of the regional plan for Bexar County, in second quarter 1999 prices, are $4.0 billion. The cost of this additional water delivered to the wholesale distribution points, including debt service (principal and interest) on the $4.0 billion of project costs, price of water, and operation and maintenance costs of all facilities, including water treatment, and energy for pumping water over the next 50 years is calculated to be $12.7 billion, or about $0.25 billion per year, in 1999 prices.

- The TWDB calculations of economic impact in Bexar County of not meeting the projected need for this new water is $25.7 billion per year in 2010, and increases to $41.7 billion per year in 2030, and to $60.5 billion per year in 2050. The impacts on ratepayers can only be determined by the local water providers at the time of implementation.
- The cost of implementing the plan is a small fraction of the annual economic impacts of not meeting the needs. See Tables 4-24 through 4-28 for information by county, city, and water user group in each county as to impact to population, school enrollment, gross business, employment, and personal income.
- The RWP does require significant quantities of energy to move water.
- Individual water management strategies in the RWP that affect springflows were evaluated as to effects upon springflow. The quantity of pumpage from the Edwards Aquifer during drought is a placeholder number awaiting an approved EAA Habitat Conservation Plan.

Issue 23. Local Government Code/County Authority. ***Several comments propose that County government have new authority to manage growth. Four County Judges propose a new State law requiring groundwater districts to give first priority to meeting the needs of residents of the district, to add scientific and impact analysis tests for the permitting of groundwater for***

use outside the district and to mandate monitoring wells for such use, and empowering Counties to enact measures designed to compensate for the loss of exported groundwater.

Response

- The RWPG has included a recommendation to the Legislature to enhance County regulatory authority.
- The RWPG has included in the RWP its own guiding assumptions concerning respect for the regulations of groundwater districts, the importance of monitoring groundwater use, the need to minimize and mitigate impacts of groundwater use and the overall goal of groundwater sustainability. Consideration of additional proposals can occur in the next planning cycle.

Issue 24. Rule of Capture. Some commenters advocate repeal of the rule of capture. Others defend the existing property rights regime.

Response

- The RWPG is required to follow existing groundwater law.
- The Planning Group has adopted a recommendation supporting the findings of the TWDB-sponsored consensus report: "The Future of Groundwater Management in Texas," with the exception of that report's recommendation to repeal the junior water rights provision of Senate Bill 1. As noted in Section 6.6, the SCTRWPG takes no position on the junior water rights provision.
- The RWPG has not adopted a recommendation on the rule of capture.

Issue 25 Junior Water Rights Provision/Interbasin Transfers. Some comments call for repeal of the junior water rights provisions of SB-1, but others say that reliance on those provisions will help rural areas defend themselves from water management strategies to export water. One commenter believes that the focus of the Plan is upon obtaining water from other regions and from Region L's estuaries and ignores sources closer to the urban demand center.

Response

- Regarding comments on the merits of the junior water rights provisions of SB 1, the RWPG is required to follow existing law. The Planning Group has adopted a legislative recommendation recognizing the validity of opposing views on the subject of the junior water rights provision and interbasin transfers, but is taking no position on whether or not these provisions of SB 1 should be changed.
- Some commenters state that it is unwise or wrong to move water from one basin to another. The RWPG believes that the extensive needs for water in Region L under drought conditions will likely require importation of water across river basin boundaries. These transactions will involve willing buyers and sellers and will be closely evaluated by TNRCC as to their economic impacts in the originating basin. Questions of equity will be addressed in those proceedings.
- The focus of the plan is upon maximizing use of the region's resources, including advanced water conservation, use of reclaimed water, aquifer recharge, aquifer storage and recovery, and use of streamflows from the region's rivers. Water will be purchased from owners of water rights or permits.

Issue 26. Simsboro Aquifer/SAWS-Alcoa. Some commenters oppose this water management strategy based on cost, groundwater impacts, its association with Alcoa, and lack of need, among other factors. Other commenters expressed their view that the HDR models inaccurately predicted increases in water levels between 2000 and 2040, and underestimated drawdown that has already occurred.

Response

- The TWDB Rules specify that existing contracts and agreements be recognized. The contracts among SAWS, Alcoa, and CPS provide for the beneficial use of water currently being extracted to facilitate ongoing mining operations and provides for the production of additional supplies from private property subject to groundwater district rules applicable to other property owners within the district.

- The RWPG believes that this strategy is needed as part of an overall plan. Many issues raised by opponents will have to be dealt with by the parties directly involved in the course of permitting processes before the project can be implemented.
- The RWPG recognizes that there are differences between its Regional Water Plan and the IPP of Region K. The SCTRWPG has responded to the "Nine Points" presented in the Region K plan as a basis for negotiating water transfers from Region K to the South Central Texas Region (see Issue 39). It has also responded to the Region K projections of groundwater availability from the Carrizo Aquifer in Bastrop County, which differ from the projections in the South Central Texas Regional Plan at year 2030 and beyond. Differences prior to 2030 have been eliminated through discussions, but differences remain beyond that date.
- The rise in predicted water levels in the HDR model was due to initial water levels that were set slightly too low. A revision of the initial water levels in the model showed that simulated water levels in the area of interest would fall by about 3 feet less after 50 years than those calculated by the original model.
- The calibration process used by HDR stressed matching hydrographs of water levels in key observation wells instead of a simple comparison of measured and calculated water levels at the end of the simulation. The approach used by HDR allows one to consider starting conditions, changes in water levels that occurred during the calibration period (1951—1996), and locations of observation wells. In Lee and Milam Counties, the difference between measured and water levels calculated by the HDR model was usually less than 20 feet.

Issue 30. LCRA Project. Some commenters oppose this component of the RWP on the basis that Region L would pay the total cost of the water, when half of the water would be used by Region K. Others oppose the project because of its overall costs, the unreliability of the supply and/or its environmental impacts on instream flows and inflows to bays and estuaries.

Response

- All issues of allocating costs and benefits will be decided by the relevant parties to the proposed strategy, and any agreement reached could be subjected to scrutiny by the

TNRCC under the provisions of SB-1 and/or other applicable law concerning interbasin transfers. As described in the RWP, this management strategy includes all facilities necessary to develop the supply under the LCRA proposal. Such facilities include diversion works, off-channel storage, wells, transmission pipelines, water treatment plants, and distribution system improvements. Potential sharing of costs for some of these facilities is the subject of on-going negotiations. The estimated cost for purchase of water from the LCRA shown in the RWP is based on LCRA's current in-basin rate of $105/acft/yr plus a 25 percent out-of-basin surcharge. Ultimate costs for purchase of water will be a subject of negotiation.

- The version of the project proposed by the Lower Colorado River Authority (LCRA) firms up the variability of supply from the natural flow of the Colorado River through the use of off-channel storage, groundwater, and stored water from the Highland Lakes.
- The SCTRWPG understands that the LCRA has a state-approved instream flow plan under which LCRA has made the New Colorado River Diversion proposal. However, LCRA is continuing assessment of potential environmental impacts associated with the New Colorado River Diversion.

Issue 31. Downstream Bays & Estuaries. Several commenters have mentioned concern about adverse impacts on bays & estuaries that could result from one or more of the proposed management strategies in the RWP.

Response

- These impacts have been evaluated at a reconnaissance level under 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 Texas Natural Resource Conservation Commission, and the Texas Parks and Wildlife Department. At such time as the relevant strategies are presented for permitting by TNRCC, 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.

- Cumulative impacts of the RWP include 1.3 percent (~19,000 acft) and 3.0 percent (~14,000 acft) reductions in mean annual freshwater inflows to the Guadalupe and Nueces Estuaries, respectively. LCRA information indicates that there would be no change in LCRA'a state-approved plan for freshwater inflows to Matagorda Bay.

Issue 32. <u>Rules/Pumping Levels of EAA</u>. One commenter urges the RWPG to use a draft EAA recharge credit rule to evaluate the Recharge and Recirculation strategy. Others are critical of EAA rules regarding permitting, forfeiture and other issues. One commenter asks if the Plan affects private residence wells in the Edwards Area, and observes that index wells in San Antonio are not a reflection of water levels in Medina County. One commenter feels that a sustainable yield concept applied to recharge understates the benefits and does not provide an equal comparison to other sources. One commenter recognizes that the assumption of 400,000 acft/yr of Edwards pumpage is valid for conservative assessment of water availability from downstream run-of-river options, but emphasizes that the 340,000 acft/yr Edwards pumpage used for assessment of current supply is a "place holder" until EAA completes its Habitat Conservation Plan as continuous pumpage of 340,000 acft/yr from the Edwards could seriously impact Comal and San Marcos Springs.

<u>Response</u>

- The SCTRWPG recognizes that there are uncertainties about the final form of EAA rules concerning such critical issues as recharge credits, additional reductions in pumping, and other matters. As these rules become final, the Regional Water Plan will be reviewed and may be amended in response to different legal requirements. The Regional Water Plan reflects current rules and planning assumptions accepted by members of the RWPG.
- The Plan has no effect on private residence wells. EAA rules and permits apply.
- EAA procedures account for local differences, using multiple key monitoring wells. The SCTRWPG has applied EAA draft Critical Period Management rules in the planning process and respects the EAA groundwater management plan.
- The sustainable yield concept was specifically adopted by the SCTRWPG for consideration of recharge enhancement projects so that they could be equitably compared to other projects on a firm yield or drought-of-record supply basis as required by TWDB

Rules for regional water planning under SB1. Furthermore, incremental increase in sustained yield of the Edwards Aquifer is one of the methods under consideration by the EAA for issuing permits for the recovery of enhanced Edwards Aquifer recharge.

- The SCTRWPG agrees with observations and concerns about Edwards Aquifer pumpage levels of 340,000 acft/yr to 400,000 acft/yr and has taken this into account in its plan for the development of sufficient additional water supplies (management supply) to protect springflow.

Issue 33. Cumulative Effects Analysis. One commenter believes environmental issues are an "afterthought" of the Initially Prepared Plan and calls for an assessment of the overall plan to evaluate cumulative impacts.

Response

- In response to comments that the IPP lacks any cumulative environmental impact analysis, each alternative plan and the Regional Water Plan, were evaluated for cumulative environmental effects over the 50-year planning horizon. Details of the methods and assumptions of these analyses are included in the Regional Water Plan, especially in Sections 5.2.3 and 5.2.4 of Vol. I. Substantial additional information regarding potential environmental concerns associated with implementation of the RWP and evaluation of alternative plans and management strategies may be found throughout Vols. II (especially Section 8) and III. The RWPG recognizes the limitations of these analyses, if only because the details of implementing each strategy cannot be known with precision at this time.
- The RWPG has discussed the problem of the regulatory agencies regarding each strategy on a stand-alone basis and have urged both State and Federal regulators to view each strategy in the context of an entire plan.

Issue 35. Aquifer Storage & Recovery (ASR). Some comments express support for the use of ASR but also note a concern about the compatibility of mixing water of different chemical composition.

Response

- The ASR project in the plan will receive close scrutiny during the permitting process. Injection wells for this purpose are regulated by TNRCC. Drinking water standards must also be met for any water delivered to a public water supply system.

Issue 36. Mixing Surface and Groundwater. One commenter expresses concern about the mixing of aquifer and surface waters for delivery by water utilities, citing potential chemical incompatibilities. Another expresses concerns regarding feasibility of aquifer storage & recovery project(s) with respect to compatibility.

Response

- These are points well taken and an important concern of any water utility as part of its systems operations. Each case has to be reviewed for specific problems, and this will be dealt with at the level of each water provider's decision process.
- SAWS is presently conducting studies to address concerns regarding compatibility of waters from sources including surface water and groundwater from the Edwards and Carrizo Aquifers.

Issue 38. Technical Questions not Included in Issues Listed Above. One commenter raised questions regarding sources of supply for Kendall County, as follows: Who is the major provider? Source of funds? Source of water? How deliver water? When water available? Why other strategies not considered? How protect private wells?

Response, in order of questions listed above:

- May be either GBRA, SAWS, BMWD, or other to be organized.
- Rates to customers for water used.
- Major providers sources.
- Pipelines.
- Some within next 2 years, and more later, as needed.

- Others included are municipal water conservation, brush management, weather modification, and rainwater harvesting.
- Newly formed undergroundwater conservation districts.

One commenter states that water demand projections are too low by an order of magnitude, and advocates a pipeline system including South Central Texas Region, Dallas, and Far West Texas that would be supplied via desalted seawater

Response.

- Unlikely public support for suggested pipeline distribution system to large areas of Texas at this time.

Texas Nursery and Landscape Association requests that definition of agriculture include horticultural products.

Response

- Nursery and garden centers located in cities are commercial customers of municipal systems and are included in municipal demands. Growers are included in agriculture to the extent that data are available. The TWDB should work with the nursery and ornamentals industry to develop water use data and growth projections for use in future water plans.
- The SCTRWPG has no authority in the matter of definition of water users insofar as permit or pumpage fees are concerned.

EAA requests SCTRWPG recommendations for water supply options provided to EAA from final plan include only options to be used in EAA's jurisdiction.

Response.

- SCTRWPG's technical consultant is reviewing EAA's consultant's tabulation of the data.

One commenter inquired as to how rural areas are to be supplied.

Response

- For housing subdivisions, public and private water suppliers form water systems and arrange to obtain water supplies either from nearby groundwater sources or by purchase from regional systems and suppliers. Individual households and businesses install their own systems.

A local government official inquired as to whether of not water in the Plan is reserved for the entity identified with need, or is the water available to others.

Response.

- Water in the Regional Plan is not necessarily reserved for the entities to which it has been tabulated. However, under SB1, neither the TWDB nor the TNRCC can provide funding or permits, respectively, for projects that are inconsistent with the Regional Plan. Therefore, there may be some degree of reliability of supplies for entities in the Plan.

One commenter states that the Plan should provide the public with a list or map of the stream segments identified by TPWD as ecologically significant and indicate which of the proposed options would affect them.

Response

- The list is included in Volume 2, Section 8, Tables 8-4 and 8-7. There are 26 segments included on the TPWD list.

Two commenters made the following comments regarding the planning process and the flow and availability of planning information:

- ***Legislative intent of "Grass Roots" planning frustrated by lack of timely and important information.***
- ***No resources were provided SCTRWPG to present a forum for discussion of issues from outside Texas with history and experience in water policy issues such as transfer of water from agriculture to urban use, concepts and theories of water banking. economic definitions and sustainability, ethics of consensus building, or leveraging of state funds to ensure local government accountability in planning, growth management and policy.***
- ***During last 3 months, significant changes appeared in plan over night.***

- *Delays in groundwater policy matters and EAA studies furnished too late.*
- *Future of Groundwater Management in Texas incomplete and without dissenting opinion.*
- *EAA recommendations not received by SCTRWPG.*

Response

- The SCTRWPG followed the planning rules and procedures of the TWDB, including use of data provided.
- All deliberations, including process to include options and strategies in Regional Plan were done in posted open meetings and complied fully with the Texas Open Meetings Act
- Information was available to all RWPG members, and was used during the time available.
- Information from the TWDB---sponsored consensus report; "Future of Groundwater Management in Texas"---was not brought to bear during development of the Regional Plan, and is being considered for inclusion in the Legislative Recommendations only.
- The EAA preliminary plan was timely delivered to the RWPG in December of 1999. Options and strategies of the EAA Plan were included in RWP and multiple alternative plans, in accordance with SCTRWPG procedures.
- The SCTRWPG acknowledges that much has been learned during this first planning cycle, and it intends to apply the lessons learned in future cycles to improve the process.

One commenter observes that there is no mention of the amount of water available from the lining of irrigation canals from the Medina Lake System managed by BMA.

Response

- Management strategies involving reduced irrigation demands (through canal lining and/or other conservation measures) and resulting enhancement of Edwards Aquifer recharge were removed from the RWP at the request of BMA and BMWD.

Commenters from Comal, Hays, and Guadalupe Counties and the Guadalupe-Blanco River Authority (GBRA) found and called attention to technical errors in the listing of water supply data for GBRA customers, including the allocations of existing supplies from Canyon Lake,

and the allocations of potentially new supplies from Canyon Lake that can be made available when GBRA's permit application pending before TNRCC is approved. In addition, one commenter has noted that the Hays/IH35 Water Supply Project, which is currently in the implementation, was not noted in the IPP.

Response

- The Technical Consultant has conferred with representatives of the entities involved, and made the necessary corrections and/or changes. It is important to note that the corrections and changes did not affect the RWP, except in the scheduling of when some water management strategies will be needed. In particular, the need for Lower Colorado River water from the proposed Bastrop diversion has been delayed from about 2010 to after 2020. In addition, the changes contribute to increased efficiencies during implementation, in that locally available supplies can be used to meet more of the projected near term rural area demands, with replacement supplies from more distant sources being scheduled at later dates. A part of these results is due to the principle that when water supplied by GBRA to customers outside GBRA's statutory service area is needed within its service area, it will be returned to meet needs of the service area. Quantities of such water now under contract to customers outside the service area were reallocated to meet needs within the service area, as of the dates these contracts are scheduled to expire. Likewise, in the RWP, water management strategies were included to meet the needs of those whose GBRA contracts are scheduled to expire. The RWP includes the Hays/IH35 Water Supply Project being implemented by GBRA.

Issue 39. Region K Policy Statement. Region K requested that Region L adopt Region K's 9 policy points for a framework within which Regions L and K can continue discussions.

Response.

Region L's perspective is presented below for each of Region K's conceptual elements using Region K's headings.

1. A cooperative regional water solution shall benefit each region.

Certainly we should strive for solutions that improve both regions' water supply situations. However, we think it is more appropriate that the criterion should be no worsening of our respective situations with interregional solutions. The statement about protecting the water resources of the LCRPA seems to be too general to have meaning for purposes of guiding future discussions. We believe our first priority should be providing adequate water supplies for our regions.

2. **Lower Colorado Regional Planning Area (LCRPA) water shortages shall be substantially reduced in exchange for an equitable contribution from the LCRPA to meet the municipal water shortages in the South Central Region.**

Reduction of shortages in LCRPA could be one of the benefits of our joint efforts. Reduction of shortages that could be satisfied by the LCRPA without interregional coordination should not be the burden of Region L. We understood from our previous discussions with you that most of your LCRPA shortage is irrigation demand that cannot be met because the economics of agriculture do not allow the development of new supplies for that use. We do not expect that the municipal and industrial users, who will pay for the distant supplies, can afford to contribute to meeting that shortage in a substantial way. The "substantially reduced" criterion for meeting irrigation shortages is too stringent.

3. **Proposed actions for interregional water transfers shall have minimal detrimental social, economic and cultural inputs.**

The South Central Texas Regional Water Planning Group (SCTRWPG) has adopted criteria to guide the selection of water supply solutions. They are compatibility, economic impact, efficiency, environmental impact, fairness, feasibility, flexibility, reliability and water quality. We will apply the criteria universally to all contemplated solutions and will strive to minimize impacts of any solutions regardless of location. The State has regulatory mechanisms in place to ensure that potential impacts are identified, quantified and addressed. These protections should be sufficient.

4. **Regional water plans with exports of significant water resources shall provide for the improvement of lake recreation and tourism in the Colorado River basin over what would occur without water exports.**

   We are not sure why integrated solutions should be burdened with meeting demands that are not required to be met within the context of SB1 Regional Planning. Perhaps more dialogue will help here. We do not believe this is an appropriate criterion. However, to the extent that exports of water from the Colorado River basin generate resources or cash, such results can be used at the discretion of those who benefit to improve recreation or other activities of the basin.

5. **Each region shall determine its own water management strategies to meet internal water shortages when those strategies involve internal water supplies and/or water demand management.**

   Generally, we agree that internal decisions should be made by the local regional planning group. Some flexibility in the general rule would be required to create a proper atmosphere within which interregional solutions could be creatively imagined.

   An internal decision to pursue a local strategy should not preclude the use of a particular supply in an interregional solution if there are other ways to meet that local need.

6. **Cooperative regional solution shall include consideration of alternatives to resolve conflicts over groundwater availability.**

   In your letter, you reference specific contracts held by the San Antonio Water System. As you know, it is beyond the purview of the regional planning groups to interfere with existing contracts and on-going projects. While we are sensitive to your concerns, it is not a matter for the South Central Texas Regional Water Planning Group to address as a whole. Any alternative to these contracts and proposed projects that you would suggest must be acceptable to all parties to these contracts. We suggest that you offer specific alternatives for consideration by the San Antonio Water System. If these alternatives are acceptable to the contract parties, the South Central Texas Regional Water Planning Group will consider them.

We also take note that Region K's proposed groundwater policy conflicts with our thoughts on groundwater management. The South Central Texas Regional Water Planning Group has not yet formulated policy recommendations to the legislature and therefore cannot comment directly on the draft policy. We look forward to discussing these issues with you further.

7. **Any water from the Colorado River would not be guaranteed on a permanent basis.**

We believe it is beyond the purview of the planning groups to set contract conditions or limitations for water sales between sellers in Region K and buyers in Region L. Conditions such as these will be the subject of negotiations between the sellers and buyers in water supply contract negotiations and subject to state regulations as administered by TNRCC. Unappropriated flows, to the extent that they may be available, belong to the state and should be available for appropriation subject to the limitations in law. Consideration should be given, however, to the anticipated future development of currently appropriated flows in the LCRPA plan.

8. **Any water from the Colorado River shall make maximum use of inflows below Austin.**

We will use economics, environmental impacts, availability of water and the other criteria discussed above to guide the selection of projects. Certainly we want to pursue projects that make sense for the basin of origin. We would prefer that this criterion be balanced and written in the positive. Specifically, it should be the objective of both regions to pursue projects that maximize the use of existing reservoirs for purposes of firming up interruptible supplies for all potential uses.

9. **Export from the Colorado River shall comply with the LCRA interbasin water transfer policy.**

We are well acquainted with LCRA policy on interbasin transfers and do not expect the LCRA to take any action that is inconsistent with their policy.

Following is one criterion that we think should be added, and Region K is requested to offer balancing language as Region L has for Region K's criteria.

1. The objective of the SB 1 planning effort is to provide water for all citizens of the state. The regional planning boundaries are a convenience for planning purposes and should not be taken as barriers to the movement of water from willing sellers to willing buyers, subject to applicable state regulations.

The South Central Texas Regional Water Planning Group approved this response at its regular meeting on June 1, 2000, and directed that it be transmitted to Region K via letter. The south Central Texas Regional Water Planning Group also approved at the April 6, 2000 meeting the analysis by Region L's technical consultant of additional options that were scoped subsequent to the meeting of the subgroup from Regions L and K on March 6, 2000.

Issue 40. ***Texas Parks and Wildlife Department Comments on Region L IPP. The Texas Parks and Wildlife Department provided General Comments and Comments on Volumes I, II, and III. The comments are summarized, and responses are given to the summaries.***

General Comments:

The Plan tends to provide good to excellent summaries of environmental information, implement Consensus criteria when appropriate, and discuss potential and probable impacts of various options. However, the discussions associated with each option tend to minimize impacts without substantiation, and fail to address cumulative and/or existing impacts, and the adequacy of Consensus environmental criteria to provide adequate instream and bay and estuary flows. Environmental implications could not be located for some components of the Plan, and the regional plan made little effort to identify springs that would be negatively affected by implementation of various water management strategies.

Response:

- The discussions in Volume III contain cautions to use in projecting the potential impacts of projects of the Plan, whose facilities at this point can only be generally located and described. At the implementation phases, field surveys will be needed.

- It is the professional judgement of the environmental analysts that the consensus planning criteria provide adequate streamflow protection to the Region L reaches proposed for development, e.g.; the Consensus criteria put into place by agreement among TWDB, TPWD and TNRCC were used in the evaluations.
- The Phase 1 work (Technical Evaluations of South Central Texas Region Water Supply Options, October, 1999), and the LCRA publication footnoted on page 5-102, Volume I, provides information about the Colorado Diversion option.
- Regarding springs, an attempt was made to identify both potentially affected springs and changes in surface water hydrology in streams crossing the recharge zones of both the Carrizo and Simsboro Aquifers. Potential streamflow changes were found to be negligible over and below the Simsboro outcrop, but substantial in some of the Carrizo scenarios. No springs were found that would be affected by the proposed Simsboro projects, but comparable information was lacking for springs potentially affected by the Carrizo projects. The Carrizo and Simsboro options were modeled and simulations were made of effects upon streamflows and aquifer levels.

***<u>Comments on Volume I (Executive Summary and Regional Water Plan)</u>:* Executive Summary does not contain potential and probable environmental impacts of each water management strategy. In addition, specific comments were made about: (a) state and federal protected species, (b) Edwards Aquifer pumping limits, as related to the 340,000 acft/yr of the Plan, (c) meaning of dependable supplies of Canyon Lake in relation to spring flows, (d) lack of discussion of relative contributions of each spring to base flow of the Guadalupe River, (e) more detailed discussion of flora and fauna of the region is needed, (f) list of springs, including those that no longer flow, should be expanded, (g) water quality discussion inadequate, (h) some organization names are incorrect, and (i) index used to give environmental rank is inadequate.**

<u>Responses:</u>
With respect to comments regarding technical points, clarification, rewording, corrections, and additional information was added to the text. Specific changes are referenced and listed below.

- ES-7 2nd Paragraph, 2nd sentence replaced with: These species are listed by County in Appendix D (Volume III) with notations concerning their habitat preferences and protected status, if any.
- Section 1, Page 1-10 (1.2.4.2) 1st paragraph replaced with: An overview of the environmental and cultural resources setting of Region L is presented in Volume I Section 5.2.5, and more specific discussions of resources and impacts are presented in the previously completed Phase 1 work (Technical Evaluations of South Central Texas Region Water Supply Options, October, 1999), and in Volume III of this series.
  - Virtually all wildlife habitat in the South Central Texas Region is on privately owned farm and ranch land. Region L encompasses a large and physiographically diverse area, including substantial portions of the Edwards Plateau, Blackland Prairies, and South Texas Plains, each of which exhibits a relatively characteristic array of vegetation types and plant species that reflect local geology, soils, land use, and climate. Because local physiography and vegetation tend to be the primary determinants of both terrestrial and aquatic wildlife habitat, the composition and relative abundance of wildlife populations varies substantially within Region L. In addition to the habitats and wildlife species common throughout Texas, Region L also contains areas of exceptional habitat, such as the southern and eastern margins of the Edwards Plateau, where high concentrations of rare or endemic species may occur.
  - Replaced last sentence, second paragraph with: These species are listed by County in Appendix D (Volume III) with notations concerning their habitat preferences and protected status, if any.
  - In third paragraph replaced "...underground aquatic..." with "...important aquifer..."
- *Eurycea* taxonomy used was that in current TPWD lists and publications.
- In Section 5, Page 5-92 1st Paragraph, replaced, "...underground aquatic..." with "...important aquifer..."
- In Section 5, Page 5-100 3rd Paragraph, replaced, "...Natural Heritage Program..." with "...Texas Biological and Conservation Data System maintained by the Texas Parks and Wildlife Department Wildlife Diversity Branch..."

- With respect to dependable supplies of water from Canyon Reservoir, the point is that when spring flow declines to certain levels, it becomes necessary to pass through inflows to Canyon to meet downstream water rights that would otherwise have been satisfied from streamflow, a part of which would have been from spring flow.
- With respect to the environmental scoring used in the Plan, if specific weightings could have been identified, perhaps a somewhat more meaningful approach could have been considered. The challenge is to develop a method of objectively comparing the potential impacts of Water Management Plans, each consisting of sets of individual Water Supply Options that encompass a wide range of locations, habitats and resources, and an equally diverse array of construction disturbances and long term management needs.

Comments on Volume II Technical Evaluations of Alternative Regional Water Plans: ***Organizations have been dissolved (TOES), names have changed, the list of species are not necessarily complete, and the statements about impacts of Colorado River diversions upon Matagorda Bay were questioned.***

Responses:

- Volume II, Environmental Assessment Section, Page 8-2 1st Paragraph; the TOES list is useful for the purposes mentioned. In addition, it is somewhat unclear as to why the reviewer, while dismissing the TOES lists as having "no legal basis" recommends additional work to unearth "...the numerous other rare and endemic species..." that are not included on U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department and TOES lists, but which, unlike the TOES species, are necessary to "...fully evaluate..." the proposed alternatives.
- Volume II, Environmental Assessment Section, Page 8-7 1st Paragraph; means that diversions would be made at high flow regimes where the amount of water diverted is small in proportion to total flow. The Lower Colorado River Authority has represented to the RWPG that the proposed diversions would be consistent with meeting the inflow needs set forth in Freshwater Inflow Needs of the Matagorda Bay System (Martin, Q., D. Mosier, J. Patek, and C. Gorham-Test, 1997, Lower Colorado River Authority) and with the existing, approved management plan for the Lower Colorado River.

Comments on Volume III Technical Evaluations of Water Supply Options: ***The following comments were made: (a) for consistency, the scientific and common names of organisms should be noted on first mention and the common name used thereafter; (b) organizations and organization names have changed; (c) there is an effect of changing location of pumping centers upon spring flows; (d) there is strong concern that brush management option could disrupt the ecological integrity of rivers, streams, springs, and riparian zones; (e) desalination of seawater is comparatively costly source of water but may be a low cost to environmental preservation; (f) effects of recharge enhancement may be understated; (g) effects of recharge upon aquifer dwelling species using water from sources outside the Edwards catchment areas***

not adequately evaluated; and (h) need to correct names of species, give habitat preferences of species, and give locations of habitats for individual species.

Responses:

With respect to comments regarding technical points, clarification, rewording, corrections, and additional information was added to the text. Specific changes are referenced and listed below.

- Section 1, Page 1.2-10, 3rd paragraph: By definition "urodele" refers to salamanders, newts, and other amphibians that retain their tail throughout life, and "anurans" refers to frogs, toads, and tree toads, etc. Changing these terms to "frogs, toads, and salamanders" would unnecessarily constrict and change the meaning of this phrase.
- Section 1, Page 1.2-11, 2nd paragraph: Replaced "...Natural Heritage Program..." with "...Texas Biological and Conservation Data System maintained by the Texas Parks and Wildlife Department Wildlife Diversity Branch..."
- Section 1, Page 1.2-12, Table 1.2-5: The dates of TOES publications used as sources are referenced in each species table. Designations by TOES were not considered comparable to federal and state lists and were not considered in quantitative evaluations of the water supply options. The environmental consultant believes the TOES lists are useful as an additional source of information. Information on *Eurycea* salamanders was obtained from TPWD.
- Section 1, Page 1.4-13, Table 1.4-3: See previous comments concerning TOES.
- The "...C2 and C3 designations were removed and, the species were left for all other species in all species tables (in all volumes).
- Section 1, Page 1.9-9, 3rd full paragraph: Replaced "...wildlife management area..." with "...Wildlife Management Area..."
- Section 2, Page 2.4-10-11, Table 2.4-1: See previous comment concerning *Eurycea* salamanders.
- Guadalupe bass is listed on the TPWD county list of rare species for Bexar County (4/29/99).
- All common names were capitalized in the tables as a formatting procedure.

- Section 2, page 2.4-16, 2nd full paragraph: Replaced "...*myotis*..." with "...*Myotis*..." and "...*Rhadina*..." with "...*Rhadine*..."
- Section 3, Page 3.2-13, Table 3.2-2: See previous comments on Guadalupe bass and C2 designations. The life history of the Texas Asaphomyian tabanid fly is currently being researched.
- Section 5, Page 5.1-7, 2nd full paragraph: Replaced "...Terrapene..." with "...turtles..."
- See previous comments on anurans and urodeles.
- Section 5, page 5.2-17: Deleted "...by USFWS as a candidate (C2) for protection and..."
- replaced "...*calgeii*..." with "...*caglei*..."
- Appendix D:
  - See previous comments on *Eurycea* salamanders.
  - Habitat information for *Haideoporus texanus* was obtained from TPWD county list of rare species (See Comal County -1/19/99). Only species on TPWD county lists were included in this table.
  - Habitat information for *Stygoparnus comalensis* was obtained from TPWD county list.
  - Guadalupe bass is listed on the TPWD county lists of rare species for several counties.
  - *Cheumatopsyche flinti* is on the TPWD county list for Hays County.
  - On page D-21 in the habitat preference section for *Protopila arca* replaced "...an Artesian well in Hays County..." with "...the upper San Marcos River..." [although the incorrect information remains on the TPWD county list]
  - Habitat information for Texas wild-rice was obtained from TPWD county list.
  - .The term "... subaquatic..." was taken from a TPWD county list.
- Appendix E
  - The rare species listed here are taken from the TPWD county lists of rare species.
  - See previous comment concerning *Cheumatopsyche flinti*.
  - On page E-1 replaced "...*Stigoparnus*..." with "...*Stygoparnus*..." and "...*Stigobromus*..." with "...*Stygobromus*..."

- Added "...Comal Springs;..." after "...Blanco River;..." to the habitat preference description for the fountain darter.
- The habitat preference description for the Blanco blind salamander does specify subterranean habitat.

Issue 41. United States Department of the Interior, Fish and Wildlife Service Comments on Region L IPP. The U. S. Fish and Wildlife Service of the U. S. Department of the Interior provided Comments on the Initially Prepared Plan. The comments are summarized, and responses are given to the summaries.

***Comments:* The Service applauds the SB1 planning process and offers assistance in determining potential effects of individual options and strategies early in the planning process in order to avoid delays in implementation. Forecasts are for future population growth, therefore conservation is needed to reduce waste and lower per capita water use. The Plan should do more to emphasize instream and estuarine needs, as well as identify ecologically unique stream segments.**

Responses.

- As mandated by the Texas legislature and implemented by the Texas Water Development Board, conservation planning was built into the water use projections developed during the initial phases of the SB-1 process. The water savings to be achieved are substantial, and fully discussed in the Phase 1 documents. Instream and estuarine water needs are considered and provided for in the planning process through the use of the consensus planning criteria put in place for the SB-1 assessment process by agreement among TWDB, TPWD and TNRCC. It is also the professional judgement of the environmental analysts that the consensus planning criteria provide more than adequate streamflow and estuarine protection to the Region L reaches proposed for development.
- Ecologically unique stream segment nominations by Texas Parks and Wildlife Department, together with the explicit reasons given for those nominations were presented as part of the comparative assessment of water management plans in Volume II. However, the Regional Water Planning Group did not designate unique stream segments

because the effects of such designations upon the potential uses of property of adjacent landowners are not clear. The SCTRWPG has included in its legislative recommendations a request that the Texas Legislature clarify its intent as to the meaning of designation upon property that might be affected.

Comments. The Plan quantifies the municipal, industrial, steam-electric, irrigation, mining, and livestock water needs, but does not recognize the water needs of springs, streams, and estuaries. Emphasis upon water conservation is good. Drought management plans are a positive step, but drought triggers are usually not invoked soon enough to prevent negative effects, and spring flows should be used instead of J-17 well levels for Comal and San Marcos Springs. Drought management plans should include considerations of water supplies for environmental purposes. Use of reclaimed water is encouraged, however water quality is a concern and reuse should not be permitted over the recharge zone of the Edwards Aquifer until adequate studies have been conducted. Also, too much reuse can adversely affect quantities available for streams, e.g.; during droughts this may be the only supply available for some stream segments.

Responses

- Nature's water needs are accommodated through the use of the consensus planning criteria.
- Many stream segments cease flow or dry up entirely during droughts. The consensus criteria provide for drought stress by forbidding diversions when streamflow falls below the 25th percentile flow. Release of stored water to meet "environmental needs" during drought will reduce the firm yield of the project unless the contingency was provided for in initial project planning. This is usually regarded as an unreasonable risk to human life and property. No large storage reservoir projects, the only type of project that could store sufficient water for environmental purposes, is being proposed for Region L.

Comments. Brush management can negatively affect wildlife habitat, there is no evidence that weather modification works during drought, and the Service has concerns about potential impacts from project construction and brine disposal for desalination strategy.

Responses

- Brush management, as included in the regional plan, would be designed in accordance with standards acceptable to wildlife agencies and The Texas State Soil and Water Conservation Board, which is the Texas agency having authority for brush management in Texas. Weather modification is authorized by statute in Texas and is currently supported with both state and local funding. Its limitations during drought are recognized, but those who use it feel that it can assist in drought by increasing precipitation at other times, thereby increasing aquifer recharge and reservoir storage for use later during drought. In the case of desalination, project construction effects and brine disposal will be carefully considered and taken into account when permit applications are made and permits obtained.

Comments. ***The Service generally approves of Aquifer Storage and Recovery (ASR), but cautions that water quality of different sources must be compatible, and quality of Edwards Aquifer must be protected***

Responses

- Water quality assessments and analyses will be addressed in permitting and implementation of ASR projects. Edwards Aquifer water to be used in ASR will be taken directly to water users, as opposed to recharging the Edwards Aquifer.

Comments. ***Concern is expressed about environmental impacts of reservoirs, including off-channel reservoirs, and the diversion of Lower Guadalupe flows upon the habitat of whooping cranes.***

Responses.

- In the case of off-channel reservoirs, such facilities can be located to minimize effects upon wildlife habitat. Comment noted. Developers of these proposed projects will need to address explicitly their potential impacts. The water provided by management strategies involving the Lower Guadalupe is primarily, if not totally, from existing, but underutilized permits. Any permits needed for diversions of water from the Lower Guadalupe will address habitat for species of the area.

<u>Comments</u>. The routing of pipelines can affect wildlife habitat and endangered species. Concern is expressed about effects of recharge projects upon endemic species in the recharge features, sedimentation when recharge is located near springs, quality of recharge water, and loss of stream flows in the headwaters of the Nueces River and its tributaries.

<u>Responses</u>

- The need to consider the effects of pipeline routes on wildlife habitat and endangered species was addressed to the extent possible given the conceptual level of project definition. The need for field studies to evaluate routing and avoid those kinds of conflicts were also addressed.
- No endemic species have been identified in recharge projects included in the analysis of options for Region L, and no proposed recharge projects are located near springs. The quality of recharge water and loss of streamflows are addressed in the report

<u>Comments</u>. The following technical comments were made: (a) Ashe Juniper was not listed in the Edwards Plateau, (b) mountain plover listed in Appendix D is now proposed to be listed as threatened, (c) no instream flow requirements have been determined for Cagle's map turtle, and (d) in the brush management description, there is no mention of the black-capped vireo nor the golden-cheeked warbler as species whose habitat might be affected.

<u>Responses</u>

- Revisions are being made to the endangered species tables recommended by Texas Parks and Wildlife Department and will be included.

7.3 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 planning work of the respective RWPGs. Status reports of coordination efforts were made at each meeting of the SCTRWPG. Representatives of Regions K and P attended many of Region L's meetings, and joint meetings were held with Regions K and J, to pursue water management strategies of mutual interest.

In addition, Region L's Executive Committee met upon separate occasions with Regions N and M for the same purpose. When requested by the SCTRWPG, members of HDR's project staff provided technical support to the SCTRWPG at joint meetings with neighboring regions and attended some of the meetings.

7.4 Final Plan Adoption

As explained in Section 7.2.4.7, the RWGP held public hearings in Victoria, Uvalde and San Antonio and also gathered written comments submitted by various individuals and organizations as well as public agencies, including the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department. The TWDB reviewed the IPP and sent four letters of comments and questions. The TWDB comments, together with RWPG responses are included in Section 7.2.4.8.1. A summary of public comments and RWPG responses are presented in Section 7.2.4.8.2.

In addition to the regular monthly meetings, the RWPG held several workshops to complete the review and approval of responses to the comments. They agreed on numerous additional Legislative Recommendations (as presented in Section 6.6) and made extensive revisions of other parts of the IPP as a result of this period of responding to public and agency comments. Changes included the following:

Commitment to accelerated research on the Edwards Aquifer Recharge and Recirculation System Strategy and clarification that this strategy is included in the Regional Water Plan for research and will require a plan amendment prior to implementation.

New recommendations for funding of major centers within the South Central Texas Region in order to provide enhanced information and training on water conservation and other technologies.

A recommendation for State participation in funding alternative technologies, such as desalination.

Nine recommendations on improving TWDB's regional water planning process, including greater involvement of local planners in development of population and water demand projections and evaluation of the State's land use and ecosystem health.

A recommendation supporting many recommendations of the TWDB-sponsored consensus report: *Future of Groundwater Management in Texas*.

Recommendations for additional socio-economic impact analysis, particularly for the agricultural and other rural water user groups, and for additional notification of groundwater management strategies that have impacts across regional boundaries.

New Sections on Emergency Transfers of Water and on Drought Management Planning.

Summary and further explanation of the cumulative analysis of environmental impacts that was performed for each alternative considered by the Regional Water Planning Group.

Summary of the evaluations of each Water Management Strategy included in the five Regional Alternative Plans and of the Adopted Plan, in accordance to evaluation criteria specified in TWDB Rules, Section 357.7(a)(7).

The RWPG formally approved the revised South Central Texas Regional Water Plan on January 4, 2001.

South Central Texas Region

List of References

South Central Texas Region
List of References

"Wastewater Contract Between the City Public Service Board and Alamo Conservation and Reuse District," San Antonio, Texas, September 1990.

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Appendix A

Irrigation Projection Methodology

Appendix A
Irrigation Water Demand Projections Methods[1]

Forecasting Methodology and Key Planning Assumptions

Forecasting Model

"The Texas Water Development Board, with technical assistance from the staff of Texas A&M University, developed a linear programming model for use in evaluating the many factors affecting irrigation water demand for the Texas agricultural sector. Linear programming models are based on mathematical techniques for systematically determining solutions for maximizing or minimizing values of linear functions under various variable (resource) constraints. For the development of the irrigation water demand projections, the objective function of the model was structured to solve for the maximization of farm income based on the profitability of specific crops grown in Texas using the resources necessary for the production of these crops. To simplify the modeling process, the TWDB used the Texas A&M University delineation of major agricultural production regions in the State.

"Several types of variables are used in the modeling procedure to determine future irrigation water demands by geographical location. These variables include crop prices, yields, production costs, water costs, and six types of irrigation delivery systems. These data are crop-specific and reflect the major crops grown in Texas, which include cotton, grain sorghum, wheat, corn, rice, peanuts, alfalfa hay, fruits, vegetables, and nuts. As part of the revenue stream, federal farm deficiency payments for specific crops and land set-aside requirements for compliance with federal farm programs are included in the model. Crop enterprise budgets, developed by Texas A&M University, provided crop-specific information such as current crop prices, variable production costs, fixed production costs, yields, deficiency payments, irrigation water applications, land restrictions for participation in federal programs, and irrigation delivery systems. Because the Texas A&M University crop enterprise budgets are planning budgets, variable costs for the crops were, in some instances, adjusted (increased or decreased) in the modeling procedure to calibrate the water demand calculated by the model to the actual published water use for each of the 14 agricultural regions. The variable costs were adjusted because these costs were the basic unknown variables in contrast to published crop prices, yields, harvested and planted acres per crop, and water use.

Irrigation Equipment and Water Use Efficiencies

"Furrow, surge, side roll, low pressure center pivot, high pressure center pivot, and low energy precision application (LEPA) are the six types of irrigation delivery systems used in the model. Information was provided by irrigation specialists regarding the type of soils and topography suitable for each type of system, capital and other costs, potential adoption rates for new, more efficient irrigation systems, along with the relative water-use efficiency of the various delivery systems. The efficiency of each delivery system varies depending on factors such as

[1] Water for Texas—Today and Tomorrow, A 1996 Consensus-Based Update To The Texas Water Plan, Volume III, Water Use Planning Data Appendix, Texas Water Development Board, June, 1996, Austin, Texas.

topography, types of soils, and climatic conditions. To the extent possible, regional irrigation specialists provided information to adjust the efficiency for each system to reflect prevailing soil and climatic conditions in each of the agricultural production regions.

Water Supply and Irrigation Costs

"To account for the cost of groundwater pumpage associated with different groundwater depths, three lift zones in each major groundwater use region were identified along with the irrigated acreage associated with each of the three lift zones. Irrigated acreage maps were overlain with maps identifying the various well depths by geographical area. This information was used in the modeling procedure to calculate future water costs (pumping costs) by applying projected energy prices to the varying lifts and costs per foot of lift capacity. For areas depending on surface water supplies, irrigation costs measured in cost per acre-foot were obtained from many of the irrigation districts throughout the state. While these districts have a variety of pricing schedules, most charge a fixed price for a given volume of water, with either a declining or increasing unit price for additional volumes of water.

Land and Acreage Constraints

"In addition to the variables used in the analyses that have been previously mentioned, specific resource constraints were included to reflect historical trends in acreage, cropping patterns, and water use. Dryland and irrigated acreage were constrained to the largest amount of annual acreage in production during the period 1974-1990. Also, an irrigated land constraint was incorporated to limit the acreage that can be converted to more efficient irrigation delivery systems. Due to the differences in soil type and topography, not all areas can be converted to more efficient irrigation systems, such as LEPA. This constraint prevents the model from converting irrigated acreage to a specific irrigation delivery system that is not suitable for that type of soil or topography even though the cost-effectiveness of such a conversion would be encouraged by the model without the constraint.

"To ensure a reasonable mix of crops that resembles historical cropping patterns, an acreage constraint was placed on each crop within a geographical area based on annual crop acreage during 1985-1990. Finally, a water constraint for each geographical area was incorporated into the model. This constraint restricts the amount of water available for irrigation to the largest quantity of annual water used for irrigation purposes during the period 1974-1990. Once the most profitable combination of irrigated and dryland crop production was estimated, along with the quantities of water required for that level of production, the regional projections were distributed to the county level by apportioning a county's share of the regional acreage and water use for that county. The county shares were calculated by estimating the county's historical crop acreage as a percent of total regional crop acreage.

Summary of Modeling Assumptions

"The irrigation water demand projections are based on specific assumptions regarding crop prices, yields, agricultural policy, and technological advances. The various key assumptions used in the development of the irrigation water demand forecasts are presented below.

1) Profitability Variables: Farm production expenses, crop prices, energy prices, and crop yields are assumed to change over time. The direction and magnitude of those changes are based on forecasts prepared by the Food and Agriculture Policy Research Institute (FAPRI). Energy forecasts were developed by the Department of Energy. The rates of growth or decline of these variables over time were applied to the prices received and paid by Texas farmers so as to capture the adjustments between national and regional prices.
2) Federal Farm Policy: Current federal farm programs and payments are assumed to remain constant over time. In some cases, depending on the projection scenario, deficiency payments and mandatory land set-aside provisions are reduced by one-half.
3) Improved water use efficiencies for surface water irrigation are assumed to be realized by more efficient canal delivery systems. Improved water use efficiencies for ground water irrigation are assumed to be realized through implementation of more efficient on-farm irrigation systems.

Surface Water Conveyance Losses

"Conveyance loss, also referred to as diversion loss, is the amount of water lost during the delivery of surface water from the point of diversion on the river or stream to the point of use on the farm. Surface water is typically conveyed by an open canal system, which exposes the water supply to possible loss from seepage, breaks, evaporation, and uptake by riparian vegetation. Surface water irrigation comprises about 31 percent of the total agricultural irrigation water use in Texas and occurs primarily along the upper and middle Texas Gulf Coast, along the Rio Grande, and in some areas of the Texas Hill Country. For areas of the state using surface water for irrigation, the water use estimates in 1990 and projections from 2000 to 2050 include conveyance losses. For areas of the state using ground water for irrigation, water use estimates and projections do not include conveyance losses because ground water is generally pumped on or near the point of use.

"Although surface water irrigation represents a relatively small portion of irrigated agriculture, the loss of water through conveyance can be considerable. Estimates of loss can range between ten and 55 percent of the total amount of water diverted. The TWDB estimates conveyance loss by examining data from surface water diversions reported to the TNRCC; estimates of on-farm water use from a joint study effort of the Soil Conservation Service (U.S. Department of Agriculture), Texas Soil and Water Conservation Board, TWDB, and other parties; and communications with river authorities, water districts, and irrigation companies. Based on this information, historical conveyance loss estimates were calculated and used as a basis for the conveyance loss factors used in the consensus projections.

"Some surface water supply entities have tried to reduce water losses by making improvements to their conveyance systems. Such improvements can include repairing weaknesses in the canals, controlling vegetation, and lining the canals. These improvements can be expensive, and not all entities have the necessary capital for investment.

"Because funding for capital improvement varies between entities or is uncertain in the future, the consensus planning staff developed two scenarios that attempt to capture changes in canal conveyance efficiency. The most likely scenario assumes that no improvements requiring capital investment will be made. It does assume conveyance loss will decline slightly as management practices improve. A second scenario assumes water supply entities will make capital investments to improve the efficiency of the canal system. For this scenario, conveyance loss declines more precipitously. The most likely scenario was used in conjunction with scenario 1 and scenario 2 of the irrigation water use projections, which are the least aggressive conservation case and the most likely case respectively. The second scenario, which included capital improvement in the conveyance system, was used in conjunction with scenario 3, the most aggressive conservation case.

"The consensus planning staff first estimated on-farm irrigation water use. "On-farm" water use refers to the amount of irrigation water used at the field, excluding conveyance loss. For the base year, 1990, county irrigation estimates were obtained from the Soil Conservation Service estimates of on-farm water use. For areas of the state that use surface water, the water lost by conveyance was added after the on-farm estimates were derived to determine total irrigation water demand.

"The relative proportions of ground and surface water supplies for irrigated agriculture are determined by a water supply allocation process, which requires irrigation water demand estimates as an input. Consequently, the initial estimates of conveyance losses contained within this report were developed using water supply allocations from the 1990 Water Plan. From these initial estimates of overall irrigation water use, the water supply allocations will be updated. This supply allocations process may, in turn, result in some further adjustments to the quantity of conveyance loss.

Forecasting Scenarios

"Six forecast scenarios were developed to encompass a range of possible economic conditions affecting irrigation water demands. The consensus planning staff, with approval from the Technical Advisory Committee, selected three of the scenarios for use in the Water Plan. The selected scenarios are presented below.

1) Scenario I: Crop yields, crop prices, and production costs are assumed to change over time. Federal farm payments are held constant at current levels during the projection period. There will be no further adoption of advanced irrigation technology during the period 1990-2050.
2) Scenario II: Crop yields, crop prices, and production costs are assumed to change over time. Federal farm payments are held constant at current levels over the projection period. The expected level of advanced irrigation technology is adopted.
3) Scenario III: Crop yields, crop prices, and production costs are assumed to change over time. Federal farm program payments are reduced by one-half from current payment levels. An aggressive level of advanced irrigation technology is adopted.

"The consensus planning staff and the Technical Advisory Committee selected Scenario II as the "most likely" case for use in water supply planning efforts".

Appendix B

General Procedures and Assumptions for Technical Evaluations

Appendix B
General Procedures and Assumptions for Formulation and Technical Evaluation of Regional Water Plans

Procedures for Formulation of Regional Water Plans

1) Identification of water supply options or management strategies for inclusion in a plan is based on the applicable, plan-specific criteria established by the South Central Texas Regional Water Planning Group (SCTRWPG).
2) Order of implementation of water management strategies within a plan is primarily based on the estimated time to implement in relation to the occurrence of projected water needs, with due consideration of engineering economies and other factors.
3) Plans include System Management Supplies to account for:
   a) Implementation of water management strategies in advance of projected need to allow for system operations with the Edwards Aquifer, development at optimal size, time for reservoir filling, time for accumulation of storage in aquifer(s), interim seasonal peaking capacity, and/or unknown problems in permitting/construction.
   b) Uncertainty as to dependable supply from the Edwards Aquifer during drought to the extent that such supply may be dependent upon pending adoption of a Habitat Conservation Plan and Critical Period Management Rules under development by the Edwards Aquifer Authority.
   c) Uncertainty as to the ultimate ability to implement specific water management strategies.
   d) The possible occurrence of drought more severe than that which has occurred historically.
4) Consistency in System Management Supplies included in the Regional Water Plan and the five alternative plans is desirable (to facilitate cost comparisons), but was not always be possible.

Procedures for Technical Evaluation of Regional Water Plans

1) Establish baseline (year 2000) hydrologic simulation for the Edwards Aquifer.
   a) Breakdown of use type and geographical distribution based on EAA originally proposed permits (without any voluntary transfers from irrigation to municipal use); and
   b) Starting heads and seasonal distribution of pumpage based on factors developed by the TWDB and currently used in the GWSIM4 model.
2) Establish baseline (year 2000) hydrologic simulation for the Carrizo Aquifer.
   a) Use available simulated starting heads representative of 1994 levels (available measured well levels obtained since 1994 will be plotted for reference); and
   b) Breakdown of use type and geographical distribution, and specified local pumpage quantities and use types, as projected by the TWDB.

3) Establish baseline hydrologic simulations for Nueces, Guadalupe – San Antonio, and Lower Colorado River Basins based on assumptions noted below and available information.
4) Perform hydrologic simulations that reflect the projected implementation of water management strategies comprising a plan in 2050.
5) Quantify the Available Yield, Total Annual Costs, Annual Unit Costs of Water, Environmental Effects, Impacts on Water Resources of the State, Impacts of Water Management Strategies on Threats to Agricultural and Natural Resources of the Region, Equitable Comparison and Consistent Consideration with Other Water Management Strategies, Interbasin Transfer Provisions in Texas Water Code Sect. 11.085(k)(1), Third Party Social and Economic Impacts from Voluntary Redistribution of Water, Efficient Use of Existing Supplies and Opportunities for Development and Operation of Regional Water Facilities, and Effects on Navigation [Sect. 357.7(a)(7)] associated with the implementation and operation of a plan. Costs will be presented on a Second Quarter 1999 basis and computed in accordance with Cost Estimating Procedures set forth in Appendix A of Volume III.
6) Assess cumulative effects of plan implementation based on differences between the baseline (year 2000) and full implementation (year 2050) hydrologic simulations.

Assumptions

1) Full exercise of surface water rights.
2) Edwards Aquifer permitted pumpage of 400,000 acft/yr (plus domestic & livestock) subject to Critical Period Management Rules currently under review by an assessment team for the Edwards Aquifer Authority. This is consistent with provisions in the EAA statute (SB1477) regarding permitted pumpage of 400,000 acft/yr after 2007 and with potential critical period management actions reducing pumpage by 15 percent to 340,000 acft/yr. 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. However, springflows resulting from the 400,000 acft/yr Edwards Aquifer pumpage scenario will be used in the baseline hydrologic simulations of the Guadalupe – San Antonio River Basins.
3) Water management strategies involving Edwards Aquifer recharge enhancement were evaluated on the basis of potential recharge recovery permits derived from increased sustained yield as described in Appendix C of Volume III. Some variation of this assumption was required for evaluation of the Recharge & Recirculation Alternative Plan.
4) In the evaluation of a plan involving river diversions for Edwards Aquifer recharge enhancement (recirculation), the diversion of "enhanced springflow" was not assumed subject to downstream water rights. River diversions for Edwards Aquifer recharge enhancement are not to result in simulated water rights shortages greater than those which would occur subject to the 400,000 acft/yr Edwards Aquifer pumpage scenario.
5) Water treatment will not be necessary for Edwards Aquifer recharge enhancement if water originates upstream of the outcrop of the Edwards Aquifer or from the Edwards Aquifer.

6) Subordination of all senior Guadalupe River hydropower permits to Canyon Reservoir. This assumption is based on past actions of the GBRA to subordinate its own Guadalupe River hydropower rights and on an existing GBRA contractual agreement with the City of Seguin.
7) Delivery of GBRA's present contractual obligations from Canyon Reservoir (about 48,150 acft/yr) to points of diversion.
8) Baseline (year 2000) effluent discharge / return flow in the Guadalupe - San Antonio River Basin will be that reported for 1988 and adjusted for SAWS direct reclaimed water use of 35,000 acft/yr. Estimated effluent discharge / return flow representative of each decade from 2010 through 2050 is included for Bexar County. Estimates are computed as a fixed percentage of projected municipal demand based on best available information for recent years.
9) 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 subject to senior water rights, instream flow constraints, and/or applicable contractual provisions.
10) Desired San Antonio River flows at Falls City gage of 55,000 acft/yr, with seasonally varying minimums under current SAWS/SARA/CPS agreement.
11) Application of Environmental Water Needs Criteria of the Consensus Planning Process (Appendix B, Volume III) in consideration of water potentially available as unappropriated streamflow for diversion and/or impoundment as a part of a plan.
12) Relative priority of surface water management strategies within a plan based on order of implementation.
13) Operation of Choke Canyon Reservoir/Lake Corpus Christi (CCR/LCC) System subject to the Corpus Christi Phase 4 (maximum yield) policy and TNRCC Agreed Order regarding freshwater inflows to the Nueces Estuary.
14) Historical Edwards Aquifer recharge estimates developed by HDR.
15) Applicable rules of groundwater management districts included.
16) A single point of delivery identical to that in the technical evaluation of water supply options is assumed for the major municipal demand center of the South Central Texas Region.
17) Regional water treatment and distribution facilities are sized to meet peak-day demands (assumed to be approximately 2.0 times average-day demands) and may serve multiple user groups with water from multiple sources, thereby reflecting economies of scale.
18) Balancing storage facilities are included near regional water treatment facilities as necessary to ensure reliability subject to seasonal and peak-day demands during drought.
19) Period of record for simulations: Guadalupe-San Antonio River Basin (1934-89, Critical Drought = 1950s), Nueces River Basin (1934-96, Critical Drought = 1990s), Colorado River Basin (1941-65, Critical Drought = 1950s).

Hydrologic Models

Guadalupe-San Antonio River Basin Water Availability Model (WRAP) (TNRCC/HDR)
Nueces River Basin Water Availability Model (WRAP) (TNRCC/HDR)
Colorado River Daily Allocation Program (RESPONSE) (LCRA)
Edwards Aquifer (Balcones Fault Zone) Model GWSIM4 (TWDB)
Carrizo-Wilcox Aquifer Model (TWDB/LBG-G/HDR)
Carrizo-Wilcox (Simsboro) Aquifer Model (BEG/TWDB/HDR)
Gulf Coast Aquifer Model (TAMU-CC)
Trinity Aquifer Model (TWDB)
Guadalupe-San Antonio River Basin Model (HDR)
Nueces River Basin Model (HDR)
Lower Nueces River Basin & Estuary Model (HDR)
SIMYLD, RESOP, & SIMDLY (TWDB/TDWR)

Appendix C

Reliability Information for Water Rights in the South Central Texas Region

Appendix C
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	MUN	C3891_1	500	100.0	500	TRI-COMMUNITY WSC	SAN MARCOS RIVER
Guadalupe	Caldwell	MUN	C3896_1	1500	82.8	99	GUADALUPE-BLANCO RIVER AUTH	SAN MARCOS RIVER
Guadalupe	Caldwell	MUN	C3896_2	1300	78.3	0	GUADALUPE-BLANCO RIVER AUTH	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3886_1	150	78.2	3	HAYS COUNTY REC ASSOC INC	BLANCO RIVER
Guadalupe	Caldwell	IRR	C3888_1	320	89.6	26	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	83.1	1	GEORGE PARTNERSHIP LTD	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3898_1	20	82.7	0	CITY OF LULING	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	C3899_1	1180	82.2	26	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	85.1	1	TEXAS PARKS & WILDLIFE DEPT	CLEAR FRK PLUM CRK
Guadalupe	Caldwell	IRR	C3906_2	12	88.0	0	TEXAS PARKS & WILDLIFE DEPT	CLEAR FRK PLUM CRK
Guadalupe	Caldwell	IRR	P3995_1	700	70.3	15	MIGUEL CALZADA URQUIZA ET UX	SALT BR
Guadalupe	Caldwell	IRR	P4022_1	450	77.2	10	MARY ANN LANGFORD ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4033_1	300	77.0	7	DICK BROWN	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4043_1	150	76.9	3	TERRAND LTD ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4080_1	425	75.8	9	BENO CORPORATION	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4502_1	600	76.2	0	JOHN SCOTT GREENE ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P4518_1	120	78.0	0	JOHN H COX	PLUM CRK
Guadalupe	Caldwell	IRR	P4569_2	240	75.9	0	ROBERT L BOOTHE	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P5092_1	150	70.2	0	WILLIAM JAMES WOOTEN ET AL	SAN MARCOS RIVER
Guadalupe	Caldwell	IRR	P5234_1	1022	70.7	0	THE LULING FOUNDATION	SAN MARCOS RIVER
Guadalupe	Caldwell	HYD	P4492_1	15000	N/A	N/A	HYDRACO POWER INC	SAN MARCOS RIVER
Guadalupe	Calhoun	MUN	C2074_65_CON	1500	100.0	1500	PLWTP	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C2074_66_CON	560	100.0	560	CCRWSC	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5176_2	3314	99.8	2976	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5177_3	11089	100.0	11089	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5177_5	4316	100.0	4316	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	MUN	C5178_1	60525	98.8	44878	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C2074_67_CON	40	100.0	40	ISP TECH.	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C2074_68_CON	1100	100.0	1100	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	5000	100.0	5000	UNION CARBIDE CHEM & PLASTICS	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5173_2	1250	100.0	1250	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	3315	99.8	2976	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5177_1	10763	100.0	10763	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5177_4	10000	100.0	10000	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	C5178_2	30525	97.7	21368	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IND	P4586_1	272	82.1	188	DEL & GLORIA WILLIAMS	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C3863_1	1237	100.0	1237	JAN KNEBEL WHEELIS	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C3863_2	1767	100.0	1767	JESS YELL WOMACK II ET AL	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C3863_3	192	100.0	192	THE ERIC KNEBEL TRUST	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C3863_4	5	100.0	5	WALTER CRAIN WOMACK	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5173_1	1250	100.0	1250	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	3315	99.8	2975	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5177_2	10763	100.0	10763	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5177_6	4316	100.0	4316	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	IRR	C5178_3	14950	96.5	7506	GUADALUPE-BLANCO RIVER AUTH	GUADALUPE RIVER
Guadalupe	Calhoun	OTH	P5381_1	150	82.6	106	BRETT BRATCHER	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_11_USCON	1	92.6	0	JOHNSON	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_12_USCON	1	92.6	0	EDGE	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_13_USCON	1	92.6	0	BELL	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_14_USCON	2	91.1	0	HOLLAND	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_15_USCON	1	92.6	0	GAVILCK	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_16_USCON	4	91.0	1	O'DONNELL	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_17_USCON	2	91.1	0	ROBERTS	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_2_YLD	0	0.0	0	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	91.0	1	YACHT CLUB	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_40_CON	5	100.0	5	MAR LODGE	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_5_USCON	130	86.0	25	COMAL CO FRESH WSD #1	REBECCA CRK
Guadalupe	Comal	MUN	C2074_8_USCON	1	92.6	0	SALGE	GUADALUPE RIVER
Guadalupe	Comal	MUN	C2074_9_USCON	1	92.6	0	KLECK	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3815_1	3	26.7	0	J D MURRELL	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3819_2	9	99.2	5	PATRICK S MOLAK	GUADALUPE RIVER
Guadalupe	Comal	MUN	C3823_1	1289	93.3	0	CITY OF NEW BRAUNFELS	COMAL RIVER
Guadalupe	Comal	MUN	C3824_3	2240	93.8	0	NEW BRAUNFELS UTILITIES	GUADALUPE RIVER
Guadalupe	Comal	MUN	P4106_1	25	19.3	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	IND	C2074_18_USCON	1	92.6	0	HENK	GUADALUPE RIVER
Guadalupe	Comal	IND	C2074_19_USCON	3	91.4	1	COMAL RD. DEPT.	GUADALUPE RIVER
Guadalupe	Comal	IND	C2074_41_CON	1	100.0	1	COMAL FAIR	GUADALUPE RIVER
Guadalupe	Comal	IND	C3824_2	139198	79.2	0	NEW BRAUNFELS UTILITIES	COMAL RIVER
Guadalupe	Comal	IRR	C1954_1	15	53.9	0	LAWRENCE D KRAUSE	JENTSCH CRK
Guadalupe	Comal	IRR	C1954_2	5	69.5	0	LAWRENCE D KRAUSE	JENTSCH CRK
Guadalupe	Comal	IRR	C1955_1	10	52.1	0	CHESTER & RICKIE KRAUSE	UNNAMED TRIB JENTSCH CRK

Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Guadalupe	Comal	IRR	C2070_1	98	24.1	0	FRANK A STANUSH	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2070_2	22	24.1	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	98.9	13	ELOY GARCIA JR ET UX	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_21_USCON	1	88.2	0	GOLDBECK	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_22_USCON	200	58.7	13	REBECCA CREEK GOLF	UNNAMED TRIB REBECCA CR
Guadalupe	Comal	IRR	C2074_23_USCON	5	88.2	0	FITZPATRICK	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_24_USCON	5	88.2	0	GARRETT	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_25_USCON	1	88.2	0	PARKER	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_26_USCON	1	88.2	0	HARRIS	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_27_USCON	2	87.8	0	COOPER	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_28_USCON	1	88.2	0	JAVIER MARTINEZ	GUADALUPE RIVER
Guadalupe	Comal	IRR	C2074_29_USCON	1	88.2	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	C3817_1	79	88.5	5	CLARENCE B ANDERSON ET AL	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3819_1	14	98.9	5	PATRICK S MOLAK	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3820_1	4	99.0	2	VETERANS OF FOREIGN WARS	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3821_1	4	99.0	2	ROBERT & MARY RAE PRESTON	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3821_2	1	98.8	0	ROBERT & MARY RAE PRESTON	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3822_1	3	99.6	2	ROBERT KRUEGER ET AL	GUADALUPE RIVER
Guadalupe	Comal	IRR	C3824_4	200	92.9	0	NEW BRAUNFELS UTILITIES	COMAL RIVER
Guadalupe	Comal	IRR	C3826_1	100	27.8	0	CITY OF NEW BRAUNFELS	OLD CHL COMAL RIVER
Guadalupe	Comal	IRR	C3828_1	1	99.5	1	CAMP WARNECKE INC	COMAL RIVER
Guadalupe	Comal	IRR	C3828_2	2	99.5	2	LIBERTY PARTNERSHIP LTD	COMAL RIVER
Guadalupe	Comal	IRR	P4607_1	50	19.1	0	PURALLOY INC	GUADALUPE RIVER
Guadalupe	Comal	HYD	C3824_1	124870	N/A	N/A	NEW BRAUNFELS UTILITIES	COMAL RIVER
Guadalupe	Comal	REC	C3816_1	1460	24.1	0	WHITEWATER SPORTS INC	GUADALUPE RIVER
Guadalupe	Comal	REC	P4114_1	3711	20.4	0	BAD SCHOLOESS INC	COMAL RIVER
Guadalupe	Comal	REC	P4114_2	1289	20.6	0	BAD SCHOLOESS INC	COMAL RIVER
Guadalupe	Dewitt	IND	C2074_62_CON	5	100.0	5	DUBOSE	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3850_1	80	97.5	36	JOSEPHINE B MUSSELMAN ET AL	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3851_1	182	97.4	121	JACK H BOOTHE	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3852_1	35	97.4	23	JOHN BRADEN JR ET AL	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3854_1	32	95.6	11	J D BRAMLETTE JR	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3855_1	26	97.5	12	MRS JOHN C LEY	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	C3856_1	50	79.3	1	PATRICK B & MARY KARYN ELDER	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	P4318_1	80	78.5	2	F T BUCHEL	GUADALUPE RIVER
Guadalupe	Dewitt	IRR	P5006_2	299	81.8	7	LORITA MAE FITZGERALD	GUADALUPE RIVER
Guadalupe	Dewitt	HYD	C3853_1	538560	N/A	N/A	CUERO HYDROELECTRIC, INC.	GUADALUPE RIVER
Guadalupe	Dewitt	REC	P5294_1	15	78.5	0	CITY OF YORKTOWN	YORKTOWN CRK
Guadalupe	Gonzales	MUN	C2074_53_CON	700	100.0	700	GCWSC	GUADALUPE RIVER
Guadalupe	Gonzales	MUN	C3846_2	2240	100.0	2240	CITY OF GONZALES	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C3847_1	250	97.5	113	DR JAMES W NIXON JR	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C3848_1	1800	100.0	1800	KING RANCH INC	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	C3908_1	670	82.1	15	LARRY E & PHYLIS A BROWNE	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P3916_1	50	79.3	1	DON A LIGHTSEY ET UX	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P4075_1	225	69.1	0	DAVID S SHELTON	GUADALUPE RIVER
Guadalupe	Gonzales	IRR	P4089_1	830	78.4	0	DR I V EPSTEIN	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P4539_1	8	85.7	0	T PAUL SIDES	UNNAMED TRIB COTTLE CRK
Guadalupe	Gonzales	IRR	P5036_1	50	78.4	0	ERNEST L MINYARD	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P5037_1	230	78.0	0	RICHARD D BRAMLET	SAN MARCOS RIVER
Guadalupe	Gonzales	IRR	P5038_1	66	78.0	0	ARTHUR DENNIS HUEBNER ET AL	SAN MARCOS RIVER
Guadalupe	Gonzales	HYD	C3846_1	796363	N/A	N/A	CITY OF GONZALES	GUADALUPE RIVER
Guadalupe	Gonzales	HYD	C5172_1	585599	N/A	N/A	GUADALUPE-BLANCO R A H-4	GUADALUPE RIVER
Guadalupe	Gonzales	HYD	C5172_2	574832	N/A	N/A	GUADALUPE-BLANCO R A H-5	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_31_CON	2350	100.0	2350	CRWA	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_32_CON	6720	100.0	6720	CITY OF NEW BRAUNFELS	COMAL RIVER
Guadalupe	Guadalupe	MUN	C2074_33_CON	800	100.0	800	CRYSTAL CLEAR	COMAL RIVER
Guadalupe	Guadalupe	MUN	C2074_34_CON	500	100.0	500	SOUTHWEST TEXAS STATE UNIVERSITY	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	C2074_35_CON	5000	100.0	5000	CITY OF SAN MARCOS	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	C2074_36_CON	350	100.0	350	MAXWELL WSC	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_37_CON	30	100.0	30	COUNTY LINE WSC	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_38_CON	200	100.0	200	GREEN VALLEY FARMS INC	SAN MARCOS RIVER
Guadalupe	Guadalupe	MUN	C2074_39_CON	589	100.0	589	KYLE	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_52_CON	1500	100.0	1500	SHWSC	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_54_CON	3000	100.0	3000	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C2074_6_CON	2000	100.0	2000	CANYON WSC	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3834_2	19	100.0	19	CANYON REGIONAL WATER AUTH	GUADALUPE RIVER
Guadalupe	Guadalupe	MUN	C3839_1	7000	100.0	6792	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_43_CON	6840	100.0	6840	PANDA ENERGY	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_44_CON	2500	100.0	2500	AM NATIONAL POWER	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_55_CON	600	100.0	600	SMI	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_56_CON	25	100.0	25	ACME BRICK COMPANY	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C2074_57_CON	185	100.0	185	STD. GYPSUM LLC	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3829_1	5000	99.1	3005	MISSION VALLEY TEXTILES, INC	GUADALUPE RIVER
Guadalupe	Guadalupe	IND	C3830_1	5	99.6	4	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	99.3	21	STRUCTURAL METALS INC	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	IND	P5240_1	31	72.5	0	H B SHANKLIN	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	C2074_48_CON	1	100.0	1	SOUTHBANK	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_49_CON	270	100.0	270	GOIRASSOCIATES	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_50_CON	5	100.0	5	W W FARMS	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_58_CON	25	100.0	25	CHAPARRAL	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_59_CON	10	100.0	10	MISSILDINE	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C2074_60_CON	1	100.0	1	BERGSTROM	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3831_1	5	99.6	4	ARTHUR R & OLIVE C POST	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3832_1	44	100.0	44	RAY E DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3833_1	56	100.0	56	GARY A DITTMAR	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3834_1	71	100.0	72	CANYON REGIONAL WATER AUTH	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3835_1	19	84.4	7	OTTO VOIGT	YOUNGS CRK
Guadalupe	Guadalupe	IRR	C3838_1	37	44.5	0	DONALD E NORED	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3839_3	200	99.4	137	SEGUIN MUNICIPAL UTILITIES	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	C3840_1	34	89.0	14	ARNO NEUMANN	GERONIMO CRK
Guadalupe	Guadalupe	IRR	C3841_1	5	62.0	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	C3895_1	580	79.4	13	STATE BANK & TRUST COMPANY	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	C3900_2	500	85.2	11	JAMES D JAMISON	UNNAMED TRIB
Guadalupe	Guadalupe	IRR	P3857_1	144	79.4	3	ROBERT M KIEHN	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P3859_1	750	77.9	17	ABNER M USSERY	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P3973_1	73	29.9	0	DONALD J JOHNSON ET UX	GUADALUPE RIVER
Guadalupe	Guadalupe	IRR	P4110_1	240	76.1	0	LYNN STORM	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P4373_1	300	71.4	0	CONTINENTAL WHOLESALE FLORISTS	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P4373_2	300	71.1	0	CONTINENTAL WHOLESALE FLORISTS	SAN MARCOS RIVER
Guadalupe	Guadalupe	IRR	P4597_1	320	75.9	0	JOHN T O'BANION JR ET AL	SAN MARCOS RIVER
Guadalupe	Guadalupe	HYD	C5488_1	663892	N/A	N/A	GUADALUPE-BLANCO R A TP-1	GUADALUPE RIVER
Guadalupe	Guadalupe	HYD	C5488_2	659995	N/A	N/A	GUADALUPE-BLANCO R A TP-3	GUADALUPE RIVER
Guadalupe	Guadalupe	HYD	C5488_3	655323	N/A	N/A	GUADALUPE-BLANCO R A TP-4	GUADALUPE RIVER
Guadalupe	Guadalupe	HYD	C5488_4	624781	N/A	N/A	GUADALUPE-BLANCO R A TP-5	GUADALUPE RIVER
Guadalupe	Guadalupe	REC	P5121_1	83	65.9	0	GUADALUPE SKI-PLEX HOME ASSOC	YORK CRK
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	IND	C3865_3	534	100.0	534	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IND	C3866_1	60	80.3	5	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IND	C3869_1	10000	99.9	9615	TEXAS PARKS & WILDLIFE DEPT	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3865_5	100	100.0	100	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3866_2	20	85.2	1	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	IRR	C3866_3	20	59.2	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	93.5	17	NEWTON B THOMPSON	PIN OAK CRK
Guadalupe	Hays	IRR	C3884_1	20	79.8	9	BRUCE COLLIE ET AL	BLANCO RIVER
Guadalupe	Hays	IRR	C3884_2	90	82.2	44	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	76.0	5	M D HEATLY SR	PECAN SPRINGS
Guadalupe	Hays	IRR	C3902_1	30	79.9	1	FRITZ OTTO ANTON	BUNTON BR
Guadalupe	Hays	IRR	P4027_1	9	63.3	0	JESS WEBB ET UX	BLANCO RIVER
Guadalupe	Hays	IRR	P4027_2	82	63.4	2	THOMAS L HUSBANDS ET UX	BLANCO RIVER
Guadalupe	Hays	IRR	P5371_1	5	65.7	1	ROBERT BOURKE SIMPSON	UNNAMED TRIB CYPRESS CRK
Guadalupe	Hays	IRR	P5426_1	165	72.1	49	JOHN G CURRIE	LTL BLANCO RIVER
Guadalupe	Hays	IRR	P5545_1	8	71.4	2	FRANK T & PAMELA H ARNOSKY	UNNAMED TRIB
Guadalupe	Hays	HYD	C3865_1	64370	N/A	N/A	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Hays	OTH	C3865_2	700	100.0	700	SOUTHWEST TEXAS STATE UNIV	SAN MARCOS RIVER
Guadalupe	Kendall	IRR	C2034_1	2	97.4	1	CHESTER P HEINEN ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2035_1	2	23.0	0	HARRY C MECKEL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2036_1	125	58.8	0	WILLIAM K ANDERSON ET UX	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2041_1	25	85.6	1	THOMAS L BRUNDAGE ET AL	CYPRESS CRK
Guadalupe	Kendall	IRR	C2041_2	109	18.2	0	THOMAS L BRUNDAGE ET AL	CYPRESS CRK
Guadalupe	Kendall	IRR	C2042_1	209	22.4	0	E J & VIRGINIA DOWER	CYPRESS CRK
Guadalupe	Kendall	IRR	C2043_1	17	19.8	0	EDGAR SEIDENSTICKER ET UX	CYPRESS CRK
Guadalupe	Kendall	IRR	C2043_2	4	19.8	0	L J MANNERING ET UX	CYPRESS CRK
Guadalupe	Kendall	IRR	C2043_3	20	19.8	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	25.9	0	WILLIAM G & MILDRED D SPROWLS	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2047_1	20	88.5	1	H C SEIDENSTICKER	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2048_1	100	26.5	0	RAYMOND JAMES ROSE	BLOCK CRK
Guadalupe	Kendall	IRR	C2049_1	5	22.9	0	KENNETH M & CYNTHIA RUSCH	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2050_1	136	88.0	6	ERWIN KLEMSTEIN	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2051_1	2	23.0	0	JOE B. KERCHEVILLE	JOSHUA CRK
Guadalupe	Kendall	IRR	C2051_2	260	19.0	0	JOE B. KERCHEVILLE	JOSHUA CRK
Guadalupe	Kendall	IRR	C2052_1	232	88.5	15	ZARCO FOWARDING, INC	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2053_1	32	23.3	0	ERNO SPENRATH	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2054_1	80	22.8	0	EDMUND BEHR ESTATE	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2056_1	20	66.2	0	MARK E. WATSON, JR., ET UX	WILLIE CRK
Guadalupe	Kendall	IRR	C2057_1	25	63.3	0	MARK E. WATSON, JR., ET UX	ASKEY CRK

Appendix C
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	Kendall	IRR	C2058_1	40	24.5	0	OTTO KASTEN	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2059_1	39	24.4	0	ROBERT C REINARZ ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2060_1	90	24.3	0	TEXAS BEVERAGE PACKERS INC	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2061_1	16	22.7	0	LOUIS SCOTT FELDER ET UX	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2061_2	18	22.8	0	MARJORIE RANZAU INGENHUETT	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2061_3	37	22.7	0	MURRAY A WINN JR	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2062_1	60	52.9	0	WILLIAM L PULS	WASP CRK
Guadalupe	Kendall	IRR	C2063_1	44	88.5	3	FROST-LANCASTER PROPERTIES	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2063_2	15	88.5	1	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	24.3	0	G PHIL BERRYMAN ET UX	SABINAS CRK
Guadalupe	Kendall	IRR	C2065_2	10	24.3	0	GUY BODINE III ET UX	SABINAS CRK
Guadalupe	Kendall	IRR	C2066_1	5	24.9	0	ROY C SMITH ESTATE	SABINAS CRK
Guadalupe	Kendall	IRR	C2067_1	20	25.8	0	TY RAMPY ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2067_2	20	54.0	0	TY RAMPY ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	C2069_1	30	97.8	14	DOUBLE U-SPRING BRANCH	SIMMONS CRK
Guadalupe	Kendall	IRR	C3870_1	3	99.6	2	PATRICIA RYAN	BLANCO RIVER
Guadalupe	Kendall	IRR	C3870_2	22	99.3	19	T R IMMEL ET UX	BLANCO RIVER
Guadalupe	Kendall	IRR	P4590_1	50	19.1	0	GEORGE M WILLIAMS SR ET AL	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P4598_1	80	18.5	0	JACOB C GASS	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5107_1	518	22.7	0	WILLIAM K ANDERSON ET UX	UNNAMED TRIB GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5125_1	40	18.9	0	ROBERT L SCHWARZ	CURRY CRK
Guadalupe	Kendall	IRR	P5321_1	150	18.9	0	LARRY J LANGBEIN	E SISTER CRK
Guadalupe	Kendall	IRR	P5474_1	10	18.5	0	ELTON RUST	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5490_1	10	18.5	0	BILLY J. & KARAN R. BOLES	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5501_1	5	18.2	0	BARRY T & KATHRYN B NALL	FLAT ROCK CRK
Guadalupe	Kendall	IRR	P5528_1	98	18.2	0	GEORGE A SCHMIDT ET UX	GUADALUPE RIVER
Guadalupe	Kendall	IRR	P5534_1	20	18.2	0	MARGOT O BURRELL	GUADALUPE RIVER
Guadalupe	Victoria	MUN	C3860_2	10	70.9	6	W L LIPSCOMB ET AL	GUADALUPE RIVER
Guadalupe	Victoria	MUN	P5466_1	20000	83.6	1320	VICTORIA, CITY OF	GUADALUPE RIVER
Guadalupe	Victoria	IND	C3859_1	110000	100.0	1900	SOUTH TEXAS ELECTRIC COOP INC	GUADALUPE RIVER
Guadalupe	Victoria	IND	C3861_1	60000	100.0	33000	E I DU PONT DE NEMOURS	GUADALUPE RIVER
Guadalupe	Victoria	IND	C5485_1	209189	N/A	N/A	CENTRAL POWER & LIGHT	GUADALUPE RIVER
Guadalupe	Victoria	IND	P3895_1	9676	92.8	2322	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	1000	97.5	450	FIRST VICTORIA NATL BANK, TRST	GUADALUPE RIVER
Guadalupe	Victoria	IRR	C3860_1	250	83.2	177	W L LIPSCOMB ET AL	GUADALUPE RIVER
Guadalupe	Victoria	IRR	C3862_1	263	99.5	183	BIG RACK LTD	GUADALUPE RIVER
Guadalupe	Victoria	IRR	C3862_2	137	99.5	96	E I DUPONT DE NEMOURS & CO	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4020_1	100	81.1	2	NELSON PANTEL	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4062_1	90	81.6	2	RONALD A KURTZ ET UX	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4182_1	200	81.6	4	MAXINE ROBSON KYLE ET AL	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P4441_1	200	81.4	4	S F RUSCHHAUPT III	GUADALUPE RIVER
Guadalupe	Victoria	IRR	P5012_1	140	73.0	19	JOE D. HAWES	ELM BAYOU
Guadalupe	Victoria	OTH	P5489_1	750	88.4	595	JESS Y WOMACK II	CUSHMAN BAYOU
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	4494	87.3	1412	BEXAR METROPOLITAN WATER DIST	Medio Cr. & Medina R.
San Antonio	Bexar	MUN	P5517_1	7500	72.2	0	LEON CREEK WSC	LEON CRK
San Antonio	Bexar	IND	C2161_1	12000	98.1	10308	CITY OF SAN ANTONIO	Arroyo Seco/San Antonio R.
San Antonio	Bexar	IND	C2162_1	36900	100.0	36900	CITY OF SAN ANTONIO	San Antonio R./Calaveras Cr.
San Antonio	Bexar	IND	C2162_3	11	100.0	11	CITY OF SAN ANTONIO	SAN ANTONIO RIVER
San Antonio	Bexar	IND	P5211_1	100	75.0	0	LONE STAR GROWERS CO	MEDINA RIVER
San Antonio	Bexar	IND	P5211_2	2900	79.1	0	LONE STAR GROWERS CO	MEDINA RIVER
San Antonio	Bexar	IND	P5337_1	25	52.2	2	H B ZACHRY CO	SIX MILE CRK
San Antonio	Bexar	IND	P5469_2	1500	69.2	0	HAUSMAN ROAD W S C	LEON 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	1440	95.3	903	SAN JUAN DITCH WSC	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1933_1	480	78.8	19	MISSION CEMETERY CO	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1942_1	886	95.4	212	ESPADA DITCH COMPANY	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1944_1	16	49.9	1	SAN ANTONIO MISSIONS NATL PARK	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	C1960_1	20	44.3	1	JOHN O SPICE	SALADO CRK
San Antonio	Bexar	IRR	C1962_1	10	49.0	2	JULIA H. KUSENER JACQUET ET AL	SALADO CRK
San Antonio	Bexar	IRR	C1965_1	300	49.5	42	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	C2140_2	1837	43.0	0	METROPOLITAN RESOURCES INC	MEDINA RIVER
San Antonio	Bexar	IRR	C2141_1	75	80.9	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	100.0	214	STRAUS MEDINA RANCH	MEDINA RIVER
San Antonio	Bexar	IRR	C2144_2	93	99.7	79	STRAUS MEDINA RANCH	MEDINA RIVER
San Antonio	Bexar	IRR	C2144_3	308	68.5	0	STRAUS MEDINA RANCH	MEDINA RIVER

Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
San Antonio	Bexar	IRR	C2145_1	32	92.8	9	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	90.1	11	JOSE LUIS AMADOR	ELM CRK
San Antonio	Bexar	IRR	C2148_1	8	89.9	2	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	1500	80.8	173	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_2	200	52.4	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	P3476_1	100	75.2	2	SAN ANTONIO RANCH LTD	UNNAMED OF LOS REYES CRK
San Antonio	Bexar	IRR	P3888_1	290	84.4	0	ALAN D BARIBEAU ET UX	MEDINA RIVER
San Antonio	Bexar	IRR	P4105_1	150	88.4	15	CITY OF LIVE OAK	SALITRILLO CRK
San Antonio	Bexar	IRR	P4134_1	200	75.3	0	ANITA T WALSH ESTATE	MEDINA RIVER
San Antonio	Bexar	IRR	P4135_1	200	75.0	0	BESSIE WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4136_1	400	75.0	0	EDWARD WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4137_1	600	75.5	0	FRANK WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_1	22	74.8	0	CITY OF SAN ANTONIO	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_2	92	74.8	0	EDWARD PATRICK WALSH	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_3	61	74.8	0	HARRY WALSH ESTATE	MEDINA RIVER
San Antonio	Bexar	IRR	P4138_4	126	74.8	0	JOHN H SMALL	MEDINA RIVER
San Antonio	Bexar	IRR	P4139_1	200	73.4	0	BESSIE WALSH	LEON CRK
San Antonio	Bexar	IRR	P4141_1	20	73.4	0	GULF LAND & INVESTMENT CO INC	LEON CRK
San Antonio	Bexar	IRR	P4141_2	23	73.4	0	H H GIRDLEY TRUSTEE	LEON CRK
San Antonio	Bexar	IRR	P4141_3	179	73.4	0	JOHN POWELL WALKER TRUSTEE	LEON CRK
San Antonio	Bexar	IRR	P4141_4	77	73.3	0	PEOPLES SAVINGS & LOAN ASSN	LEON CRK
San Antonio	Bexar	IRR	P4187_1	666	72.6	0	LOTTIE WALSH MAHLA ESTATE	LEON CRK
San Antonio	Bexar	IRR	P4294_1	40	99.3	24	MARY HARPER TUDHOPE	PARITA CRK
San Antonio	Bexar	IRR	P4361_1	20	77.2	1	JEROME & FLORENCE REAL	MARTINEZ CRK
San Antonio	Bexar	IRR	P4362_1	20	77.2	1	WALLACE REAL ET UX	MARTINEZ CRK
San Antonio	Bexar	IRR	P4496_1	30	77.0	2	WILLIAM WALLS JR	MARTINEZ CRK
San Antonio	Bexar	IRR	P4497_1	206	83.0	21	CARL RAY DRZYMALLA ET AL	MARTINEZ CRK
San Antonio	Bexar	IRR	P4498_1	83	76.8	6	VIRGINIA JAKSIK	MARTINEZ CRK
San Antonio	Bexar	IRR	P4499_1	54	76.7	4	JOSEPH M STANUSH ET AL	MARTINEZ CRK
San Antonio	Bexar	IRR	P5262_1	250	42.7	0	ANTHONY J GRANIERI	E CHANNEL
San Antonio	Bexar	IRR	P5265_1	35	87.1	2	MARY JAKSIK ZIGMOND	MARTINEZ CRK
San Antonio	Bexar	IRR	P5266_1	45	71.2	0	RANDALL K HOOVER ET UX	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	P5289_1	300	38.9	0	SOUTHEAST INVESTMENTS INC	ROSILLO CRK
San Antonio	Bexar	IRR	P5423_1	20	23.8	0	SAN ANTONIO PARKS & REC. DEPT.	UNNAMED TRIB HUESTA CRK
San Antonio	Bexar	IRR	P5503_1	220	61.8	0	O-SPORTS GOLF DEVELOPMENT II	PANTHER SPRING CRK
San Antonio	Bexar	IRR	P5549_1	1125	67.9	0	BEXAR METROPOLITAN WATER DIST	POLECAT CRK
San Antonio	Bexar	IRR	P5549_2	1125	61.6	0	BEXAR METROPOLITAN WATER DIST	Potranco
San Antonio	Bexar	IRR	P5577_1	420	78.8	0	ROBERT L G WATSON	SAN ANTONIO RIVER
San Antonio	Bexar	IRR	P5596_1	770	65.7	0	BILLY T MITCHELL	MEDINA RIVER
San Antonio	Bexar	IRR	P5598_1	120	79.3	0	VERSTRAETEN BROTHERS FARMS INC	LONG HOLLOW CRK
San Antonio	Bexar	MIN	P4025_1	431	84.1	0	CAPITOL AGGREGATES INC	MEDINA RIVER
San Antonio	Bexar	MIN	P4025_2	769	77.6	0	CAPITOL AGGREGATES INC	MEDINA RIVER
San Antonio	Bexar	MIN	P4025_3	3304	62.3	0	CAPITOL AGGREGATES INC	MEDINA RIVER
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	100.0	250	THE BLUE WING CLUB	SAN ANTONIO RIVER
San Antonio	Goliad	IND	C5486_1	12500	100.0	12500	CENTRAL POWER & LIGHT	COLETO CREEK
San Antonio	Goliad	IRR	C2193_1	284	93.4	80	JAMES M PETTUS ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2194_1	1020	100.0	1020	JULIA GANTT NEWTON ET AL	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	C2195_1	410	98.6	319	JOE F FRENCH	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	93.4	24	JAMES M PETTUS II	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	92.2	198	JUNE PETTUS	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P5079_1	114	92.2	24	JOHN C & SHERRY BROOKE	SAN ANTONIO RIVER
San Antonio	Goliad	IRR	P5220_1	90	92.2	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	78.8	54	PATRICIA PITTMAN LIGHT	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	C2184_1	120	86.8	8	BONNIE SKLOSS	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2184_2	80	80.1	2	BONNIE SKLOSS	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2185_1	90	92.2	19	FRANCIS MOY & MARY MOY KOWALIK	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2186_1	70	92.2	15	VINCENT LABUS JR	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2188_1	40	92.2	8	ALFRED MOCZYGEMBA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	C2189_1	350	98.6	272	CLEM R CANNON ET AL	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	92.2	13	ANDREW RIVES ET UX	CIBOLO CRK

Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
San Antonio	Karnes	IRR	P3787_1	20	92.2	4	FELIX MOCZYGEMBA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3803_1	80	89.5	5	OLIVE L RIDLEY ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3803_2	80	90.2	5	OLIVE L RIDLEY ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3808_1	232	86.5	15	FLAVIAN B MOCZYGEMBA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3851_1	50	89.5	3	SAM M. KORZEKWA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3852_1	50	89.5	3	THOMAS A KORZEKWA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P3852_2	25	74.9	2	THOMAS A KORZEKWA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4002_1	80	77.0	5	CASPER F MOCZYGEMBA JR ET AL	CIBOLO CRK
San Antonio	Karnes	IRR	P4407_1	50	89.5	3	TOMMY NAJVAR ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4490_1	90	79.3	2	DANIEL R ANDERSON ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4503_1	55	79.6	1	HENRY D STRINGER JR	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4512_1	160	92.3	34	OLIVE L RIDLEY ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4536_1	100	89.5	7	JAMES M & NANCY W BAILEY	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4536_2	200	89.5	13	JAMES M & NANCY W BAILEY	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4538_1	150	89.5	10	ALICE P JENDRUSCH ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P4561_1	525	89.5	35	RIO GRANDE RESOURCES CORP	CIBOLO CRK
San Antonio	Karnes	IRR	P5002_1	150	89.5	10	WM A JEFFERS JR & ANN JACKSON	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5043_1	150	92.2	31	MELANIE A JACOBS ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5044_1	150	89.5	10	CHARLES WAYNE HUBBARD ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5062_1	100	89.5	7	ALFRED J RAHE	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5214_1	100	76.5	7	OTTO WACLASWCZYK	CIBOLO CRK
San Antonio	Karnes	IRR	P5239_1	4	89.3	0	HOLY TRINITY CATHOLIC CHURCH	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5296_1	74	89.9	5	DENNIS J MOY	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5306_1	200	89.5	13	HERBERT JOHN EWALD JR ET AL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5323_1	100	77.4	7	WILLIAM I DUBEL	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5333_1	90	77.4	6	HECTOR O HERRERA, ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5333_2	300	77.4	20	HECTOR O HERRERA, ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5367_1	300	77.2	20	SUSIE LEE YANTA	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5368_1	300	77.1	20	ARTHUR RAY YANTA ET UX	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5399_1	223	93.5	23	GARY E POGUE ET UX	DOE BR
San Antonio	Karnes	IRR	P5455_1	3	77.3	0	DAVID C. "CHARLIE" ZUNKER	SAN ANTONIO RIVER
San Antonio	Karnes	IRR	P5532_1	3	77.6	0	FELIX BRONDER	SAN ANTONIO RIVER
San Antonio	Kendall	MUN	C1143_1	523	99.1	325	CITY OF BOERNE	CIBOLO CRK
San Antonio	Kendall	MUN	C1143_2	310	99.0	181	CITY OF BOERNE	CIBOLO CRK
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	Medina	MUN	C2130_1	750	93.0	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	MUN	C2130_2	170	93.0	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	MUN	C2130_3	19974	83.4	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	IRR	C2130_4	45856	83.2	0	BEXAR-MEDINA-ATASCOSA COS WCID	MEDINA RIVER
San Antonio	Medina	IRR	C2133_1	18	87.9	1	HARLEY & DOROTHY TSCHIRHART	MEDINA RIVER
San Antonio	Medina	IRR	C2134_1	17	90.1	1	GLENNIS W STEIN	MEDINA RIVER
San Antonio	Medina	IRR	C2135_1	5	96.1	1	KITTIE NELSON FERGUSON	SAN GERONIMO CRK
San Antonio	Medina	IRR	C2136_1	6	89.5	0	KITTIE NELSON FERGUSON	UNNAMED TRIB SAN GERONIMO CRK
San Antonio	Medina	IRR	C2138_1	16	87.9	1	CLIFFORD L SOWELL SR ET UX	MEDINA RIVER
San Antonio	Medina	IRR	C2139_1	112	87.9	8	A L GILLIAM	MEDINA RIVER
San Antonio	Medina	IRR	P4140_1	185	73.5	0	KATHLEEN DAVENPORT CARSKADDEN	MEDINA RIVER
San Antonio	Medina	IRR	P4149_1	20	73.5	0	GLENNIS W STEIN	MEDINA RIVER
San Antonio	Medina	IRR	P4151_1	170	72.9	0	JAMES A OPPELT ET UX	MEDINA RIVER
San Antonio	Medina	IRR	P4159_1	50	72.7	0	MARIE I HABY ET AL	MEDINA RIVER
San Antonio	Medina	IRR	P4170_1	15	72.8	0	TWAIN J JAGGE ET UX	MEDINA RIVER
San Antonio	Medina	IRR	P4367_1	160	72.5	0	LEE W TSCHIRHART	MEDINA RIVER
San Antonio	Medina	IRR	P4434_1	156	72.5	0	ALVIN C & CARMEN SANTLEBEN	MEDINA RIVER
San Antonio	Medina	RCG	P3220_1	991	8.4	28	EDWARDS UNDERGROUND WD	SAN GERONIMO
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	93.7	14	BILL & MELVIN DEAGEN ET AL	CIBOLO CRK
San Antonio	Wilson	IRR	C1153_1	100	92.3	21	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	C1157_1	117	92.3	24	OSCAR SANDERS	CIBOLO CRK
San Antonio	Wilson	IRR	C1158_1	30	93.4	9	VIVA LEA MILLS	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_1	0	90.2	0	DEBORAH M IRWIN ET VIR	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_2	13	93.5	4	GAYLON T CLICK ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_3	16	93.5	5	GAYLON T CLICK ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_4	7	93.5	2	PATRICK NEIDORF	CIBOLO CRK
San Antonio	Wilson	IRR	C1159_5	3	93.2	1	WAYNE DODD ET AL TRUSTEES	CIBOLO CRK
San Antonio	Wilson	IRR	C1160_1	140	93.4	40	MRS MAGGIE WEBER	CIBOLO CRK
San Antonio	Wilson	IRR	C1161_1	15	93.3	4	JOHN DRZYMALA	CIBOLO CRK
San Antonio	Wilson	IRR	C1162_1	2	92.4	0	ALVIN PRUSKI	CIBOLO CRK
San Antonio	Wilson	IRR	C1162_2	78	87.2	5	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	93.8	2	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	93.7	10	GERVAS JASKINIA ESTATE	CIBOLO CRK
San Antonio	Wilson	IRR	C1171_1	80	99.5	56	ROSS OWEN SCULL	CIBOLO CRK

Appendix C
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
San Antonio	Wilson	IRR	C1171_2	250	89.5	16	ROSS OWEN SCULL	CIBOLO CRK
San Antonio	Wilson	IRR	C1171_3	330	76.6	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	78.5	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	74.6	1	JOHN WILLIAM HELTON JR ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2165_1	50	92.1	10	ED WISEMAN MARITAL TRUST	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2165_2	70	72.9	2	ED WISEMAN MARITAL TRUST	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2166_1	105	93.7	41	NICK KOLENDA	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2166_2	95	74.6	2	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	94.8	4	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	99.5	44	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	C2173_1	78	98.6	61	CECIL MARK RICHARDSON ET AL	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	72.3	1	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	74.6	3	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	78.1	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	78.4	11	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	78.5	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	78.5	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	79.1	4	FRED J LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2181_3	159	79.2	4	FRED J LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2182_1	700	92.2	146	LEO V LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2182_2	166	74.7	4	LEO V LYSSY ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	C2183_1	100	100.0	100	BENJAMIN C PAWELEK	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3837_1	21	86.5	1	LAWRENCE R HALLIBURTON ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3837_2	29	86.5	2	W H HALLIBURTON, ESTATE OF	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3861_1	200	86.5	13	GEO D POOL & RONALD R STINSON	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3887_1	50	86 5	3	PATTILLO FAMILY FARMS INC	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3897_1	716	50 0	17	ALFRED J NEWMAN, ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P3994_1	1056	84 3	24	BOENING ENTERPRISES	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4121_1	38	79 9	1	BENITO D. CABRIALES ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4181_1	86	79 9	2	BERTRAND O BAETZ ESTATE ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4181_2	120	78 5	3	BERTRAND O BAETZ ESTATE ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4484_1	300	79 5	7	DELBERT J KELLER	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P4495_1	50	79 6	1	WILLIAM & IRENE C WALLS JR	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5126_1	150	79 1	3	WILLIAM M PAVLISKA	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5171_1	200	79 0	5	MESCALERO PROPERTIES	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5182_1	100	76 8	7	JAMES T WATSON	CIBOLO CRK
San Antonio	Wilson	IRR	P5194_1	210	78 8	5	JOE R HOLLAWAY JR ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5202_1	75	78 5	2	GEORGE R GAWLIK ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5218_1	360	87 7	24	WILLIAM P REDDICK ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	P5224_1	60	87 4	4	JOHNNY KOSUB & BETTY KOSUB	CIBOLO CRK
San Antonio	Wilson	IRR	P5243_1	54	78 3	1	FRANK R BOLF	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5264_1	130	74 6	3	LILLIAN S WISEMAN TRUST ET AL	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5307_1	300	74 5	7	JAMES R LEININGER	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5308_1	100	65 9	7	SAM JARZOMBEK	CIBOLO CRK
San Antonio	Wilson	IRR	P5320_1	200	72 9	5	SHELBY KOEHLER ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5395_1	254	72 7	6	RENATO MARTINEZ ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5395_2	450	72 3	10	RENATO MARTINEZ ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5499_1	50	72 2	1	GARY ZOOK, ET UX	SAN ANTONIO RIVER
San Antonio	Wilson	IRR	P5559_1	99	62 7	3	RALPH MCGREW ET UX	CIBOLO CRK
San Antonio	Wilson	IRR	P5587_1	300	60 4	0	ALOIS D KOLLODZIEJ ET UX	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	0 0	0	SAM COUNTISS	UNNAMED TRIB LIVE OAK CRK
Nueces	Atascosa	IRR	C3216_1	20	34 9	0	ATASCOSA COWBOY RECREATION	UNNAMED TRIB ATASCOSA RIVER
Nueces	Atascosa	IRR	C3217_1	27	33 7	0	WOODROW W MARSH	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3218_1	7	33 7	0	JACK L MCGINNIS ET UX	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3218_2	11	33 7	0	DOYLE LAWHON ET UX	ATASCOSA RIVER
Nueces	Atascosa	IRR	C3219_1	30	33 7	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	98 8	1	MAGSONS N. V	BONITA CRK
Nueces	Atascosa	IRR	P3986_1	10	35 2	0	O M NAEGELIN FARMS INC	UNNAMED TRIB ATASCOSA RIVER

Basin	County of Diversion Location(s)	Use	WR ID#	Authorized Diversion (acft/yr)	Volume Reliability (%)	Minimum Annual Diversion (acft)	Owner	Stream
Nueces	Atascosa	IRR	P3986_2	70	34.4	0	O M NAEGELIN FARMS INC	ATASCOSA RIVER
Nueces	Atascosa	MIN	P5511_1	120	1.5	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	19996	61.9	1839	ZAVALA-DIMMIT CO WID 1	NUECES RIVER
Nueces	Dimmit	IRR	C3086_1	554	32.5	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	1090	100.0	1090	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	55.2	0	LUCILE C WHITECOTTON ET AL	SOLDIER SLOUGH
Nueces	Dimmit	IRR	C3099_1	34	45.9	0	CHARLES W & MARJORIE V WILSON	EL BARROSA CRK
Nueces	Dimmit	IRR	C3102_1	15	38.0	0	NEEDMORE RANCH INC	APPURCEON CRK
Nueces	Dimmit	IRR	C3103_1	400	89.4	1	R W BRIGGS, JR	BURRO CRK
Nueces	Dimmit	MIN	C3082_9	4	61.9	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	MUN	C3200_1	0	0.0	0	T E BURNS ET AL	MARTINE CRK
Nueces	Frio	IRR	C3193_1	8	38.2	0	HOWARD F BENNETT	FRIO RIVER
Nueces	Frio	IRR	C3199_1	50	33.9	0	PANTHER HOLLOW RANCH, LTD	UNNAMED TRIB TODOS SANTOS CRK
Nueces	Frio	IRR	C3208_1	230	1.1	0	COX FEEDLOTS INC	UNNAMED TRIB CHACON CRK
Nueces	Frio	IRR	C3209_1	118	67.1	63	E F MORRIS	CHACON CRK
Nueces	Frio	IRR	C3210_1	20	56.8	0	FRANCIS MALDONADO	UNNAMED TRIB SAN MIGUEL CRK
Nueces	Frio	IRR	C3211_1	40	91.7	22	GLEN EARL BAKER	SAN MIGUEL CRK
Nueces	Frio	IRR	C3211_2	60	43.9	25	GLEN EARL BAKER	SAN MIGUEL CRK
Nueces	Frio	IRR	C3212_1	25	2.3	0	CHARLES CURTIS RAMSEY ET UX	BUCKHORN CRK
Nueces	Frio	IRR	P3884_1	80	5.6	0	CLAUDE D J SMITH	SAN MIGUEL CRK
Nueces	Frio	IRR	P3903_1	150	5.8	0	LA SALLE CATTLE COMPANY LTD	FRIO RIVER
Nueces	Frio	IRR	P3914_1	19	39.3	0	A E SCHLETZE FARMS	ELM CRK
Nueces	Frio	IRR	P3914_2	7	39.0	0	A R GALLOWAY ET UX	ELM CRK
Nueces	Frio	IRR	P4014_1	124	9.5	0	JOE H BERRY	LEONA RIVER
Nueces	Frio	IRR	P4041_1	25	4.4	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	16.4	0	DR LESLIE R FRICKE	SAN MIGUEL CRK
Nueces	Frio	IRR	P5247_1	50	0.0	0	CONNIE BRADLEY	SAN MIGUEL CRK
Nueces	Frio	IRR	P5248_1	50	0.0	0	HELEN BRANHAM	SAN MIGUEL CRK
Nueces	Frio	IRR	P5249_1	50	0.0	0	THERESA BIEDIGER	SAN MIGUEL CRK
Nueces	Frio	REC	P3919_1	0	0.0	0	ROY HINDES	UNNAMED TRIB LIVE OAK CRK
Nueces	La Salle	MUN	P5170_1	0	0.0	0	PATRICK HUGHES WELDER JR	UNNAMED TRIB GREEN BR
Nueces	La Salle	IRR	C3104_1	250	98.0	149	WAITZ SUPER MARKET, INC	NUECES RIVER
Nueces	La Salle	IRR	C3105_1	150	99.6	131	FRANKLIN JERRY MEEKS	NUECES RIVER
Nueces	La Salle	IRR	C3106_1	20	93.9	6	M C WHITWELL ET UX	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3106_2	20	92.9	5	M C WHITWELL ET UX	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3107_1	210	36.1	7	CARL CONWAY	NUECES RIVER
Nueces	La Salle	IRR	C3108_1	298	28.2	0	C L LEHMAN ESTATE	NUECES RIVER
Nueces	La Salle	IRR	C3109_1	10	46.8	0	M C WHITWELL ET UX	NUECES RIVER
Nueces	La Salle	IRR	C3111_1	30	94.8	14	EUGENE WHITE	NUECES RIVER
Nueces	La Salle	IRR	C3112_1	47	98.3	33	FREDNA K DOBIE	NUECES RIVER
Nueces	La Salle	IRR	C3114_1	199	98.0	140	RALPH P. GUTTMAN	NUECES RIVER
Nueces	La Salle	IRR	C3115_1	55	97.9	39	VALLEY FLEA MARKET INC	NUECES RIVER
Nueces	La Salle	IRR	C3116_1	33	97.9	23	BRENDA JOAN BOYD	NUECES RIVER
Nueces	La Salle	IRR	C3116_2	145	97.9	102	PRINCE WOOD ET AL	NUECES RIVER
Nueces	La Salle	IRR	C3117_1	270	95.9	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	99.9	126	LOUIS OSWALD LIND	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3124_1	5	99.9	5	RAUL DEL TORO ET UX	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3125_1	20	83.6	0	GEORGE & SHARON TRIGO	NUECES RIVER
Nueces	La Salle	IRR	C3126_1	100	83.2	10	SILLER BROTHERS	NUECES RIVER
Nueces	La Salle	IRR	C3126_2	260	39.4	8	SILLER BROTHERS	NUECES RIVER
Nueces	La Salle	IRR	C3127_1	180	87.8	18	LEE M & VALDA M GATES	NUECES RIVER
Nueces	La Salle	IRR	C3128_1	39	91.7	5	VALDA M GATES	NUECES RIVER
Nueces	La Salle	IRR	C3129_1	180	91.9	26	LOUISE G DAVIS	NUECES RIVER
Nueces	La Salle	IRR	C3130_1	126	91.0	32	BILLIE JEAN TAYLOR	NUECES RIVER
Nueces	La Salle	IRR	C3131_1	50	90.7	11	RONALD C FEUDO	NUECES RIVER
Nueces	La Salle	IRR	C3132_1	195	90.3	34	EL TRES EXPLORATION INC	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3133_1	54	95.9	24	H B RAMSEY	NUECES RIVER
Nueces	La Salle	IRR	C3133_2	296	94.4	123	RODNEY D JONES	NUECES RIVER
Nueces	La Salle	IRR	C3134_1	398	91.7	148	GEORGE C HIXON	NUECES RIVER
Nueces	La Salle	IRR	C3135_1	42	100.0	42	H.B. RAMSEY	UNNAMED TRIB NUECES RIVER

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	C3135_2	38	91.7	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	91.3	23	T.G. RANKIN	NUECES RIVER
Nueces	La Salle	IRR	C3138_1	55	91.3	14	CHARLES D. JOHNSON	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3139_1	2023	98.0	1195	HOLLAND TEXAS DAM & IRR. CO.	UNNAMED TRIB NUECES RIVER
Nueces	La Salle	IRR	C3140_1	76	80.2	5	FRED HILLJE ESTATE	NUECES RIVER
Nueces	La Salle	IRR	C3201_1	649	38.1	0	JEFF E RUSK ET AL	FRIO RIVER
Nueces	La Salle	IRR	C3203_1	106	62.3	0	DOUGLAS A MILLER, ET AL	UNNAMED SLOUGH FRIO RIVER
Nueces	Medina	IRR	C3189_1	40	19.1	0	RICHARD W SCHWEERS	HONDO CRK
Nueces	Medina	IRR	C3190_1	80	52.9	0	WIMBERLY DEVELOPMENT CORP	UNNAMED TRIB HONDO CRK
Nueces	Medina	IRR	C3191_1	20	32.4	0	L S MOLLERE, TRUSTEE	SECO CRK
Nueces	Medina	IRR	C3207_1	2000	0.5	0	BEXAR-MEDINA-ATASCOSA WCID 1	CHACON CRK
Nueces	Medina	IRR	P3954_1	70	6.1	0	ERNESTO & ALONSO RODRIGUEZ	HONDO CRK
Nueces	Medina	IRR	P4286_1	4	0.8	0	C H PIFER	CHACON CRK
Nueces	Medina	IRR	P4506_1	40	4.8	0	JAMES THOMAS BAGBY JR	HONDO CRK
Nueces	Medina	IRR	P5344_1	132	0.0	0	JAMES R HATCHETT	FT EWELL CRK
Nueces	Medina	MIN	P5420_1	100	4.8	0	INGRAM READYMIX INC	HONDO CRK
Nueces	Medina	RCG	C3192_1	520	0.0	0	EDWARDS UNDERGROUND WATER DIST	PARKERS CRK
Nueces	Medina	RCG	P3745_1	585	0.0	0	EDWARDS UNDERGROUND W D	MIDDLE VERDE
Nueces	Medina	RCG	P3806_1	1185	0.0	0	EDWARDS UNDERGROUND W D	SECO CRK
Nueces	Medina	OTH	P5192_1	0	0.0	0	JOHN ROBERT WINDROW ET UX	W BR LIVE OAK
Nueces	Uvalde	MUN	P3913_1	0	0.0	0	JOE G SMYTH JR	WOOD SLOUGH
Nueces	Uvalde	MUN	P4505_1	200	5.3	0	UTOPIA WATER SUPPLY CORP	SABINAL RIVER
Nueces	Uvalde	MUN	P5063_2	6	4.1	0	GAFFORD FAMILY PARTNERSHIP	FRIO RIVER
Nueces	Uvalde	MUN	P5497_1	35	5.7	0	CONCAN WATER SUPPLY CORP	FRIO RIVER
Nueces	Uvalde	IND	C3087_1	10	93.3	0	R L WHITE COMPANY	GATO CRK
Nueces	Uvalde	IRR	C3064_1	150	27.3	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	27.4	0	GEORGE H MOFF	NUECES RIVER
Nueces	Uvalde	IRR	C3067_1	1461	89.3	124	EVERETT L CLARK	NUECES RIVER
Nueces	Uvalde	IRR	C3068_1	310	87.4	12	WILLARD R WALLACE ET AL	NUECES RIVER
Nueces	Uvalde	IRR	C3069_1	134	44.6	0	ARIZONA T CRUMP	NUECES RIVER
Nueces	Uvalde	IRR	C3072_1	200	83.2	0	MIRASOL RANCH FAMILY LTD PART	NUECES RIVER
Nueces	Uvalde	IRR	C3073_1	144	27.3	0	SAM BARKLEY	NUECES RIVER
Nueces	Uvalde	IRR	C3163_1	113	37.8	0	JOHN HAMMAN JR ESTATE	FRIO RIVER
Nueces	Uvalde	IRR	C3163_2	133	4.1	0	JOHN HAMMAN JR ESTATE	FRIO RIVER
Nueces	Uvalde	IRR	C3165_1	86	37.8	0	WALLACE S & ISABEL B WILSON	FRIO RIVER
Nueces	Uvalde	IRR	C3166_1	35	38.0	0	JOE C KRANZ ET UX	FRIO RIVER
Nueces	Uvalde	IRR	C3167_1	11	38.0	0	MACONDA BROWN O'CONNOR	FRIO RIVER
Nueces	Uvalde	IRR	C3168_1	4	38.2	0	JOHN S BUCHANAN	FRIO RIVER
Nueces	Uvalde	IRR	C3168_2	37	37.8	0	JOHN S BUCHANAN	FRIO RIVER
Nueces	Uvalde	IRR	C3169_1	40	37.8	0	JOHN S. GRAVES, JR, ET AL	MAYHEW
Nueces	Uvalde	IRR	C3170_1	19	21.3	0	JOHN M & MARY ANN BARKLEY	FRIO RIVER
Nueces	Uvalde	IRR	C3171_1	75	53.7	0	MICHAEL L STONER	FRIO RIVER
Nueces	Uvalde	IRR	C3172_1	1000	6.6	0	THOMAS & GRETEL EKBAUM	FRIO RIVER
Nueces	Uvalde	IRR	C3173_1	1000	6.6	0	ALVIN M RIMKUS	FRIO RIVER
Nueces	Uvalde	IRR	C3174_1	31	25.8	0	RIO GRANDE CHILDRENS HOME INC	DRY FRIO RIVER
Nueces	Uvalde	IRR	C3175_1	9	21.0	0	EL CAMINO GIRL SCOUT COUNCIL	DRY FRIO RIVER
Nueces	Uvalde	IRR	C3181_1	400	6.0	0	BRUCE L BOSWELL ET UX	W SABINAL RIVER
Nueces	Uvalde	IRR	C3182_1	40	18.0	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	8.2	0	GEORGE E LIGOCKY	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	C3194_2	49	7.7	0	GEORGE E LIGOCKY	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	C3196_1	40	19.7	0	SAMUEL DON SMITH	LEONA RIVER
Nueces	Uvalde	IRR	C3197_1	523	90.0	236	MARJORIE LEE KERR ESTATE	LEONA RIVER
Nueces	Uvalde	IRR	C3197_2	305	89.8	138	MARJORIE LEE KERR ESTATE	LEONA RIVER
Nueces	Uvalde	IRR	P3988_1	28	7.8	0	GEORGE LIGOCKY	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P3989_1	56	12.0	0	JAMES C HENRY, ET UX	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P3990_1	30	5.4	0	DON INMAN	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P3991_1	250	80.8	0	D S TURNER ET UX	UNNAMED TRIB COOK'S SLOUGH
Nueces	Uvalde	IRR	P4177_1	200	6.0	0	MARVIN G VERSTUYFT ET AL	FRIO RIVER
Nueces	Uvalde	IRR	P4177_2	795	5.8	0	MARVIN G VERSTUYFT ET AL	FRIO RIVER
Nueces	Uvalde	IRR	P4238_1	140	4.1	0	CON CAN ENTERPRISES INC	FRIO RIVER
Nueces	Uvalde	IRR	P4304_1	12	4.9	0	C V & LONA SHEFFIELD	LEONA RIVER
Nueces	Uvalde	IRR	P4305_1	1140	5.8	0	A C SANDERLIN ET AL	FRIO RIVER
Nueces	Uvalde	IRR	P4352_1	110	5.3	0	LOUIS A WATERS	LITTLE CRK
Nueces	Uvalde	IRR	P5063_1	94	4.1	0	GAFFORD FAMILY PARTNERSHIP	FRIO RIVER
Nueces	Uvalde	IRR	P5241_1	108	4.1	0	BARKAT LAND & CATTLE CO	FRIO RIVER
Nueces	Uvalde	IRR	P5325_1	255	5.3	0	RONALD E LEE, JR	SABINAL RIVER
Nueces	Uvalde	IRR	P5372_1	320	4.1	0	ROBERT L K LYNCH ET AL	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	19.6	0	DONALD R LINDENBORN JR TRUSTEE	NUECES RIVER
Nueces	Zavala	IRR	C3075_1	124	19.6	0	WALTER D MOORE	NUECES RIVER
Nueces	Zavala	IRR	C3076_1	200	19.4	0	DON P DIXON	NUECES RIVER
Nueces	Zavala	IRR	C3077_1	200	19.4	0	K & M FARMS	NUECES RIVER

Appendix C
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
Nueces	Zavala	IRR	C3078_1	200	19.4	0	WILBA RALPH WALKER ET AL	NUECES RIVER
Nueces	Zavala	IRR	C3079_1	313	19.4	0	JACK RUTLEDGE	NUECES RIVER
Nueces	Zavala	IRR	C3080_1	75	13.8	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	38.6	0	GEORGE C THOREEN ET AL	NUECES RIVER
Nueces	Zavala	IRR	C3082_1	8000	60.2	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	39.3	0	MARIO A ESCOBAR ET UX	NUECES RIVER
Nueces	Zavala	IRR	C3084_1	80	39.4	0	OPAL E C MARBURGER	NUECES RIVER
Nueces	Zavala	IRR	C3085_1	320	27.4	0	WARD L BOX	NUECES RIVER
Nueces	Zavala	IRR	C3088_1	150	88.2	0	CHAPARROSA RANCHES, LTD	CHAPARROSA CRK
Nueces	Zavala	IRR	C3089_1	206	85.9	0	ERROL O JONSSON ET AL	CHACON CRK
Nueces	Zavala	IRR	C3089_2	174	71.8	0	ERROL O JONSSON ET AL	CHACON CRK
Nueces	Zavala	IRR	C3090_1	45	48.5	0	JIM G FERGUSON, JR	COMANCHE CRK
Nueces	Zavala	IRR	C3090_2	65	40.5	0	JIM G FERGUSON, JR	COMANCHE CRK
Nueces	Zavala	IRR	C3091_1	800	65.6	0	L C ROBBINS JR	COMANCHE CRK
Nueces	Zavala	IRR	C3091_2	400	65.5	0	TURKEY CREEK RANCHES LTD	COMANCHE CRK
Nueces	Zavala	IRR	C3091_3	400	64.7	0	FRANK W HARBORTH	COMANCHE CRK
Nueces	Zavala	IRR	C3091_4	498	64.0	0	RICHARD DALE LEDOUX ET AL	COMANCHE CRK
Nueces	Zavala	IRR	C3092_1	684	48.5	0	TURKEY CREEK RANCHES LTD	UNNAMED TRIB COMANCHE CRK
Nueces	Zavala	IRR	C3198_1	150	15.5	0	DENVER C CARNES	LEONA RIVER
Nueces	Zavala	IRR	P4310_1	84	5.3	0	BREWSTER FARMS INC	LEONA RIVER
Nueces	Zavala	IRR	P4339_1	50	5.0	0	CHARLES R IRWIN	LEONA RIVER