Guadalupe-Blanco River Authority

Water Conservation Plan
Wholesale Water Suppliers

Title 30. Part I, Chapter 288,
Subchapter A, 288.5

APRIL 29, 2009

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INTRODUCTION

INTRODUCTION AND OVERVIEW

The Guadalupe-Blanco River Authority is a water conservation and reclamation district created by the State of Texas in 1933 as a public corporation under Section 59, Article 16 of the Constitution of Texas. It was reauthorized in 1935 as the Guadalupe-Blanco River Authority by an act of the Texas Legislature (VCS Art. 8280-106).

GBRA was established to develop, conserve and protect the water resources of the Guadalupe River basin and make them available for beneficial use. Since its beginning, however, GBRA has understood that its planning and resource development efforts could not take place in isolation but must always consider the broader scope of regional and statewide water needs. GBRA's statutory district begins near the headwaters of the Guadalupe and Blanco Rivers, ends at San Antonio Bay, and includes Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Calhoun and Refugio counties (figure 1) encompassing 7,900 square miles. Today, ten operating divisions and the General Division supply essential services including water and wastewater treatment, water quality testing, the management of water rights and delivery of stored water, the production of electricity from seven hydroelectric plants, engineering and design support, economic development and educational support to a population of 550,000 people.

GBRA cannot levy or collect taxes or assessments or in any way pledge the general credit of the State of Texas. Revenues for maintenance and operation are derived from the services GBRA provides to customers throughout the basin.

GBRA is governed by a board of nine directors appointed by the Governor, subject to confirmation by the Texas Senate. Each director serves a six-year term with three directors appointed or reappointed every two years. Management and administrative functions are performed by the General Manager and staff under policies established by the Board.

GBRA MISSION

The mission of the GUADALUPE-BLANCO RIVER AUTHORITY is to protect, conserve, reclaim and steward the resources of the ten-county District in order to ensure and promote quality of life for those we serve.

This mission has been separated into six specific goals:

Water Resource Management:

To ensure a supply of quality water for both immediate and long term needs of the District by development of all feasible alternatives; and development of flood management measures.

Water Quality:

To ensure that the quality of water in the District is suitable for municipal, agricultural, environmental and industrial supplies as well as recreational uses.

Public Services:

To expand the GBRA's public services and continue to enhance current operations.

Economic Development:

To create economic development opportunities for each community in the District, through partnerships with the GBRA.

Technical Assistance and Support

To provide increased professional and technical assistance to customers and other entities.

Communication and Education

To inform and educate employees and the public regarding protection, conservation and reclamation of District resources and GBRA stewardship of those resources.

DEFINITIONS OF COMMONLY USED TERMS

Conservation – Those practices, techniques and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.

Drought Contingency Plan – A strategy for implementing water use restrictions during periods of drought and emergency events.

Industrial Use – The use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, commercial fish production and the development of power by means other than hydroelectric, but does not include agricultural use.

Municipal per capita water use – The sum total of water diverted into a water supply system for residential, commercial, public and institutional uses divided by actual population served.

Municipal use – The use of potable water within or outside a municipality and its environs whether supplied by a person, privately owned utility, political subdivision, or other entity as well as the use of sewage effluent for certain purposes, including the use of treated water for domestic purposes, fighting fires, sprinkling streets, flushing sewers and drains, water parks and parkways and recreational purposes, including public and private swimming pools, the use of potable water in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands and for the watering of lawns and family gardens.

Municipal use in gallons per capita per day – The total average daily amount of water diverted or pumped for treatment of potable use by a public water supply system. The calculation is made by dividing the water diverted or pumped for treatment for potable use by population served. Indirect reuse volumes shall be credited against total diversion volumes for the purpose of calculating gallons per capita per day for targets and goals.

Public water supplier – An individual or entity that supplies water to the public for human consumption.

Regional water planning group – A group established by the Texas Water Development Board to prepare a regional water plan under Texas Water Code, § 16.053.

Retail public water supplier – An individual or entity that for compensation, supplies water to the public for human consumption. The term does not include an individual or entity that supplies water to itself or to its employees or tenants when that water is not resold to or used by others.

Reuse – The authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake or other body of state-owned water.

Water conservation plan – A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s).

Water loss – The difference between water diverted or treated and water delivered (sold). Water loss can result from: (1) inaccurate or incomplete record keeping; (2) meter error; (3) unmetered uses such as firefighting, line flushing and water for public buildings and water treatment plants; (4) leaks; and (5) water theft and unauthorized use.

Wholesale public water supplier – An individual or entity that for compensation, supplies water to another for resale to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants as an incident of that employee service or tenancy when that water is not resold to or used by others, or an individual or entity that conveys water to another individual or entity, but does not own the right to the water which is conveyed, whether or not for a delivery fee.

Water Conservation Plan for Wholesale Water

BACKGROUND

Current Water Uses

The citizens of the GBRA water service area use approximately 190,000 acre feet of water annually from both surface water and groundwater sources. Among surface water uses, the large majority (about 44 percent) is for municipal use. Industrial use accounts for about 37 percent.

Current Water Supply

In the Guadalupe River Basin, both surface water and groundwater are important water sources. However, the majority of water (60%) is supplied from surface sources. Surface water supplies are a combination of the natural flows of the Guadalupe River and its' tributaries and releases of stored water from the Canyon Reservoir under Certificate of Adjudication 18-2074 as amended as authorized by the TCEQ.

Increasing competition for available water supplies can be moderated by the implementation of water conservation programs. Water conservation can provide a significant source of "new" water and reduce the risk of disruptive water shortages. Recognizing this benefit, the Guadalupe-Blanco River Authority Board of Directors adopted a revised Water Conservation Plan (WCP-2009) in April 2009, to encourage and where appropriate, require the conservation of ground and surface water within the ten-county district of the Guadalupe-Blanco River Authority and to any customers of water diverted for short or long term use to customers outside of the district. The revised WCP-2009 was approved by GBRA Board of Directors on April 29, 2009.

Consistent with this WCP-2009, GBRA has developed a comprehensive water conservation program. Additionally, a Water Conservation Plan and Drought Contingency Plan have been developed specifically for all wholesale water supply customers who contract for and receive stored water from Canyon Reservoir through GBRA's Water Resource Division.

Under Senate Bill 1 approved in 1997 by the Texas Legislature, all major municipal water rights holders are required to submit to TCEQ for approval and then implement a water conservation plan. This WCP-2009 is intended to satisfy this state requirement.

This WCP-2009 is consistent with the requirements of the Texas Commission on Environmental Quality Rules, Title 30 TAC Section 288.5 and 288.30.

Components of the WCP-2009 include:

- Technical assistance
- Administrative and pricing requirements
- Water distribution system efficiency improvement
- Implementation reports
- Education

SECTION I-A

Description of the GBRA's service area, including population and customer data, water use data, water supply system data, and wastewater data.

GBRA's Service Area

GBRA's statutory district begins near the headwaters of the Guadalupe and Blanco Rivers, ends at San Antonio Bay, and includes Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Calhoun and Refugio counties (figure 1). Today, Eleven Operating Divisions and General Division supply essential services including water and wastewater treatment, water quality testing, the management of water rights and delivery of stored water, the production of electricity from seven hydroelectric plants, engineering and design support, economic and community development and natural resource education.

Population Data for all 10 Counties in GBRA's District

See Table 1-1 for information relating to historical population for the past eight years 2000-2007 for all ten counties. See Table 1-2 for charts indicating surface water usage from Canyon Reservoir for the years 2000-2007 for all ten counties.

Historical Surface Water Use / GBRA's Customers

See Table 1-3 for surface water contract amounts, by type of use for GBRA's customers.

Figure 1. GBRA Water Service Area

Table 1-1

POPULATION FOR GBRA'S TEN COUNTIES*

Census	Caldwell	Calhoun	Comal	Dewitt	Gonzales	Guadalupe	Hays	Kendall	Refugio	Victoria	Total
2000	32,194	20,647	78,021	20,013	18,628	89,023	97,589	23,743	7,828	84,088	471,774
2001	33,812	20,669	81,729	20,104	18,639	92,193	104,498	24,628	7,768	84,738	488,778
2002	34,928	20,410	84,719	20,053	18,875	94,374	109,718	25,314	7,700	85,054	501,145
2003	35,572	20,454	87,785	20,100	19,057	97,101	114,193	26,178	7,625	85,395	513,460
2004	36,461	20,498	90,857	20,146	19,247	100,014	118,760	27,617	7,550	85,737	526,887
2005	35,383	20,561	97,090	20,713	19,463	105,077	129,129	29,532	7,450	85,427	549,825
2006	35,622	20,958	105,431	20,341	19,135	114,736	137,940	31,350	7,493	86,756	579,762
2007	35,843	20,937	108,170	20,265	19,174	119,084	142,310	32,474	7,386	86,750	592,393

*2000 US Census Bureau, 2001-2007 Texas Association of Counties

Table 1-2

2000 Water Use

CUSTOMER	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
TOTAL MUNICIPAL USE	1206.30	1186.00	1320.09	1253.14	1324.87	1278.69	1730.98	1714.27	1759.76	1603.66	659.25	660.56	15697.57
TOTAL INDUSTRIAL USE	46.36	56.23	58.65	56.23	62.63	62.80	64.39	63.35	81.85	56.55	45.64	41.63	696.31
TOTAL IRRIGATION USE	16.20	15.92	40.72	37.56	30.83	35.27	81.23	78.55	62.21	27.94	22.15	6.25	454.83
TOTAL DOMESTIC USE	0.22	0.28	0.32	0.21	0.42	0.45	0.5125	0.53	0.42	0.28	0.21	0.23	4.0825
TOTAL PERMIT 1886	1269.08	1258.43	1419.78	1347.14	1418.75	1377.21	1877.11	1856.70	1904.24	1688.43	727.25	708.67	16852.79

2001 Water Use

CUSTOMER	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
TOTAL MUNICIPAL USE	979.24	1079.48	1134.39	1281.17	1401.46	1525.32	1691.80	1705.44	1324.93	1422.45	706.80	651.40	14691.24
TOTAL INDUSTRIAL USE	127.95	50.22	170.57	221.87	239.78	394.72	358.34	493.42	436.95	250.87	248.88	161.48	3155.05
TOTAL IRRIGATION USE	3.55	1.91	1.99	23.01	45.52	57.69	84.11	70.91	25.72	58.16	10.57	1.47	384.61
TOTAL DOMESTIC USE	0.22	0.25	0.23	0.27	0.45	0.53	0.64	0.60	0.43	0.32	0.22	0.24	4.38
TOTAL PERMIT 1886	1110.96	1131.86	1307.18	1526.32	1687.21	1978.26	2134.89	2270.37	1788.03	1731.80	966.47	814.59	18235.28

2002 Water Use

CUSTOMER	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
TOTAL MUNICIPAL USE	1202.19	1199.51	1220.41	1315.67	1660.44	1738.42	1064.71	1852.84	1449.60	1338.81	1350.99	848.52	16242.11
TOTAL INDUSTRIAL USE	118.65	291.06	291.48	298.48	328.97	276.69	304.72	351.81	246.48	275.55	330.73	172.72	3287.34
TOTAL IRRIGATION USE	15.64	19.01	32.62	38.97	70.98	78.27	29.67	76.13	30.69	22.72	17.51	3.61	435.82
TOTAL DOMESTIC USE	0.20	0.26	0.30	0.33	0.44	0.51	0.23	0.21	0.28	0.20	0.15	0.12	3.25
TOTAL PERMIT 1886	2673.16	3019.42	3089.32	1653.46	2060.83	2093.89	1399.34	2280.99	1727.05	1637.28	1699.38	1024.97	19968.53

2003 Water Use

CUSTOMER	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
TOTAL MUNICIPAL USE	792.17	753.06	793.07	980.00	1289.35	1077.72	1081.39	1279.06	1115.40	1010.02	852.27	1464.88	12488.39
COMAL ROAD DEPT.	0.08	0.08	0.00	0.49	0.37	0.15	0.15	0.06	0.03	0.03	0.03	0.03	**1.50**
TOTAL INDUSTRIAL USE	177.54	212.25	181.99	266.99	430.85	396.91	419.01	464.23	339.40	265.48	293.88	194.05	3642.58
TOTAL IRRIGATION USE	12.28	7.95	20.55	51.81	63.45	51.98	33.50	81.31	15.98	26.38	6.85	22.53	394.58
TOTAL DOMESTIC USE	0.09	0.08	0.03	0.14	0.05	0.16	0.20	0.33	0.18	0.13	0.11	0.11	1.62
TOTAL PERMIT 1886	982.08	973.34	995.64	1298.94	1783.70	1526.77	1534.10	1824.93	1470.96	1302.01	1153.11	1681.57	16527.17

2004 Water Use

CUSTOMER	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
TOTAL MUNICIPAL USE	859.82	647.10	865.08	819.67	1013.23	961.44	1232.34	1328.28	1165.07	1043.21	831.89	1412.62	12179.75
TOTAL INDUSTRIAL USE	207.55	225.04	227.82	351.85	248.41	312.77	392.43	328.21	300.70	308.99	217.58	216.37	3337.72
TOTAL IRRIGATION USE	5.36	3.59	4.79	19.78	33.34	20.89	53.05	41.67	42.87	28.96	14.49	21.11	289.90
TOTAL DOMESTIC USE	0.04	0.06	0.07	0.33	0.11	0.10	0.14	0.22	0.18	0.07	0.06	0.07	1.45
TOTAL PERMIT 1886	1072.77	875.79	1097.76	1191.63	1295.09	1295.20	1677.96	1698.38	1508.82	1381.23	1064.02	1650.17	**15,808.82**

2005 Water Use

CUSTOMER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
TOTAL MUNICIPAL USE	879.16	792.61	911.92	1120.07	1109.44	1319.95	1395.68	1456.46	1513.10	1369.64	1054.70	1649.24	**14,571.97**
TOTAL INDUSTRIAL USE	212.13	175.12	254.64	304.84	304.82	448.29	559.10	523.99	612.43	539.53	412.30	383.50	**4,730.69**
TOTAL IRRIGATION USE	7.48	2.42	24.54	39.7	29.97	54.2	34.41	47.23	27.5	33.46	21.64	11.29	**333.84**
TOTAL DOMESTIC USE	0.04	0.06	0.06	0.14	0.18	0.24	0.20	0.12	0.14	0.07	0.12	0.06	**1.45**
TOTAL PERMIT 1886	1098.81	970.21	1191.16	1464.75	1444.41	1822.68	1989.39	2027.80	2153.17	1942.70	1488.76	2044.09	**19,637.95**

2006 Water Use

CUSTOMER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
TOTAL MUNICIPAL USE	1338.38	1330.90	1814.79	1989.57	2138.32	2354.76	2389.35	3590.43	3128.55	2838.04	2834.83	2673.60	**28,421.52**
TOTAL INDUSTRIAL USE	214.78	228.25	309.28	457.46	503.44	624.71	605.36	641.74	686.39	537.03	306.91	230.96	**5,346.31**
TOTAL IRRIGATION USE	14.19	24.48	25.57	45.97	56.82	74.95	63.79	88.01	45.65	39.73	21.49	8.22	**508.87**
TOTAL DOMESTIC USE	0.05	0.06	0.07	0.13	0.11	0.17	0.21	0.20	0.18	0.09	0.05	0.07	**1.39**
TOTAL PERMIT 1886	1567.40	1583.69	2149.71	2493.13	2698.69	3054.59	3058.70	4320.38	3860.77	3414.89	3163.28	2912.86	**34,278.09**

2007 Water Use

CUSTOMER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
TOTAL MUNICIPAL USE	2435.40	2407.61	2735.66	2730.31	2390.40	2327.98	2306.79	2568.41	2750.00	2800.56	2692.27	2537.86	**30,683.25**
TOTAL INDUSTRIAL USE	206.26	316.76	269.83	405.06	500.91	536.90	409.98	465.73	605.16	521.59	306.54	203.24	**4,747.96**
TOTAL IRRIGATION USE	3.50	22.95	11.23	12.21	25.35	30.45	13.62	38.96	32.34	42.87	32.72	30.71	**296.91**
TOTAL DOMESTIC USE	0.08	0.03	0.03	0.03	0.09	0.07	0.04	0.13	0.14	0.12	0.08	0.04	**0.90**
TOTAL PERMIT 1886	2645.24	2747.35	3016.75	3147.61	2916.75	2895.40	2730.43	3073.23	3387.64	3365.14	3031.61	2771.85	**35,729.02**

2008 Water Use

CUSTOMER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
TOTAL MUNICIPAL USE	2199.59	2306.84	2530.81	2687.88	2955.46	2980.76	2825.51	2691.84	2599.79	3100.28	3312.04	3140.24	**33,331.05**
TOTAL INDUSTRIAL USE	181.90	302.88	332.18	483.00	580.40	621.56	625.76	732.37	532.74	517.48	521.73	374.24	**5,806.24**
TOTAL IRRIGATION USE	26.87	24.87	29.93	47.50	62.86	70.58	57.96	44.33	59.97	59.29	38.55	29.59	**552.30**
TOTAL DOMESTIC USE	0.04	0.07	0.05	0.09	0.11	0.21	0.15	0.19	0.13	0.13	0.06	0.09	**1.31**
TOTAL PERMIT 1886	2408.41	2634.66	2892.97	3218.47	3598.83	3673.11	3509.38	3468.73	3192.63	3677.18	3872.38	3544.16	**39,690.91**

Table 1-3
Guadalupe-Blanco River Authority

Customer	Purpose	AF/YR Commit.	Exp Dt	Div Rate	County
Springs Hill WSC I	Mun 010	1500	123150	500 GPM	Guad
Canyon Lake WSC	Mun 010	2000	123144	4200 GPM	Comal
Canyon Lake WSC II	Mun 010	2000	123150	4200 GPM	Comal
Canyon Lake WSC III	Mun 010	2000	123150	6945 GPM	Comal
Green Valley SUD	Mun 010	1000	123140	1200GPM	Guad
Gonzales Co. WSC	Mun 010	700	030139	600 GPM	Gonz
Rebecca Crk. MUD	Mun 010	130	123137	600 GPM	Comal
Calhoun County RWSC	Mun 010	500	071610	898 GPM	Calhoun
City of Port Lavaca	Mun 010	1500	011016	2 MGD	Calhoun
POC MUD	Mun 010	60	071940	725 GPM	Calhoun
Yacht Club	Mun 010	4	123116	6 GPM	Comal
CRWA (Dunlap)				3000 GPM	
City of Marion	Mun 010	100	123139		Guad
City of Cibolo	Mun 010	1350	123139		Guad
Green Valley SUD	Mun 010	1800	Varies		Various
Springs Hill WSC	Mun 010	1925	123139		Guad
East Central WSC	Mun 010	1400	Varies		Various
Bexar Met WD	Mun 010	4000	123118		Bexar
NBU	Mun 010	6720	12511	6000 GPM	Comal
City of Seguin	Mun 010	1000			Guad
WW Sports	Mun 010	1	123110	60 GPM	Comal
Crystal Clear	Mun 010	800	111232	600 GPM	Guad
Dittmar, Gary	Mun 010	5	N/A	2800 GPM	Guad
Dittmar, Ray	Mun 010	5	N/A	1200 GPM	Guad
Springs Hill WSC II	Mun 010	1000	123150	10327 GPM	Guad
City of Blanco	Mun 010	600	123150	375 GPM	Comal
HH Ranch Properties	Mun 010	250	123144	600 GPM	Comal
Boerne	Mun 010	3611	123137		Kendall
Fair Oaks Ranch	Mun 010	1850	123137		Bexar
SAWS	Mun 010	4000	123137		Bexar
Cordillera Ranch	Mun 010	1000	123137		Com/Ken/Bex
Kendall & Tapatio	Mun 010	750	123137		Kendall
DH Invest.-Johnson Ranch	Mun 010	400	123137		Comal
Comal Trace	Mun 010	100			Comal
SJWTX-Bulverde	Mun 010	400	123140		Com/Ken/Bex
SJWTX-Park Village	Mun 010	322	123137		Com/Ken/Bex
San Marcos	Mun 010	10000	070147	6,000 GPM	Comal/Hays
Kyle	Mun 010	2957	123138	1,842 GPM	Hays/Caldwell
CRWA	Mun 010	2038	123139	1390 GPM	Hays
Buda	Mun 010	1120	123142	694 GPM	Hays
GoForth WSC	Mun 010	1050	123139	650 GPM	Guad
2428 Partners	Mun 010	3136	123150	2776 GPM	Guad
Monarch	Mun 010	560	123137	350 GPM	Guad
SUBTOTAL Municipal		**65,644**			
Bill Holland	Dom 011	1	123120	20 GPM	Comal
Maricopa Lodge	Dom 011	2	123110	15 GPM	Comal
Debra Salge	Dom 011	1	123109	20 GPM	Comal
Peter Kleck	Dom 011	1	123109	40 GPM	Comal
Don Johnson	Dom 011	1	123110	20 GPM	Comal
Emil Gavlick	Dom 011	1	123118	12 GPM	Comal
George O'Donnell	Dom 011	4	123116	26 GPM	Comal
Marvin Roberts	Dom 011	1	123109	30 GPM	Comal

Michael Walton	Dom 011	1	123110	30 GPM	Comal
Stephen Edlund	Dom 011	1	123116	20 GPM	Comal
Karl Braddick	Dom 011	1	123109	26 GPM	Comal
Gerald Cain	Dom 011	1	123110	16 GPM	Comal
Thomas Livengood	Dom 011	1	123109	26 GPM	Comal
SUBTOTAL Domestic		**17**			
CMC Steel	Ind 020	700	Indef.	1000 GPM	Guad
Acme Brick	Ind 020	25	123130	100 GPM	Guad
BP Chemical	Ind 020	1100	022110	10250 GPM	Calhoun
Coleto Creek Power	Ind 020	4000	090125	16000 GPM	Victoria
UCC/DOW	Ind 020	100	123111	24000 GPM	Calhoun
Seadrift Coke L. P	Ind 020	334	071513	1550 GPM	Calhoun
Temple Inland (St. Gyp)	Ind 020	258	123113	125 GPM	Guad
Henk Paving	Ind 020	1	123110	100 GPM	Comal
Comal Fair	Ind 020	1	123129	200 GPM	Comal
Comal Rd. Dept.	Ind 020	3	123114	2000 GPM	Comal
GPP (Panda Energy)	Ind 020	6840	123121	6600 GPM	Guad
Guadalupe County	Ind 020	1	123109	150 GPM	Guadalupe
Hays Energy LP (ANP)	Ind 020	2464	123125	1528 GPM	Comal
SUBTOTAL Industrial		**15,827**			
Jack DuBose	Irr 030	5	123122	50 GPM	Gonz
Ind. Golf Assn.	Irr 030	2	123111	250 GPM	Gonz
Comal ISD	Irr 030	2	123113	13 GPM	Comal
Gladys Erben	Irr 030	5	123111	435 GPM	Comal
Terry Zurovec	Irr 030	4	123110	250 GPM	Guad
Hawk Golf Club	Irr 030	200	123110	325 GPM	Comal
Eddie Goldbeck	Irr 030	1	123110	70 GPM	Comal
Golf Club of Seguin	Irr 030	25	123122	200 GPM	Guad
Southbank Property Own	Irr 030	1	123111	60 GPM	Guad
Roy Cunningham	Irr 030	2	123110	40 GPM	Comal
George Lenz	Irr 030	2	123110	60 GPM	Comal
Foresight Golf Partners	Irr 030	290	123130	2000 GPM	Guad
Javier Martinez	Irr 030	1	123111	12 GPM	Comal
Maldonado Nursery	Irr 030	6	123109	100 GPM	Guad
Allen’s Bend HOA	Irr 030	1	123109	35 GPM	Guad
Lodge at Turkey Cove	Irr 030	1	123111	26 GPM	Comal
Everett Deschner	Irr 030	2	123120	60 GPM	Comal
Comal Cty-Hidden Valley	Irr 030	20	123110	250 GPM	Comal
Golf Associates	Irr 030	10	123130	2000 GPM	Guad
Larry Aniol	Irr 030	1	123110	500 GPM	Comal
Melanie Schulz	Irr 030	5	123109	100 GPM	Guadalupe
William Waggener	Irr 030	1	123110	20 GPM	Comal
Ron & Belinda Frisk	Irr 030	1	123110	18 GPM	Comal
Ray Leubner	Irr 030	1	123109		Comal
Tom Smith	Irr 030	1	123109		Comal
Kenneth Speck	Irr 030	1	123109		Comal
Bill Biegel	Irr 030	1	123109		Comal
Anthony Cantrell	Irr 030	1	123109		Comal
John Sanders	Irr 030	2	123109		Comal
Jeff Bearden	Irr 030	1	123109		Comal
Karen Baker	Irr 030	1	123109		Comal
Daniel Hawk	Irr 030	1	123109		Comal
Jimmy Force	Irr 030	1	123109		Comal
Donald Cook	Irr 030	1	123109		Comal
Rio Encino	Irr 030	1	123109		Comal
Robert Fleming	Irr 030	1	123109		Comal
Samir Sayegh	Irr 030	1	123109		Comal

Edward Maser	Irr 030	1	123109		Comal
Robert Bowling-Bikini Bottom	Mun 010	1	123109		Comal
Chris Amundsen	Irr 030	1	123109		Comal
Paul Nugent	Irr 030	1	123109		Comal
William Latham	Irr 030	1	123109		Comal
SUBTOTAL Irrigation		**608**			
UPSTREAM DIVERSION CONTRACTS					
Kerrville	Irr 030	26	123120	750 GPM	Kerr
Southerland Prop. Inc.	Irr 030	117	123129	900 GPM	Comal
Tom Fatjo	Irr 030	10.67	123140	100 GPM	Kerr
Robert Sieker	Irr 030	1	123135	.03 GPM	Kerr
Wheatcraft, Inc.	Irr 030	33	123126	400 GPM	Kerr
SUBTOTAL Upstream Diversion		**187.67**			
TOTALS		**82,283.67**			

Water Supply System Data

Canyon Reservoir is the only water supply operations system in GBRA's ten county district area. Information pertaining to historical water use of GBRA's customers is stated in Table 1-2.

Wastewater Data

Table 1-4 lists all of GBRA's wastewater discharge permits.

Table 1-4
GBRA WASTEWATER DISCHARGE PERMITS

WWTP	TPDES/ TLAP No.	Permit Expiration Date	Design Capacity (interim/final)	Receiving Stream	Area Served
Lockhart No.1-Larremore Plant	10210-001	Feb 1, 2010	1.1 MGD	Town Creek to Plum Creek	City of Lockhart (50%)
Lockhart No. 2- FM 20 Plant	10210-002	Feb 1, 2010	1.5 MGD	Plum Creek	City of Lockhart (50%)
Buda WWTP	11060-001	Feb 1, 2010	0.95/1.5 MGD	Porter Creek to Plum Creek	City of Buda
Village of Wimberley WWTP	13321-001	Feb 1, 2015	0.015/0.05 MGD	No discharge	Blue Hole Nursing Home/Wimberley, TX
Canyon Park Estates WWTP	11496-001	Feb 1, 2012	0.18/0.26 MGD	Canyon Reservoir	Silverleaf Condominiums/Hancock, TX
Dunlap WWTP	11378-001	Apr 1, 2010	0.7/0.95 MGD	Guadalupe River	River Bend, Bandit and Southbank Subdivisions, southeast of New Braunfels, Comal Co., TX
Northcliffe WWTP	11751-001	Feb 1, 2010	0.3 MGD	No discharge	Northcliffe Subdivision/Schertz, TX
Springs Hill WWTP	11427-001	Dec 1, 2009	0.3 MGD	Guadalupe River	Nob Hill and Springs Hill Area, South of Seguin, TX
Victoria Willow Street Plant	10466-001	Jan 1, 2010	2.5 MGD	Guadalupe River	City of Victoria (20%)
Victoria Regional WWRS	11078-001	Feb 1, 2010	9.6 MGD	Guadalupe River	City of Victoria (80%)
Crestview WWTP	13954-001	Dec 1, 2009	0.03 MGD	Chocolate Bayou	Crestview Sub- division/Calhoun Co., TX
Cordillera Ranch	14385-001	Feb 1, 2010	0.064/0.128/0.192 MGD	No discharge	Cordillera Ranch Subdivision
Sunfield	14377-001	Jun 1, 2009	0.25/0.5/0.99 MGD	Brushy Creek to Plum Creek	Heep Ranch Subdivision, portions of Buda
Shadow Creek	14431-001	Feb 1, 2010	0.162/0.486 MGD		
Gerdes Land Application	04438	Jun 27, 2013			
Luling WTP Land Application	730021	Sep 25, 2012			
Port Lavaca WTP Land Application	730106	Nov 22, 2010			

SECTION I-B

Specification of conservation goals including, target per capita water use goals for wholesaler's service area, maximum acceptable unaccounted-for water, the basis for the development of said goals, and a time frame for achieving those goals.

The purpose of the GBRA's water conservation program is to increase water use efficiency and reduce water waste. Achievement of significant water conservation savings can only occur if each retail water utility sets and aggressively implements its own water conservation programs. However, TCEQ rules require that all conservation plans for state waters have reasonable water conservation goals.

To determine a reasonable municipal water conservation goal, it is necessary to examine the technical potential for water savings for each of the following:

- Implementation of the statewide plumbing code requiring water efficient plumbing fixtures
- Plumbing fixture retrofits of existing buildings
- Reductions in distribution system water losses
- Educational and informational programs to encourage water use efficiency
- Reductions in seasonal water uses, particularly landscape irrigation

Based on reported water savings across the country, each water savings category noted above has a range of potential savings. Some of these savings are based on dry and average per capita water use. Per capita water use varies with each GBRA water customer.

Technical studies have been conducted by the Texas Water Development Board to quantify a range of savings from various conservation services. Based on these ranges, an expected water savings of about 14-25 gpd per person can be achieved with moderate water conservation efforts by year 2020 in the GBRA water service area. The largest water savings are due to implementation of state law requiring water efficient plumbing in all new housing and commercial establishments.

The success in achieving the GBRA's water conservation goal depends on implementation of similar goals by the GBRA's water customers. Thus, the GBRA water sale contracts will require a similar goal from each water customer.

GBRA reviewed all its municipal water conservation programs in the year 2005-2006 to determine if expansion of the programs was warranted based on needs, program effectiveness and available resources.

Goals

1. Develop water conservation plans and drought contingency plans for each city in the district with a population of 5,000 or more and for each major customer (100 acre feet or more) of stored water from Canyon Reservoir.
2. Achieve a per capita water use of 150 gpd for all municipal customers which use water from storage in Canyon Reservoir by the year 2014 and 147 gpd by the year 2019.
3. Utilize the "averaging concept" in the commitment of water in order to stretch the supply of stored water.
4. Work with systems to develop water supplies based on a firm yield.
5. Develop criteria for use of reuse water for golf courses and residential purposes.
6. Establish criteria for increased metering to track and manage water supplies.
7. Maximum acceptable unaccounted for water of 15% or less by the year 2014 and 15% or less by the year 2019.

Targets

The WCP-2009 emphasizes (1) assistance to local communities in the development of water conservation plans and drought contingency plans, (2) water education programs and (3) implementation of contractual water conservation rules, goals, guidelines and requirements.

Goals for manufacturing water conservation are dependent upon individual manufacturing processes. These goals will be determined on a case-by-case basis, and their implementation will be specified in individual water sale contracts.

Irrigation water conservation efforts will continue under the water conservation plan at the Calhoun Canal System. These programs will focus on: (1) continuing canal improvements and (2) potential volumetric water measurement and pricing.

It must be recognized that GBRA's Calhoun Canal System is more than a seasonal irrigation canal system. The canals are used throughout the year to deliver municipal, industrial, and livestock water. Most of these off-peak season deliveries are for small quantities of water, making the operation more challenging when compared to some other canal operations.

Conservation and Education

Over the past twenty years, the GBRA has provided educational programs to thousands of students, as well as distributed thousands of pieces of water conservation literature to our customers and communities in our water service area. GBRA continues distributing water education programs

with an emphasis on conservation, targeted at 4th grade students. In 1989, recognizing the need to make today's students aware of water resource issues, GBRA took the first steps toward developing what has become a model elementary water education program. Fall, 2008 was the twentieth consecutive year that GBRA has supplied this program free of charge to all fourth grade classrooms in the river basin. ***This school year, a total of 415 Journey Through the Guadalupe River Basin programs were mailed to 105 schools and approximately 10,400 students. Since the program's inception, approximately 180,000 students have gained valuable information that will help them assume their responsibilities as caretakers of tomorrow's water resources.***

In 2003, GBRA implemented River of Life, targeted at middle-school students. The curriculum emphasizes pollution control, water quality and conservation. To date a total of 300 teachers have been instructed in the River of Life curriculum. Approximately 100,000 students have received instruction from the River of Life Program.

Additional water conservation education is provided by:

Community Service

Clean Texas 2000
GBRA received an award certificate and official designation as a "Clean Texas 2000 Partner" in 1994 by the Texas Commission on Environmental Quality. Selection is based on an organization's continuing support and participation in environmental projects. Since then, GBRA has maintained an ongoing program of participation in Clean Texas 2000 activities and events.

County Fairs, Trade Shows and Environmental Fairs
GBRA participates in these events through financial support, providing literature and materials, and loaning displays and providing educational presentations on water quality, water conservation, water safety and other topics.

Requests for Information
GBRA staff members respond to many public requests for information each year on a wide variety of subjects. They assist with research projects, provide literature, materials and photographs from the GBRA library and archives, and occasionally create special materials for specific needs.

Texas Parks and Wildlife Department EXPO
GBRA participates in this annual event to encourage conservation preservation and protection of our natural resources with emphasis on preventing water pollution, participation in the Clean Rivers Program and monitoring water quality to determine possible sources of pollutants. (This responsibility has been transferred to Economic Development.)

Education

A Journey Through the Guadalupe River Basin

This one week unit for the 4th grade classroom, written and developed by GBRA, introduces students to basin-wide water uses and issues. Cartoon characters "Edward A. Armadillo" and "Lupe" the turtle present the learning narrative which includes geography, water uses, the importance of springflow, and water conservation, water quality and regulation. Each classroom kit includes a teacher's guide, map poster, pretests, and posttests, CD, overhead transparency map of the Basin, student manuals and "award" pencils. More than 180,000 students have studied and completed this program since its introduction in 1989. In 2010, approximately 420 classes and over 10,500 students will study the *Journey* program.

Drinking Water Week and Water Utilities Awareness Week

GBRA participates in these annual nationwide programs. Since 1998, GBRA has featured news releases and advertisements promoting water conservation and water quality, Board proclamations, reduced water testing fees for the public, bumper stickers, buttons, employee participation, and billing statement messages to customers. Public open houses and tours have been at the Luling and Port Lavaca water treatment plants and the Lockhart and Victoria wastewater treatment plants for schools and members of the general public.

River of Life

This curriculum, written and developed by GBRA includes lessons on the physical properties of water, the hydrologic cycle, the watersheds of the Guadalupe River, the Edwards and other aquifers in the region, the health of a body of water, pollution sources, drinking water and wastewater treatment and water conservation. The curriculum was developed for use in middle-school. Approximately 100,000 students have been introduced to topics from the River of Life since its introduction in 2003.

Texas Stream Team (formerly Texas Watch)

GBRA is an active sponsor of this statewide water quality monitoring program. We offer training classes for schools, clubs and private individuals designed to certify them as “Water Quality Monitors.” The test data they collect from area rivers and streams is shared with the Texas Commission on Environmental Quality (TCEQ). In 1994, GBRA and its Regional Laboratory Director were cited as “Texas Watch Lead Partners” for their “outstanding dedication to volunteer monitoring.” GBRA provides monitors with replacement chemicals, test kits and assistance.

Special Literature

GBRA maintains an inventory of water conservation literature from various organizations which it distributes free to schools, civic groups, as bill stuffers, and at other public and private functions.

Special GBRA publications include:

GBRA - Bright Ideas for Water and Energy Conservation

This four-page handout describes helpful water saving suggestions for inside and outside the home.

GBRA River Run

This publication by the GBRA Public Communications office features articles on water-related issues such as water quality, conservation, and resource management and is distributed several times a year to more than 4,000 public officials, water authority managers and staff, area media, and other constituents.

“Xeriscape - Water Conservation Through Creative Landscaping”

Two slide programs are available: a shorter version (15 minutes) focuses on the importance of

Xeriscape and how to implement it in your landscape; and a longer version (20-25 minutes) is geared to garden clubs and organizations that need additional information regarding Xeriscape plants and landscape information. Handouts and plant lists are available for distribution with each program.

Water Conservation

Presentations are available for different levels, including elementary school, high school, and adults, and include age-appropriate videos and Power Point presentations.

Public Information

Public Information

GBRA sponsors advertising messages about water safety, water conservation, water quality and other important topics in newspapers and radio stations throughout the basin as budget allows. Public Service Announcements and press releases on these issues, as well as lake management information are disseminated to basin media accordingly.

SECTION I-C

Practice(s) and/or device(s) to be utilized to measure and account for the amount of water diverted from the source(s) of supply.

All customers of the GBRA Water Resources Division are required to submit annual use reports. Additionally, GBRA operations require for regular calibration and reading of water supply meters.

SECTION I-D

Monitoring and record management program for determining water deliveries, sales, and losses.

GBRA maintains records of all water transactions as well as daily reading of Canyon Reservoir storage capacity, inflow and releases and requires annual reports of all water use.

SECTION I-E

Program of metering and leak detection and repair for the wholesaler's water storage, delivery, and distribution system.

As a contract requirement, each municipal water purchaser is required to submit on at least an annual basis a water system audit to determine the amount of water which is being lost from the system as a result of various conditions including theft, leaks, inaccurate meters, or bookkeeping errors. If such audit reveals that the customer's average system loss has been in excess of twenty (20) percent, the GBRA customer must perform the following:

a) All system master meters and a random sampling of at least five (5) percent of Purchaser's customer meters are tested to determine their accuracy.

b) After audit or testing performed in accordance with this section, Purchaser would submit in writing to GBRA a system efficiency plan outlining the corrective actions to be taken by Purchaser and a specific time schedule for each of the deficiencies found by the survey to be remedied.

Additional purchaser requirements include:

- Metering (unless GBRA agrees otherwise) all water pumped at the contractual diversion points and calibrating those meters at least once a year,
- Implementing an ongoing education program promoting water conservation through distribution of educational material and by conducting workshops,
- For municipal customers, no declining block rates for retail customers, and
- Adopting water conservation and drought contingency plans which include appropriate water use goals such as percentage reduction in per capita use, reduced peak water demands or reduced wastewater flows.

A further requirement is that each purchaser report every five years to the GBRA on the status of their water conservation program.

SECTION I-F

Requirement in every wholesale water supply contract entered into or renewed after official adoption of the water conservation plan (by either ordinance, resolution, or tariff) and including any contract extension, that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements of this chapter; if the customer intends to resell the water, then the contract between the initial supplier and customer must provide that the contract for the resale of the water must have water conservation requirements so the each successive customer in the resale of the water will be required to implement water conservation measures in accordance with applicable provisions of this chapter.

All new water sales and water or wastewater utility service contracts or any extension of such contracts are required to contain appropriate conditions requiring conservation measures that are consistent with the provisions of this WCP-2009 as adopted or amended by the GBRA Board of Directors.

This WCP-2009 requires that a water sale contract applicant must promote efficiency in the purchaser's use of water. In addition, each purchaser further agrees that, in the event that it furnishes water or water services to a third party that in turn will furnish the water or services to the ultimate consumer, the requirements of the water sale contract relative to water conservation shall be met through contractual agreements between it and the third party.

SECTION I-G

A reservoir system operations plan providing for the coordinated operation of Canyon Reservoir.

CANYON DAM AND RESERVOIR OPERATION

Background

Canyon Dam and Reservoir was completed in 1964 as a cooperative project that is jointly managed by GBRA and the U.S. Army Corps of Engineers. GBRA is responsible for reservoir water management and release within the 'conservation pool,' between 800 feet mean sea level (msl) and the normal operating elevation of 909 msl. The Corps is responsible for management and release of waters within the 'flood control pool,' at elevations from 909 to 943 feet msl. Water is normally released as soon as possible from this portion of the reservoir as it must be kept empty to contain runoff from high rainfall and flood events.

Canyon Reservoir supplies stored water to cities, industries, and agricultural users. Under a permit issued by the Texas Commission on Environmental Quality (TCEQ), GBRA is currently allowed to divert a five-year average of 90,000 acre feet per year of stored water to supply contracted water users. To many users Canyon storage is their sole source of water; for others, it provides a dependable, alternative source of water during drought conditions and low river flows.

At maximum conservation pool level of 909 feet elevation msl, the reservoir covers more than 8,200 surface acres and impounds 386,200 acre-feet of water to a depth of 140 feet.

Reservoir Averaging:

Over the past 25 years, GBRA has developed an operating procedure whereby stored water from Canyon Reservoir is used to "firm-up" run-of-the-river water for users downstream of the reservoir. As an example, by using stored water from Canyon Reservoir, GBRA developed and used a "reservoir averaging" method whereby Coleto Creek Reservoir, an off-channel cooling lake for a steam-electric power plant in the lower basin, has been dependably operated with a run-of-the-river permit for water from the Guadalupe River, firmed up by a minimum quantity of stored water. The run-of-the river permit for Coleto Creek Reservoir is 20,000 acre-feet per year. With TCEQ's approval, GBRA's contract for stored water provides for an average of 6,000 acre-feet per year of stored water from Canyon, with a special condition that the maximum quantity of stored water that can be used during any one year is 18,900 acre-feet. This is possible, because in most years, the run of the

river permit and natural run off are sufficient to keep Coleto Creek Reservoir full, and no Canyon releases are necessary. In this way, stored water for the electric utility is minimized, and the project has an adequate water supply to allow operations during short term droughts. This is just one example of the benefits of reservoir averaging.

Pricing of Stored Water:

GBRA has a philosophy of pricing stored water, so the rate includes the cost of the capital; operation and maintenance of facilities; management of water rights; and other expenses required to store, manage and deliver water. A basin-wide price is calculated as the weighted average cost of service from all water resource activities. The current rate for stored water is $105.00 per acre-foot per year. This rate will increase as new projects are financed and built, and GBRA becomes more active in other water-related activities such as flood management and conservation.

Stored Water for Agricultural Irrigation:

In the Guadalupe River Basin, most irrigation farmers who use surface water have rights only to run-of-the river flows. Thus, they do not have a dependable water supply during times of drought. In the Calhoun Canal System, GBRA signs annual contracts with irrigation customers. This water is delivered under GBRA's run of river permits. In a very dry year, if GBRA has uncommitted water in storage at the beginning of the year, GBRA can provide stored water from Canyon Reservoir, under a special arrangement with its' irrigation farmers. Under this policy, on a year-to-year basis, GBRA can provide stored water to meet the needs of irrigators who need more water to finish a season. The charge for this water is the basin price for stored water -- $105.00 per acre foot, and is prorated among all the irrigators who use the canal system. In this way, individual irrigators can proceed with their respective farming operation, with assurance that there will be enough water available to complete that irrigation season and bring the crop to maturity. This method reduces the need to resort to various strategies during the irrigation season to perhaps over irrigate when stream flows are high, in an effort to store soil moisture for later months when stream flows are not expected to be adequate to meet irrigation needs. All who participate share the costs, and thereby benefit by having a limited amount of stored water available during times of drought. It is emphasized, however, that this policy is operated on a year-to-year basis as opposed to being a long-term irrigation water supply policy.

DROUGHT CONTINGENCY PLAN FOR CANYON RESERVOIR

The purpose of the Drought Contingency Plan (DCP-2009) for Canyon Reservoir is to specify how GBRA will contract and supply firm and interruptible stored water supplies during a repetition of the critical Drought of Record. In managing the stored water from Canyon Reservoir and future sources of water supply, GBRA must

- define the conditions under which water shortages exist and
- specify the actions to be taken by GBRA to mitigate the adverse effects of such shortages.

The overall goals of the DCP-2009 are to:

- Extend available water supplies.
- Preserve essential uses of water and protect public health and safety during extreme shortages of supplies.
- Equitably distribute among GBRA's water customers any adverse economic, social and environmental impacts associated with drought-induced water shortage.

The scope of the DCP-2009 must adhere to the findings of TCEQ's adjudication of GBRA's water rights. Essentially the scope of the DCP-2009 is limited to the curtailment of firm water supplies to insure that there is sufficient firm, uninterruptable water available to meet projected demands for such water through a repetition of the Drought of Record. **Firm, stored water is subject to curtailment only if it is determined that the drought in effect is worse than the Drought of Record.**

In times of shortage of supply caused by drought or emergency, the TCEQ's South Texas Watermaster will determine when water rights holders must reduce or stop diversions. GBRA, in accordance with Section 11.039 of the Texas Water Code, will curtail and distribute the available supply of interruptible (run-of-river) water among all of its water supply customers on a pro rata basis, so that preference is given to no one and all interruptible water supply customers suffer alike. Projections of actual demand for stored water over the next ten years are less than the firm stored water supplies available. Thus, curtailment of firm stored water demands is unlikely in the next decade, even under a recurrence of extreme drought conditions.

A basic assumption in assessing water availability for the DMP is that all operational policies must be evaluated as if the worst drought ever recorded for the lower Guadalupe River were to reoccur. This Drought of Record for Canyon Reservoir was the 1947-1956 period.

If the shortage of supply caused by the drought is worse than the Drought of Record, then GBRA, must curtail and distribute the available supply of firm water among all of its firm water supply customers on a pro rata basis, so that preference is given to no one and all firm water supply customers suffer alike.

INTERRUPTIBLE SUPPLIES

In the Guadalupe River Basin, the largest use for run-of-river water is for agricultural production. Agricultural producers must plan their crops for the next season based upon the projected water supply, even though more supply may actually be available in future months. GBRA's contracts provide that uncommitted stored water can be used to finish a crop if there is insufficient run-or-river water available. Overall, the recommended alternative best balances the economic benefit to the agricultural producers, while protecting all firm demands.

Curtailment of Water Supplies to Instream Flow Needs

GBRA's permit from the Federal Energy Regulatory Commission (FERC) describes the method GBRA uses to meet the Instream flow needs below Canyon Reservoir.

Curtailment of Firm Water Demands

The GBRA is required by TCEQ and the Texas Water Code to follow water supply allocation procedures to insure that there is no shortage or deficiency of stored water for firm demands during a repeat of the Drought of Record. Given the demand on firm water supplies at present, the possibility of a firm water shortage occurring is unlikely.

The GBRA cannot determine with absolute certainty whether a particular drought event will be more or less severe than the Drought of Record. Therefore GBRA will request voluntary reduction of firm demands in the early stages of a severe drought.

The GBRA cannot invoke mandatory curtailments of firm water demand unless it can be demonstrated that a particular drought event is more severe than the Drought of Record or some other water emergency that drastically reduces the available firm water supply. GBRA staff has developed a simplified "drought monitoring procedure" for identifying a drought worse than the Drought of Record for Canyon Lake watershed. Historical inflow data for the contributing watershed of Canyon Lake was used in the development of this procedure.

Stage 1 Firm Water Curtailment Policy

Voluntary water conservation measures will be implemented whenever either:

(1) there is a curtailment in interruptible water supplies or

(2) the total storage in Canyon Reservoir is less than elevation 895 M.S.L. or 277,500 acre-feet.

At such times, the GBRA will implement an aggressive public information campaign to provide up-to-date information on water supply conditions and promote voluntary action to conserve water.

Stage 2 Firm Water Curtailment Policy

The GBRA will further encourage the firm water customers to reduce water use whenever the total storage in Canyon Reservoir is at or below elevation 890 M.S.L. or 245,333 acre-feet. To implement end-user water demand reductions may require that mandatory water use restrictions be imposed on end users by the firm water wholesale customers themselves. To encourage such water demand reductions, the GBRA will investigate alternative incentive policies, including the use of special water pricing incentives to participating wholesale water customers.

Stage 3 Firm Water Curtailment Policy

The GBRA will further encourage the firm water customers to reduce water use whenever the total storage in Canyon Reservoir is at or below elevation 885 M.S.L. or 215,615 acre-feet. Stage 2 efforts to reduce water demands will be pursued more aggressively by GBRA.

Stage 4 Firm Water Curtailment Policy

Implementation of the mandatory curtailments of firm water demands will occur whenever the river system is experiencing a drought more severe than the Drought of Record. During a drought more severe than the Drought of Record, the GBRA will curtail and distribute the available supply of firm water among all of its firm water supply customers on a pro rata basis according to their demand for stored water.

The GBRA Board of Directors will declare a drought worse than the drought of record when the following three conditions are simultaneously met: a) drought at least 36 consecutive months (36 months since Canyon Reservoir was last full); and b) the cumulative inflow deficit since the beginning of the drought exceeds the envelope curve for cumulative inflow deficits by at least 5% for six

consecutive months; and c) the storage of Canyon Reservoir is less than elevation 885' M.S.L. or 215,615 acre-feet. The GBRA Board of Directors will cancel such a declaration if any of the following conditions are met: d) the cumulative inflow deficit since the beginning of the drought is less than the envelope curve for cumulative inflow deficits by at least 5% for six consecutive months; or e) the storage in Canyon Reservoir is greater than elevation 890' M.S.L. or 245,333 acre-feet.

In addition to the above features, this curtailment policy for firm water demands requires each GBRA firm water customer to prepare and adopt a legally enforceable local drought contingency plan which specifies the actions to be taken to comply with the DCP-2009 regarding the curtailment of firm supplies. Such plans have to be developed pursuant to GBRA guidelines and submitted for GBRA review and approval within a reasonable time. GBRA staff provides direct technical assistance with the preparation of required local plans.

SECTION I-H

A means for implementation and enforcement which shall be evidenced by: a copy of the ordinance, rule, resolution, or tariff, indicated official adoption of the water conservation plan by the water supplier; and a description of the authority by which the water supplier will implement and enforce the conservation plan.

IMPLEMENTATION OF DROUGHT CONTINGENCY PLAN

Annual Review and Revisions

The DCP-2009 is subject to review each year. The DCP-2009 may be revised at any time subject to approval by the GBRA Board and the TCEQ. Changing water supply and demand conditions will be reflected as necessary in future plans.

Administration

GBRA monitors customers compliance with the required demand reduction goals and will take enforcement action as necessary against non-compliant customers. Monitoring and enforcement of water use restrictions at the end-user level generally will be the customer's responsibility. At present, GBRA's ability to enforce curtailments of firm water demands is uncertain and may be limited to taking civil action to enjoin a non-compliant customer for breach-of-contract.

Senate Bill 1 requires all public purveyors of water to develop drought contingency plans. GBRA will partner with local and state agencies to hold a series of drought management planning workshops throughout the basin for public water agencies. GBRA staff will also provide assistance with development of water conservation plans for communities and water districts in the service area upon request.

Section II
Projections of Population and Future Water Demands

The Texas Water Development Board's (TWDB) 2004 Water Use Survey projections of population and water demands for the Guadalupe-Blanco River Authority's (GBRA) 10-county statutory service area are presented below. The 2004 projections were developed by the TWDB in cooperation with the Texas Commission on Environmental Quality (TCEQ) and the Texas Parks and Wildlife Department (TPWD) for use in developing the Texas Water Plan. The TWDB 2004 projections are used in order to be consistent with the most recent Texas Water Plan and the present regional water planning that is being conducted in accordance with Senate Bill 1 (SB1), Texas Legislature, 1997 Regular Session.

The projections show the quantities of water that will be needed in each city and county of the service area at each of the projection years (2010, 2020, 2030, 2040, 2050 and 2060) for each major water using purpose – municipal, industrial, steam-electric power generation, agricultural irrigation, mining, and livestock and poultry. Information is also included about projected water needs for aquaculture, bays and estuaries, and recreation.

2.1 Population Projections

The definitions, concepts, and procedures used by the TWDB in making the 2004 projections are quoted below.

"The technique for projecting population is a cohort-component procedure, which uses the separate cohorts (age/sex/race/ethnic groups) and components of cohort change (fertility rates, survival rates, and migration rates) to calculate future populations. Projections of each cohort are then summed to the total population. Cohorts used in the projection process are defined as single-year-of-age (0 to 75) cohorts by sex and race/ethnic groups, which include Anglo, Black, Hispanic, and Other. Anglos are defined as persons of white non-Spanish origin; Blacks are defined as persons of Black non-Spanish origin; Hispanics are defined as persons of Spanish origin of all racial and ethnic groups; and Other is defined as those persons of other race/ethnic groups of non-Spanish or non-Black origin".

"Many counties in Texas have special populations generally referred to as "institutional" populations. These are people who are assumed not to participate in the same demographic processes as the base population and generally tend to move in and out of these institutional arrangements at fixed intervals. More specifically, these groups are defined as college/university populations, military populations, prison populations, and populations in other institutional arrangements. Institutional

populations are removed from the base population for computing future cohort populations, but are added back into the total projected base cohort population at the end of each projection interval".

"The components of cohort change include fertility rates, survival rates, and migration rates. Fertility rates for each female cohort are incorporated into the projection procedure for calculating the number of births anticipated to occur between each projection interval. Survival rates for each cohort are used to compute the change in the number of cohorts relating to the number of deaths anticipated to occur between each projection interval. Migration rates for each cohort are used to compute the change in each cohort due to immigration or emigration in a specific locale".

"Key assumptions used in developing the population projections are associated with the demographic components of change for each cohort and are described below:

1) Consistent with the planning information made available from the State Data Center, fertility rates for Anglo females are trended downward through the year 2010 and held constant at the 2010 rate through the year 2050; and fertility rates for Black, Hispanic, and Other females are trended downward through the year 2030 and held constant at the 2030 rate through the year 2050.

2) Survival rates are assumed to follow national trends over the projection period.

3) Migration rates are set to the 1980-1990 base period rates for each county and are varied from this base data set in accordance with the alternatively defined projection scenarios".

"The projected county population is allocated to each city of 1,000 or more population based on each city's historic share of the county population. The rural or "country-other" population is calculated as the residual of the sum of the cities' projected population and the projected county population.

"Three population projection scenarios, based on varying the 1980-1990 migration rates, were selected to project a range of alternative future populations. The three population projection scenarios are presented below:

1) 0.0 Migration: Zero net migration over the projection period. Only the natural increase or decrease in population is assumed.

2) 0.5 Migration: One-half of the 1980-1990 migration rate is assumed to occur over the projection period.

3) 1.0 Migration: the 1980-1990 migration rate is assumed to occur over the projection period".

"From this range of population projections, consensus planning staff and the Water Demand/Drought Management Technical Advisory Committee approved a "most likely growth" scenario for each of the 254 counties, based on recent and prospective growth trends and their combined professional opinions".

The development of the population forecasts incorporated a number of data sources and information files based on the 1990 Census data obtained form Dr. Steve Murdock, Chief Demographer for the Texas State Data Center and Texas A&M University. These data sources included the following:

1) 1990 Population by Cohort (Age, Sex, and Race/Ethnic Groups) Modified for Age and Race/Ethnicity.

2) 1990 Institutional Populations (Prison Populations, College Populations, Military Populations, and Other Populations in Institutional Arrangements).

3) Projected Fertility Rates by Age and Race/Ethnic Groups.

4) Projected Survival Rates by Single Years of Age, Sex, and Race/Ethnic Groups.

5) 1980-1990 Migration Rates by Single-Year Estimates and Cohort.

In 1970, the 10-county service area had a population of 228,183 and had increased to 359,139 by 1990 (Table II-1). The year 2000 population of this area is 471,774; the year 2030 projected population is 899,384; and the year 2060 projected population is 1,358,227 (Table II-1). The projected growth rate for the area is 1.91 percent per year, which is 28 percent higher than the projected State total of 1.49 percent per year (Table II-1).

Population growth rates for the Upper Basin counties are highest, ranging from 1.01 percent per year for Caldwell County to 3.05 percent per year for Comal County, with an average of 2.52 percent per year for the five-county Upper Basin area (Table II-1). Rates in the Mid-Basin area average 0.35 percent per year, while rates in the Lower Basin area are projected at 0.88 percent per year (Table II-1). As will be shown later, the size of the populations of cities and counties determines the quantities of water that will be needed for municipal purposes.

Table II-1
Guadalupe-Blanco River Authority Service Area*
Guadalupe River Basin Population Projections

COUNTY/CITY	*Historic Population*				*Population Projections*					
	1970	*1980*	*1990*	*2000*	*2010*	*2020*	*2030*	*2040*	*2050*	*2060*
UPPER BASIN										
1. KENDALL	6,964	10,635	14,589	23,743	35,720	50,283	65,752	78,690	89,312	99,698
2. COMAL	24,165	36,446	51,832	78,021	108,219	146,868	190,873	233,964	278,626	326,655
3. HAYS	27,642	40,594	65,614	97,589	120,199	172,674	180,725	214,912	252,857	293,736
4. GUADALUPE	33,554	46,708	64,873	89,023	114,878	146,511	180,725	214,912	252,857	293,736
5. CALDWELL	21,178	23,637	26,392	32,194	40,534	50,275	60,221	70,176	80,159	89,804
Subtotal	113,503	158,020	223,300	320,570	419,550	566,611	711,479	852,925	1,005,291	1,152,639
MIDDLE BASIN										
6. GONZALES	16,375	16,883	17,205	18,628	19,872	21,227	22,260	23,003	23,219	23,151
7. DEWITT	18,660	18,903	18,840	20,013	20,460	20,964	21,251	21,341	21,021	20,548
Subtotal	35,035	35,786	36,045	38,641	40,332	42,191	43,511	44,344	44,240	43,799
LOWER BASIN										
8. VICTORIA	53,766	68,807	74,361	84,088	93,073	102,487	110,221	116,368	121,416	125,865
9. REFUGIO	9,494	9,289	7,976	7,828	8,217	8,505	8,609	8,799	8,915	8,877
10. CALHOUN**	16,385	18,445	17,457	20,647	22,402	24,158	25,564	26,472	26,814	27,047
Subtotal	79,645	96,541	99,794	112,563	123,692	135,150	144,394	151,639	157,145	161,789
Total	228,183	290,347	359,139	471,774	583,574	743,952	899,384	1,048,908	1,206,676	1,358,227

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun county located west of Lavaca Bay

Source: Texas Water Development Board

2.2 Per Capita Water Use Projections (With Water Conservation)

Daily water use per person is known as per capita municipal water demand. The TWDB method of computing per capita water use is quoted below.

"The quantity of water used for municipal purposes is reported to the Texas Water Development Board on an annual basis by cities and other water suppliers such as rural water supply corporations, municipal utility districts, freshwater supply districts, and other types of water suppliers. the types of information reported included ground water and/or surface water use, source of the water (aquifer, river, reservoir, or stream), water sales and water purchases to other municipalities and end-users, number of service connections, estimated population served, and other pertinent information. This information provides for the identification of the water use and water supply network for each geographical area of Texas".

"In calculating the per capita water use for a specific entity, all water sales to other municipalities, industries, or other utilities are removed from the reported total water produced (pumpage or diversions) in order to arrive at the quantity of water used for municipal purposes by that specific entity. Annual per capita water use, typically stated in gallons per capita daily (gpcd), is then calculated by dividing the adjusted reported annual water use for a specific entity by its estimated annual population, and then dividing by 365 to obtain the daily number of gallons per person. Annual population estimates developed by the State Data Census Population Estimation Program are used for calculating city per capita water use".

"The diversity of the state with respect to climatic conditions, population density, and the availability of water results in a wide range of per capita water use estimates by geographical area across the state. From a climatological perspective, rainfall conditions play a major role in the quantity of water used for municipal purposes, particularly for outdoor purposes. During below-normal rainfall conditions, people tend to use more water than during normal or average weather conditions. To portray this weather-related phenomenon, two types of per capita water use estimates were calculated for use in the consensus water planning efforts. One estimate assumes below-normal rainfall conditions; the other assumes normal weather conditions. These two estimates were incorporated into two separate scenarios of municipal water use forecasts".

"To better represent current-day water use as affected by existing plumbing, appliances, and conservation technology, the assumed normal weather per capita water use is based on the average per capita water use over five years of record (1987-1991) for each entity. The assumed below-normal rainfall condition per capita water use is based on the highest per capita water use recorded by an

entity over ten years of record (1982-1991). For planning purposes, the assumed below-normal rainfall per capita water use variable is constrained to an upper limit of 25 percent above the calculated (5-year average) normal condition per capita water use variable. This constraint was used as an adjustment for water conservation practices put in place after 1985".

"Municipal water conservation is increasingly recognized by water utilities as a cost-effective approach for extending water supplies. In addition, many conservation strategies are simply good management alternatives. Staffs of the three agencies (TWDB, TCEQ, and TPWD) estimated a likely range of water conservation savings that could be attained over the 2000-2060 planning period. These are included in alternative municipal water use forecast scenarios. These potential savings are based on assumptions regarding the rate of implementation of indoor plumbing conservation measures as well as the rates of implementation of conservation measures in seasonal, dry-year irrigation, and other municipal water uses. These four municipal use sub-categories and associated potential savings assumptions are presented below:

Components of Municipal Water Conservation Savings

Areas of Potential Municipal Water Use Savings	Expected Conservation Savings	Advanced Conservation Savings
Indoor Plumbing Savings	20.5 gallons per capita daily	21.7 gallons per capita daily
Seasonal Water Savings	7.0% of total seasonal use	20% of total seasonal use
Dry-Year Irrigation Savings	10.5% of dry-year seasonal use	20% of dry-year seasonal use
Other Municipal Savings	5% of total average year use	7.5% of total average year use"

"A primary assumption associated with the definition of the "expected" municipal water conservation case is that these levels of savings are likely to occur from both market forces and regulatory requirements. The typical plumbing fixtures and appliances available for purchase are noticeably more water-efficient than those sold in earlier decades. The availability of water-efficient landscaping in the marketplace and improved landscaping practices are changing outdoor water uses. Better public education on efficient indoor and outdoor water uses and pricing "signals" from the marketplace are also changing consumer behavior".

"In addition to the market-type forces, a driving force underlying the expected municipal water conservation savings is the likely effect produced by the State Water-Efficient Plumbing Act passed in 1991. Not only are these potential water savings from the implementation of the Act substantial, but they are also economically sound from a cost-saving perspective, do not require day-to-day behavior

changes by the consumer, affect the larger year-round base water use, and will occur with a relatively high degree of predictability".

"The primary difference between the expected and advanced conservation savings scenarios is one of timing. The majority of the additional savings reflected in the advanced conservation case arise from accelerating the effect of the plumbing bill with municipal utilities engaging in active water-efficient plumbing retro-fit programs. Some additional savings are from slightly more aggressive assumptions on seasonal, dry-year urban irrigation, and other municipal uses. The advanced conservation scenario represents the maximum technical potential for water conservation savings. The expected scenario represents feasible strategies for water conservation savings that are economically sound"

"Unique projected water conservation savings patterns were projected for each individual municipality and rural area considered in the forecasts, as well as for the state as a whole. These projected savings estimated by the consensus planning staff are provided as guidelines for regional and local water planners and managers. Although staffs of the three agencies feel the identified array of conservation measures embodied in the projections are reasonable and feasible, the particular selection of specific water conservation goals and implementation of strategies to achieve those goals are primary responsibilities of the utility manager and local government".

"Each entity's projected municipal water conservation savings (measure in gallons) are subtracted from the appropriate estimated value of the two per capita water use scenarios, the assumed below-normal rainfall conditions, and the assumed normal weather conditions. In most instances, this calculation results in declining per capita water use for each city and community. An example of how the expected and advanced conservation cases affect the two per capita water use scenarios is presented below."

Impact of Municipal Water Conservation Savings on State Average Per Capita Water Use

Below-Normal Rainfall Conditions*

	2000	2010	2020	2030	2040	2050
Planning Per Capita Use	189	189	189	189	189	189
Expected Case Conservation	181	172	164	160	157	156
Advanced Case Conservation	175	161	151	149	147	146
Plumbing Code Only	185	179	175	171	168	167

Normal Weather Conditions

Planning Per Capita Use	165	165	165	165	165	165
Expected Case Conservation	157	149	141	137	134	133
Advanced Case Conservation	152	140	130	128	126	125
Plumbing Code Only	160	155	150	146	143	142

* Highest annual per capita water use over the last 10 years, constrained to an upper limit of 25 percent above the normal conditions per capita water use.

The TWDB's 2004 per capita water demand projections for the counties and cities of GBRA's 10-county statutory service area for the "below-normal, with advanced water conservation" cases are shown in Table II-2. The 2004 projections were computed as described above, with the result for each city being computed from that city's water use, as reported to the

Table II-2
Guadalupe-Blanco River Authority Service Area* Guadalupe River Basin
Projected Per Capita Municipal Water Demand with Advanced Water Conservation

County/City	2000 (gpcd)	Projected Per Capita Municipal Water Demand** 2010 (gpcd)	2020 (gpcd)	2030 (gpcd)	2040 (gpcd)	2050 (gpcd)	2060 (gpcd)
Upper Basin							
Kendall	123	116	113	111	109	109	109
Comal	161	155	150	148	146	145	145
Hays	135	128	126	125	124	124	124
Guadalupe	139	128	126	125	124	124	124
Caldwell	129	123	118	115	113	112	112
Upper Basin Average	***137***	***130***	***127***	***125***	***123***	***123***	***123***
Middle Basin							
DeWitt	137	134	131	128	125	123	123
Gonzales	183	185	185	185	185	184	184
Victoria	145	140	136	133	130	128	128
Middle Basin Average	***155***	***153***	***151***	***149***	***147***	***145***	***145***
Lower Basin							
Refugio	136	136	135	133	132	131	131
Calhoun	117	112	108	106	105	103	103
Lower Basin Average	***127***	***124***	***122***	***120***	***119***	***117***	***117***
Total Area Average	***141***	***136***	***133***	***131***	***129***	***128***	***128***
State Average	***173***	***171***	***168***	***165***	***163***	***162***	***162***

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Per Capita water use is in gallons per person per day (gpcd); below-normal precipitation, with advanced water conservation.

Source data from the Texas Water Development Board

TWDB for the period 1987 through 1991. Thus, the projections for each city are based upon the city's own water use experience for its specific climate, age and type of plumbing fixtures, landscaping, and personal preferences, water using practices and habits of the people who live there. The individual county per capita projections are obtained by summing the projections for all cities located in the county and the projection for the unincorporated area population of the county computed at 110 gallons per person per day.[1]

Average per capita municipal water use in the 10-county service area in 2000 was calculated to be 141 gallons, with averages of 137 gallons in the Upper Basin area, 155 gallons in the Mid-Basin

[1] This rate was estimated from reports of water use by water supply corporations that serve unincorporated and rural

area, and 127 gallons in the Lower Basin area (Table II-2). The average per capita water use of the 10-county area in 2000 was 18 percent below the State average of 173 gallons per day.

The 2010, below-normal precipitation per capita water use level is used in projecting municipal water demand in order to give an indication of municipal water demand during dry-weather conditions, so that plans can be made to have an adequate supply of water for municipal purposes when precipitation is below normal and the two-way squeeze (lower-than-normal supplies and higher-than-normal demands) upon municipal water systems is in effect. The projected per capita municipal water demands of Table II-2 would not be the level of use for normal and higher-than-normal precipitation. These projections only apply for below-normal precipitation conditions.

The TWDBs 1996 Consensus Water Plan per capita water use projections have a declining trend from years 2000 through 2050. The reason for this decline is the effects of water conservation. The projections shown in Table II-2 are for the "advanced water conservation" case, as described above in the TWDBs explanation of methods to compute per capita water use. A major water conservation activity included in the TWDB 1996 Consensus projections is the installation of low-flow plumbing fixtures in new homes and businesses, and the replacement of plumbing fixtures in structures that were built before the 1991 Plumbing Fixtures Act went into effect in 1992. However, water conservation from the use of low-flow plumbing fixtures has an upper limit, which is estimated at about 22 gallons per person per day (gpcd), and occurs gradually over time as new structures are added to the existing stock of structures, and as existing structures are remodeled and/or retro-fitted with low-flow plumbing fixtures. Other water conservation measures, such as public information to encourage water using behavior modifications to save water, drought tolerant landscaping, leak detection and repair, and increasing rate structures, will be needed in order to accomplish the projected declining trend in per capita water use, as shown in Table II-2.

Per capita water use in the Upper Basin counties, for below-normal precipitation with advanced conservation, is projected to decrease from an average of 137 gpcd in year 2000 to 123 gpcd in year 2060 (Table II-2). In the Middle Basin counties, per capita water use for the below-normal precipitation with advanced conservation is projected to decline from an average of 155 gpcd to 145 gpcd, and in the Lower Basin from and average of 127 gpcd to 117 gpcd. The average per capita water use for the service area is projected to decline from 141 gpcd in year 2000 to 128 gpcd in 2060. The rates and trends for each county and each city can be viewed in Table II-2 and will not be stated here. However, it is important to note that there is significant variation among the cities of the service area, with the higher rates being in the cities in the Middle and Upper Basins. A part of the explanation for these differences is their location in a more arid climate. Another factor is that tourism in the "Hill

Country" counties brings people to these cities who use water in hotels, motels, and restaurants, but the number of tourists are not known well enough to be included in the population count that is used to compute per capita water use for these cities. Thus, the local population is credited with total water use for the city. Given this possibility, water conservation programs should include measures to reduce water use in the commercial establishments that serve tourists.

2.3 Projected Water Requirements

In this section, the projections of water requirements for each of the major water-using functions — municipal, manufacturing, steam-electric power generation, agricultural irrigation, mining, livestock and poultry, agriculture, bays and estuaries, and recreation — are presented for cities and counties for the years 2010, 2020, 2030, 2040, 2050 and 2060. The projections are for total water use (groundwater plus surface water) for below-normal precipitation, with advanced water conservation.

2.3.1 Municipal Water Requirements

Water for municipal purposes includes water for use in and around homes and commercial establishments, and water for public health and safety, recreation and aesthetics in urban areas; water for drinking, bathing, sanitation, food preparation, dishwashing, laundry, lawn watering, fire protection, restaurants, car washes, swimming pools, hot tubs, saunas, fountains, golf courses, public parks, sports centers, aquariums, and perhaps other uses. Since municipal water is supplied by public water supply utilities, it must meet Safe Drinking Water Standards. Water treatment technology exists such that water of the service area can normally be treated to meet Safe Drinking Water Standards.

The projected annual quantity of municipal water needed at each decade point in time is computed using the following formula:

$$\text{MWD} = \frac{gpcd(P)(365)}{325{,}851}$$

Where:

MWD = Number of acre-feet (acft) of water needed for one year;
gpcd = Number of gallons of water used per person per day during the year;
P = Projected population of the service area in the projection year;
365 = Number of days in one year; and
325,851 = Number of gallons of water in 1 acre-foot.

In the computation, the population is from the projections shown in Table II-1, while the number of gallons of water used per person per day is from Table II-2. The municipal water demand projections are presented in Table II-3. The computation, as stated here, results in the TWDB 2004 Consensus Water Plan, most likely case projection of municipal water demand for below-normal precipitation with advanced water conservation, since the most likely population projection and the below-normal precipitation with advanced conservation per capita water use are used in the computation.

Table II-3

Guadalupe-Blanco River Authority Service Area
Guadalupe River Basin Municipal Water Demand Projections
for Below-Normal Precipitation with Advanced Water Conservation

COUNTY/City	*2000 Use (acft)*	*Projected Municipal Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	**3,262**	**4,649**	**6,370**	**8,142**	**9,610**	**10,888**	**12,139**
2. COMAL	**14,055**	**18,771**	**24,753**	**31,598**	**38,304**	**45,318**	**53,018**
3. HAYS	**10,926**	**17,278**	**24,409**	**29,964**	**35,414**	**42,121**	**47,474**
4. GUADALUPE	**13,850**	**17,113**	**21,167**	**25,595**	**29,907**	**34,980**	**4,053**
5. CALDWELL	**4,643**	**6,306**	**7,898**	**9,222**	**10,555**	**11,926**	**13,328**
Subtotal	**46,736**	**64,117**	**84,597**	**104,521**	**123,790**	**145,233**	**166,492**
MIDDLE BASIN							
6. GONZALES	**3,828**	**4,108**	**4,404**	**4,624**	**4,764**	**4,794**	**4,774**
7. DEWITT	**3,065**	**3,064**	**3,039**	**3,400**	**2,982**	**2,889**	**2,839**
Subtotal	**6,893**	**7,172**	**7,475**	**7,663**	**7,746**	**7,683**	**7,613**
LOWER BASIN							
8. VICTORIA	**13,664**	**14,590**	**15,614**	**16,378**	**16,884**	**17,435**	**18,034**
9. REFUGIO	**1,191**	**1,249**	**1,287**	**1,282**	**1,299**	**1,312**	**1,302**
10. CALHOUN**	**2,705**	**2,948**	**3,222**	**3,5556**	**3,870**	**4,007**	**4,171**
Subtotal	**17,560**	**18,787**	**20,123**	**21,216**	**22,053**	**22,754**	**23,507**
Total	**71,189**	**90,076**	**112,195**	**133,400**	**153,589**	**175,670**	**197,612**

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun County located west of Lavaca Bay.

Source: Texas Water Development Board

In 2000, municipal water use was reported at 71,189 acre-feet per year (acft/yr) for the 10-county service area (Table II-3) Of this total, 65 percent was in the Upper Basin counties, 10 percent was in the Middle Basin counties, and 25 percent was in the Lower Basin counties. Although projected per capita water use is declining due to advanced water conservation, projected municipal water demand for the 10-county service area is trending upward due to projected population growth. Projected municipal water demand for the 10-county area for below-normal precipitation, with advanced water conservation, is 90,076 acft/yr in 2010, and increases to 133,400 acft/yr in 2030, and 197,612 acft/yr in 2060 (Table II-3). Of the projected demands in 2060, 84.3 percent is in the Upper Basin counties, 3.9 percent is in the Middle Basin counties, and 11.8 percent is in the Lower Basin counties (Table II-3). It is emphasized that the municipal water demand projections for individual cities are based upon the population and per capita water use projections for the city, with the county projections being the sum of the projections for the cities and unincorporated areas of the county

2.3.2 Industrial Water Requirements

Freshwater is used by industries in manufacturing for cooling manufacturing processes, cleaning and waste removal, internal transportation, and in some cases is a production factor integral to the process, such as in vegetable canning. In addition, water is needed by employees for drinking and sanitation. Water is also needed for grounds maintenance, landscaping, fire protection, and aesthetics.

That is to say that these manufacturing establishments depend upon freshwater, in the quantities reported, in order to carry out their respective levels of operation. The quantities are expressed in terms of the number of acre-feet diverted from streams and canals plus the number of acre-feet pumped from wells for use within manufacturing plants. Much of this water is used several times within the plants, but for purposes of this report, all quantities are referred to only once, as measured at the diversion point, since these are the quantities that must be available in order for the respective manufacturing processes to operate. Thus, for purposes of this report, the term "Manufacturing Water Use" means the quantities of fresh water, as measured at the diversion points, including any pumped from wells.

At the present time, there are 32 different types of water-using industries located within the 10-county service area. The major water users are food processing, fabric and textiles, chemicals, abrasives, metals, and equipment manufacturing. The 32 types of water-using industries are:

1. Meat products
2. Dairy products
3. Grain mill products
4. Bakery products
5. Sugar and confectionery products
6. Beverages
7. Miscellaneous food preparations
8. Broad-woven fabric mills – cotton
9. Broad-woven fabric mills – man-made Fiber
10. Hats, caps, and millinery
11. Household furniture
12. Miscellaneous publishing and printing
13. Industrial inorganic chemicals
14. Plastic materials & synthetic resins, rubber, fiber
15. Soap, detergents, and cleaning preparation
16. Industrial organic chemicals
17. Petroleum refining
18. Miscellaneous products of petroleum and coal
19. Fabricated rubber products
20. Plastics products
21. Cement, hydraulic
22. Structural clay products
23. Concrete, gypsum, and plaster
24. Abrasive, asbestos, and miscellaneous non-metallic mineral
25. Steelworks, blast furnaces, and rolling and finishing mills
26. Primary smelting and refining of nonferrous metals
27. Rolling, drawings, and extruding of nonferrous metals
28. Fabricated structural metal products
29. Farm and garden machinery and equipment
30. Electric lighting and wiring equipment
31. Household audio and video equipment and recording
32. Dolls, toys, games, and sporting and athletic equipment

In 2000, the quantity of water that was diverted from surface sources plus the quantity pumped from wells for use by manufacturing establishments of the service area was reported at 77,473 acft/yr (Table 2-4). The 2004 TWDB water plan identified planned growth of existing industries and planned expansion and additions of water-using industries of the area, together with estimates of the quantities of water that will be needed to operate the plants.

Table II-4
Guadalupe-Blanco River Authority Service Area*
Guadalupe River Basin
Industrial Water Demand Projections
with Water Conservation

COUNTY	*2000 Use (acft)*	*Projected Industrial Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2. COMAL	**6,283**	**7,729**	**8,563**	**9,314**	**10,045**	**10,672**	**11,553**
3. HAYS	**157**	**212**	**249**	**285**	**322**	**355**	**386**
4. GUADALUP	**2,097**	**2,638**	**2,957**	**3,249**	**3,530**	**3,771**	**4,097**
5. CALDWELL	**11**	**15**	**18**	**21**	**24**	**27**	**29**
Subtotal	**8,548**	**10,594**	**11,787**	**12,869**	**13,921**	**14,825**	**16,065**
MIDDLE BASIN							
6. GONZALES	**2,051**	**2,400**	**2,628**	**2,822**	**3,011**	**3,177**	**3,402**
7. DEWITT	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Subtotal	**2,205**	**2,584**	**2,827**	**3,034**	**3,236**	**3,413**	**3,656**
LOWER BASIN							
8. VICTORIA	**24,323**	**28,726**	**32,095**	**35,035**	**37,962**	**40,578**	**43,520**
9. REFUGIO	**0**	**0**	**0**	**0**	**0**	**0**	**0**
10. CALHOUN**	**42,397**	**47,784**	**54,767**	**59,235**	**63,575**	**67,406**	**72,238**
Subtotal	**66,720**	**78,510**	**86,862**	**94,270**	**101,537**	**107,984**	**115,758**
Total	**77,473**	**91,688**	**101,476**	**110,173**	**118,694**	**126,222**	**135,479**

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun county located west of Lavaca Bay.

Source: Texas Water Development Board

Projections of future water requirements were made for each manufacturing sector type. The projections took into account the conservation effects of recycling and reuse and the expected improvements in water-use technology. The projections were then summarized and are tabulated for the counties in which the industries are located (Table II-4).

Total manufacturing water use within the service area in 2000 was reported at 77,473 acft/yr, of which 11 percent was in the Upper Basin counties, 3 percent was in the Middle Basin counties of Gonzales and DeWitt, and 86 percent was in Victoria and Calhoun Counties (Table II-4). Projected manufacturing water requirements for the service area are 91,688 acft/yr in 2010, and 135,479 acft/yr in 2060 (Table II-4). It is emphasized that a large proportion of

water used for manufacturing purposes is cooling water, which is recirculated many times and then is returned to the streams and river or is discharged into arms of the bays and estuaries, thus, it is not consumed and is available for downstream uses, including other diverters, fish and wildlife, and recreation.

2.3.3 Steam-Electric Power Water Requirements

Steam-electric power generation plants located in Victoria, Calhoun, and Goliad Counties obtain water from the Guadalupe River for condenser cooling, boiler feed make-up, sanitation, grounds maintenance, and pollution control. Consumptive (evaporative) water requirements typically range from one-third to one-half gallon of water for each kilowatt-hour of electricity produced; however, from 20 to 60 gallons of water are circulated through the power plant condenser for each kilowatt-hour of electric power produced.

In the service area, one steam-electric plant (Coleto Creek) diverts water from a cooling lake (Coleto Creek Reservoir) and returns its cooling water to the same lake. Make-up water to replace that which is evaporated or consumed is diverted from the Guadalupe River. The other major power plant diverts water from the river, uses it once, and returns it to the river, where it is then available for downstream uses.

Steam-electric power water requirements are expressed in terms of consumptive use as opposed to gross quantities diverted, as is the case for all other purposes. For power plants that use cooling lakes, this is the quantity needed to keep the lakes satisfactorily supplied. However, for plants that divert from streams and use the once-through cooling procedure, water planners and operators must be sure that stream flow is adequate to meet gross diversion needs.

Projected steam-electric power water demands for the 10-county service area are 8,123 acre-feet per year in 2010, and 83,739 acre-feet per year in 2060 (Table II-5).

Table II-5
Guadalupe-Blanco River Authority Service Area*
Guadalupe River Basin
Steam-Electric Power Water Demand Projections
with Water Conservation

COUNTY	*2000 Use (acft)*	*Projected Steam-Electric Power Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2. COMAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3. HAYS	**0**	**1,009**	**718**	**949**	**1,949**	**2,663**	**3,627**
4. GUADALUPE	**129**	**4,788**	**3,406**	**3,326**	**5,136**	**5,585**	**7,515**
5. CALDWELL	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Subtotal	**129**	**5,797**	**4,124**	**4,275**	**7,085**	**8,248**	**7,515**
MIDDLE BASIN							
6. GONZALES	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7. DEWITT	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**
LOWER BASIN							
8. VICTORIA	**2,197**	**1,757**	**1,478**	**30,802**	**38,282**	**54,623**	**71,720**
9. REFUGIO	**0**	**0**	**0**	**0**	**0**	**0**	**0**
10. CALHOUN**	**684**	**569**	**454**	**530**	**624**	**738**	**877**
Subtotal	**2,881**	**2,595**	**2,195**	**2,565**	**3,018**	**3,570**	**4,242**
Total	**3,010**	**8,123**	**6,056**	**35,607**	**45,991**	**63,609**	**83,739**

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun county located west of Lavaca Bay.

*** Coleto Creek partially in Goliad County. Diversions from the Guadalupe River.

Source: Texas Water Development Board

2.3.4 Agriculture Irrigation Water Requirements

In the service area, the major irrigated crop is rice, which is produced in Calhoun and Victoria Counties. Irrigation is practiced in the other counties, where irrigated crops include grain, forage, and in recent years, some acreage of orchards in the Upper Basin. The source of water for irrigation in the Upper and Middle Basin counties is about 50/50 between surface water and groundwater. In Victoria County, over 98 percent of irrigation is from wells drilled into the Gulf Coast Aquifer. In Calhoun County, 91 percent of irrigation water is from surface sources, with 9 percent from aquifers.

In 2000, irrigation water use in the service area was estimated at 20,647 acre feet, with 11.9 percent in the Upper Basin, 12.3 percent in the Middle Basin, and 75.8 percent in the Lower Basin (Table II-6). The TWDB 2004 projections were based upon the assumptions that federal farm program payments are reduced to one-half of previous levels, and that advanced water conservation practices are adopted by service area farmers. Under these assumptions, projected irrigation water demands, which include canal losses between the Guadalupe River Diversion points and the irrigated acres, are 23,515 acre-feet per year in 2030, and 17,470 acre-feet per year in 2060 (Table 2-6). A part of the projected decline is due to improved efficiency in the delivery system and water conservation practices on the irrigation farms, and a part is due to the projected decline in federal farm programs and projected declining irrigation economic conditions.

Table II-6
Guadalupe-Blanco River Authority Service Area*Guadalupe River Basin
Irrigation Water Demand Projections with Water Conservation

COUNTY	*2000 Use (acft)*	*Projected Irrigation Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	**396**	**714**	**699**	**685**	**671**	**658**	**646**
2. COMAL	**50**	**204**	**186**	**169**	**152**	**135**	**119**
3. HAYS	**162**	**353**	**350**	**347**	**344**	**341**	**338**
4. GUADALUPE	**875**	**1,070**	**955**	**846**	**742**	**710**	**705**
5. CALDWELL	**989**	**1,044**	**928**	**824**	**733**	**651**	**578**
Subtotal	**2,472**	**3,385**	**3,118**	**2,871**	**2,642**	**2,495**	**2,386**
MIDDLE BASIN							
6. GONZALES	**2,438**	**1,304**	**1,124**	**969**	**835**	**720**	**621**
7. DEWITT	**102**	**159**	**132**	**108**	**87**	**69**	**54**
Subtotal	**2,540**	**1,463**	**1,256**	**1,077**	**922**	**789**	**675**
LOWER BASIN							
8. VICTORIA	**6,708**	**9,936**	**8,576**	**7,402**	**6,388**	**5,514**	**4,759**
9. REFUGIO	**850**	**69**	**69**	**69**	**69**	**69**	**69**
10. CALHOUN**	**8,077**	**15,568**	**13,654**	**12,096**	**11 041**	**10,285**	**9,581**
Subtotal	**15,635**	**25,573**	**22,299**	**19,567**	**17,498**	**15,868**	**14,409**
Total	**20,647**	**30,421**	**26,673**	**23,515**	**21,062**	**19,152**	**17,470**

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun County located west of Lavaca Bay.

Source: Texas Water Development Board

2.3.5 Mining Water Requirements

Mining includes the production or recovery of building materials such as sand, gravel, clay and stone, and crude petroleum. Water use for mining purposes in the 10-county service area in 2000 was reported at 5,781 acre-feet (Table II-7). About 90 percent of water use within the service area is for sand and gravel recovery, with most of the remainder being for crude petroleum recovery. Use of water for crude petroleum recovery is located in the oil-producing Counties of Guadalupe, Caldwell, Gonzales, DeWitt, Refugio, and Victoria. Some sand, gravel, stone, or lime mining is done in practically all of the counties of the service area, but is largest in Comal, Hays, DeWitt, Victoria, and Calhoun Counties.

The 2004 projections of future water requirements for mining are based upon projections of growth in the building materials and the energy industries. It is emphasized, however, that the use of water for crude petroleum recovery is expected to rise as water flooding of oil fields is developed and expanded, but will decline after a period of time, as oil recovery is completed.

Projections of future water requirements for mining are 7,221 acre-feet per year in 2010, 8,582 acre-feet per year in 2030, and 10,123 acre-feet per year in 2060 (Table II-7).

Table II-7
Guadalupe-Blanco River Authority Service Area*
Guadalupe River Basin
Mining Water Demand Projections
with Water Conservation

COUNTY	*2000 Use (acft)*	*Projected Mining Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	**6**	**6**	**6**	**6**	**6**	**6**	**6**
2. COMAL	**2,224**	**2,678**	**2,897**	**3,029**	**3,159**	**3,287**	**3,401**
3. HAYS	**129**	**142**	**151**	**157**	**161**	**162**	**163**
4. GUADALUPE	**270**	**306**	**321**	**330**	**338**	**346**	**353**
5. CALDWELL	**12**	**14**	**15**	**16**	**17**	**18**	**18**
Subtotal	**2,641**	**3,146**	**3,390**	**3,538**	**3,681**	**3,819**	**3,941**
MIDDLE BASIN							
6. GONZALES	**33**	**28**	**27**	**26**	**25**	**24**	**24**
7. DEWITT	**58**	**64**	**67**	**68**	**68**	**70**	**71**
Subtotal	**91**	**92**	**94**	**94**	**93**	**94**	**95**
LOWER BASIN							
8. VICTORIA	**3,015**	**3,944**	**4,511**	**4,906**	**5,308**	**5,721**	**6,041**
9. REFUGIO	**6**	**7**	**8**	**8**	**8**	**8**	**8**
10. CALHOUN**	**28**	**32**	**35**	**36**	**37**	**38**	**38**
Subtotal	**3,049**	**3,983**	**4,554**	**4,950**	**5,353**	**5,767**	**6,087**
Total	**5,781**	**7,221**	**8,038**	**8,582**	**9,127**	**9,680**	**10,123**

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun County located west of Lavaca Bay.

Source: Texas Water Development Board

2.3.6 Livestock and Poultry Water Requirements

Drinking water is needed for farm and ranch animals (beef cattle, dairy cattle, horses, swine, goats, sheep, chickens, and turkeys). In 2000, it was estimated that 11,877 acre-feet of water were used in this way in the service area (Table II-8). TWDB's 2004 projection for livestock water demands for the service area is 12,191 acre-feet (Table II-8). The projections are based upon projections of maximum carrying capacities of range land for cattle production, and projected trends of the numbers of poultry within the service area.

2.3.7 Aquaculture Water requirements.

An aquaculture industry is beginning to develop in some parts of the Texas coastal area, however it has limited potential at this time.

Table II-8
Guadalupe-Blanco River Authority Service Area*
Guadalupe River Basin
Livestock Water Demand Projections with Water Conservation

COUNTY	*2000 Use (acft)*	*Projected Livestock Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	446	446	446	446	446	446	446
2. COMAL	298	298	298	298	298	298	298
3. HAYS	280	280	280	280	280	280	280
4. GUADALUPE	1,057	1,057	1,057	1,057	1,057	1,057	1,057
5. CALDWELL	918	918	918	918	918	918	918
Subtotal	2,999	2,999	2,999	2,999	2,999	2,999	2,999
MIDDLE BASIN							
6. GONZALES	5,159	5,453	5,453	5,453	5,453	5,453	5,453
7. DEWITT	1,689	1,689	1,689	1,689	1,689	1,689	1,689
Subtotal	6,848	7,142	7,142	7,142	7,142	7,142	7,142
LOWER BASIN							
8. VICTORIA	1,085	1,085	1,085	1,085	1,085	1,085	1,085
9. REFUGIO	623	623	623	623	623	623	623
10. CALHOUN**	342	342	342	342	342	342	342
Subtotal	2,050	2,050	2,050	2,050	2,050	2,050	2,050
Total	11,897	12,191	12,191	12,191	12,191	12,191	12,191

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.
** Only that part of Calhoun County located west of Lavaca Bay.

Source: Texas Water Development Board

2.3.8 Bays and Estuaries Freshwater Inflows

Although the relationships between freshwater inflows and estuarine production are not fully understood, there is agreement that freshwater is needed to maintain productive conditions in the estuaries, including the Guadalupe Bay (San Antonio Bay system) into which the Guadalupe River discharges. Freshwater inflows establish salinity gradients that are important to the reproduction, growth, and development of marine species. River flows also transport nutrients and sediments that are essential to organisms of the food chain for important finfish and shellfish species of the estuaries. Data have been collected and studies have been made by federal and state agencies and the GBRA of the relationships among freshwater inflows and estuarine conditions. The major data collection and study efforts are summarized briefly in the following paragraphs.

The Texas Parks and Wildlife Department has sampled the San Antonio Bay system for salinity and fisheries catch since the mid 1930s.[2] These data have been used by individual researchers and state agencies to compute correlations between fisheries catch and inflows. Although statistically significant correlations have been found between the volumes of inflow and fish catch, it is clear that the volume of fish catch depends upon many other factors, including severe weather events (freezes and hurricanes), price of fish, size and effort of the fishing fleet, and cost of labor and fuel.

In 1967, the TWDB, in cooperation with universities and other state and federal agencies, initiated a Texas Bays and Estuaries program. The purpose of the program was to collect physical, chemical, and biological data with which to develop an understanding of the relationships among freshwater inflows, nutrients, sediments, and other factors affecting the ecology and fisheries of each of the Texas bays and estuaries in order to guide the planning and development of water resources.

Between 1975 and 1979, the TWDB and the Texas Department of Water Resources performed intensive data collection, laboratory studies, and hydrologic modeling studies, with publication of reports for each of the major Texas estuarine systems, including "Guadalupe Estuary: A Study of the Influence of Freshwater Inflows," LP-107, August 1980. The hydrology of the contributing drainage areas was calculated, water quality of inflows was tested, mathematical models of circulation and the salinity of Guadalupe Bay were calculated, production and transport of nutrients from the marshes into the estuary were estimated, and

[2] Espey, Huston & Associates, Inc., *Water Availability Study for the Guadalupe and San Antonio River Systems*, Volume I, Austin, Texas, February 1986, page 5-1.

phytoplankton, zooplankton, and benthic organisms of the food chain were identified and related to salinity. Quantities of commercial and sport fish landings for the period 1962 through 1976 were statistically correlated to seasonal quantities of freshwater inflows.

The analyses showed that shrimp harvests were positively correlated with freshwater inflows in the spring months of April through June and negatively correlated with freshwater inflows in the winter months of November and December. Finfish (trout and drum) harvests were positively correlated with inflows in November, December, April, and June, and negatively correlated with inflows in other months. Thus, from these analyses, it appeared that the freshwater needs of some species (e.g., shrimp) could be adverse to the productivity of other species (e.g., trout and drum), and vice versa.

Using the equations and computer models developed during the study, computations were made of the quantities of freshwater flows that might be needed to achieve: (1) upper and lower monthly salinity limits for metabolic activities of fisheries species; (2) marsh inundation needs for nutrient transport; and (3) the quantities of freshwater inflows correlated with average values of fisheries harvests for the 1962-1976 period for the major commercial and sport fisheries species of Guadalupe Bay – red drum, sea trout, and white shrimp. Computations were also made of the maximum estimated total commercial harvests of shrimp (the highest commercial valued species) if the 1941-1976 average annual freshwater inflows were distributed in a seasonal pattern to meet salinity and marsh inundation needs (i.e., harvest enhancement of the major commercial species of the estuary).

Although the studies of 1975-1979 were the most comprehensive undertaken to that date, the mathematical expressions of the relationships, of necessity, had been estimated using only a few years, and in some cases, only a few months of data, since no more data were available. In 1985, the Texas Legislature authorized and funded joint TWDB, TPWD, and Texas Water Commission studies with emphasis upon understanding the relationships among freshwater inflows and associated nutrients, sediments, and bay conditions necessary for a sound ecological environment. The schedule for these studies was 1985-1989, with publication of results upon completion of the studies. The 1985-1989 studies were built upon the earlier work described above, and in particular, were based upon longer time series of data.

Given that the national scientific consensus was that it required at least 30 years of physical, chemical, and biological data to understand estuarine needs, the 1985 Texas studies mentioned above proceeded with data collection in several large-scale ecosystems at once, with development of analytical methods and models proceeding simultaneously. By the end of 1990,

most of the analytical tools, procedures, and models had been developed and tested. Results of application of the models were reported in 1994 with publication of a nationally recognized report entitled "*Freshwater Inflows to Texas Bays and Estuaries: Ecological Relationships and Methods for Determination of Needs*." Currently, estimates of freshwater inflow needs are available for the four largest Texas estuaries: San Antonio Bay and the Guadalupe Estuary; Matagorda Bay and the Lavaca-Colorado Estuary; Galveston Bay and the Trinity-San Jacinto Estuary; and Corpus Christi Bay and the Nueces Estuary (preliminary results).

The historic minimum, median, average, and historic maximum quantities of freshwater inflows that enter San Antonio Bay and the Guadalupe Estuary each month during the 1941-1987 period of record are shown in Table 2-9. The minimum annual inflow was 275,082 acft in 1956, the average inflow has been 2,344,140 acft, and the maximum inflow was 5,430,974 acft in 1987. The TWDBs analyses show that maximum fish harvest would occur at an annual inflow of about 1.15 million acft (Table 2-10). It must be recognized that the timing of inflow is as important as the quantity.

2.3.9 Recreation Water Use

In the service area, water-oriented recreation is popular and is an important business enterprise. Recreational activities include sport fishing in the lakes and streams, swimming, boating, water skiing, sailing, canoeing, rafting, tubing, water slides, camping, picnicking, hiking, and weekend visits to the area to enjoy water sports and the scenery of the springs, streams, and lakes. None of these activities are consumptive users of water, but each of them depends upon the springs, streams, and lakes. Since water-oriented recreational needs can be met, at least in part, with natural flows of the springs, streams, and Blanco and Guadalupe Rivers, water for recreational purposes is not tabulated separately from other uses.

Table II-9

Guadalupe-Blanco River Authority Service Area
San Antonio Bay and the Guadalupe Estuary
Historical (1941-1987) Freshwater Inflows

Month	*Historic Minimum (acft)*	*Median (acft)*	*Average (acft)*	*Historic Maximum (acft)*
January	**14,045**	**111,174**	**159,824**	**726,253**
February	**20,830**	**124,181**	**176,908**	**892,688**
March	**17,747**	**117,988**	**152,252**	**394,149**
April	**20,751**	**110,428**	**200,956**	**925,080**
May	**39,972**	**221,648**	**296,814**	**1,283,832**
June	**5,123**	**166,559**	**296,820**	**2,457,912**
July	**6,534**	**95,220**	**156,689**	**1,008,185**
August	**7,129**	**95,829**	**114,014**	**353,924**
September	**11,817**	**120,977**	**244,917**	**2,230,029**
October	**20,785**	**138,447**	**227,510**	**1,262,823**
November	**11,267**	**113,360**	**169,135**	**666,397**
December	**20,188**	**109,880**	**148,301**	**765,991**
Total Q	**196,188**	**1,525,691**	**2,344,140**	**12,967,263**
Year	**(1956)***			**(1987)****
Annual Q	**275,082**			**5,430,974**

Source: Texas Water Development Board, Austin, Texas, September 1998.

*** The minimum observed quantity of inflow occurred in 1956.**

****The maximum observed quantity of inflow occurred in 1987.**

Table II-10
Guadalupe-Blanco River Authority Service Area
Guadalupe River Basin
Estimated Fish Harvest as a Function of Freshwater Inflow Quantities
Guadalupe Estuary

Freshwater Inflow (million acft)	*Fish Harvest (million pounds)*
1.03	**2.54**
1.10	**2.76**
1.15	**2.93**
1.17	**2.81**
1.20	**2.68**
1.25	**2.51**
1.30	**2.28**

Source: Texas Water Development Board, Austin, Texas, September 1998.

2.3.10 10-County Service Area Total Water Requirements

In this section, TWDBs 2004 projections of total (ground plus surface water) future water requirements of the service area for all purposes – municipal, manufacturing, steam-electric power generation, agricultural irrigation, mining, livestock and poultry are presented. In order to obtain these totals, individual category projections presented earlier are summed at each projection point for all purposes for each county of the service area.

Of the total 189,997 acre-feet of water used in 2000, 33.4 percent was in the Upper Basin, 9.7 percent in the Middle Basin, and 56.9 percent in the Lower Basin areas (Table II-11). In 2000, 37.5 percent of water use was for municipal purposes, 40.8 percent was for industry, 9.2 percent was for steam-electric power, 10.9 percent was for agriculture, 1.2 percent was for mining, and 6.2 percent was for livestock watering (Table II-12).

Projected total water requirements for the service area for the year 2010 are 249,588 acre-feet per year with projected water requirements for the year 2060 of 419,716 acre-feet per year (Table II-11). In 2060, the distribution of water use among purposes is projected to change to a higher proportion of use in municipal and manufacturing purposes, with a lower proportion in irrigation (Table II-12).

Table II-11
Guadalupe-Blanco River Authority Service Area*
Guadalupe River Basin
Total Water Demand Projections
with Water Conservation

COUNTY	*2000 Use (acft)*	*Projected Total Water Demand*					
		2010 (acft)	*2020 (acft)*	*2030 (acft)*	*2040 (acft)*	*2050 (acft)*	*2060 (acft)*
UPPER BASIN							
1. KENDALL	**4,110**	**5,815**	**7,521**	**9,279**	**10,733**	**11,998**	**13,237**
2. COMAL	**22,910**	**29,680**	**36,697**	**44,408**	**51,958**	**59,710**	**68,389**
3. HAYS	**11,654**	**23,596**	**33,070**	**39,955**	**47,016**	**55,672**	**63,392**
4. GUADALUP	**18,278**	**32,249**	**40,864**	**47,921**	**55,388**	**64,299**	**74,593**
5. CALDWELL	**6,573**	**8,297**	**9,777**	**11,001**	**12,247**	**13,540**	**14,871**
Subtotal	**63,525**	**99,637**	**127,929**	**152,564**	**177,342**	**205,219**	**234,482**
MIDDLE BASIN							
6. GONZALES	**13,509**	**13,293**	**13,636**	**13,594**	**14,088**	**14,168**	**14,274**
7. DEWITT	**5,068**	**5,160**	**5,158**	**5,116**	**5,051**	**4,953**	**4,907**
Subtotal	**18,577**	**18,453**	**18,794**	**19,010**	**19,139**	**19,121**	**19,181**
LOWER BASIN							
8. VICTORIA	**50,992**	**60,307**	**63,622**	**66,841**	**70,001**	**73,165**	**76,804**
9. REFUGIO	**2,670**	**1,948**	**1,987**	**1,982**	**1,999**	**2,012**	**2,002**
10. CALHOUN**	**54,233**	**69,243**	**72,474**	**75,795**	**79,489**	**82,816**	**87,247**
Subtotal	**107,895**	**131,498**	**138,083**	**144,618**	**151,509**	**157,993**	**166,053**
Total	**189,997**	**249,588**	**284,806**	**316,192**	**347,990**	**382,333**	**419,716**

* Data are for entire counties of the Guadalupe-Blanco River Authority Statutory Service Area, as opposed to only that part of a county located within the Guadalupe River Basin.

** Only that part of Calhoun County located west of Lavaca Bay.

*** Coleto Creek in Goliad County. diversions from the Guadalupe River for steam-electric power generation.

Source: Texas Water Development Board

Table II-12
Guadalupe-Blanco River Authority Service Area*
Total Water Demand Projections with Water Conservation
Summary by Type of Use

County	2000 (acft)	2010 (acft)	2020 (acft)	2030 (acft)	2040 (acft)	2050 (acft)	2060 (acft)
Upper Basin							
Kendall							
Municipal	3,262	4,649	6,370	8,142	9,610	10,888	12,139
Industrial	0	0	0	0	0	0	0
Irrigation	396	714	699	685	671	658	646
Steam-Electric	0	0	0	0	0	0	0
Mining	6	6	6	6	6	6	6
Livestock	446	446	446	446	446	446	446
Total Demand	4,110	5,815	7,521	9,279	10,733	11,998	13,237
Comal							
Municipal	14,055	18,771	24,753	31,598	38,304	45,318	53,018
Industrial	6,283	7,729	8,563	9,314	10,045	10,672	11,553
Irrigation	50	204	186	169	152	135	119
Steam-Electric	0	0	0	0	0	0	0
Mining	2,224	2,678	2,897	3,029	3,159	3,287	3,401
Livestock	298	298	298	298	298	298	298
Total Demand	22,910	29,680	36,697	44,408	51,958	59,710	68,389
Hays							
Municipal	10,926	17,278	24,409	29,964	35,414	42,121	47,474
Industrial	157	212	249	285	322	355	386
Irrigation	162	353	350	347	344	341	338
Steam-Electric	0	1,009	718	949	1,949	2,663	3,627
Mining	129	142	151	157	161	162	163
Livestock	280	280	280	280	280	280	280
Total Demand	11,654	19,274	26,157	31,982	38,470	45,922	52,268
Guadalupe							
Municipal	13,850	17,113	21,167	25,595	29,907	34,980	40,533
Industrial	2,097	2,638	2,957	3,249	3,530	3,771	4,097
Irrigation	875	1,070	955	846	742	710	705
Steam-Electric	129	4,788	3,406	3,326	5,136	5,585	7,515
Mining	270	306	321	330	338	346	353
Livestock	1,057	1,057	1,057	1,057	1,057	1,057	1,057
Total Demand	18,278	26,972	29,863	34,403	40,710	46,449	54,260

Caldwell							
Municipal	4,643	6,306	7,898	9,222	10,555	11,926	13,328
Industrial	11	15	18	21	24	27	29
Irrigation	989	1,044	928	824	733	651	578
Steam-Electric	0	0	0	0	0	0	0
Mining	12	14	15	16	17	18	18
Livestock	918	918	918	918	918	918	918
Total Demand	6,573	8,297	9,777	11,001	12,247	13,540	14,871
Middle Basin							
Gonzales							
Municipal	3,828	4,108	4,404	4,624	4,764	4,794	4,774
Industrial	2,051	2,400	2,628	2,822	3,011	3,177	3,402
Irrigation	2,438	1,304	1,124	969	835	720	621
Steam-Electric	0	0	0	0	0	0	0
Mining	33	28	27	26	25	24	24
Livestock	5,159	5,453	5,453	5,453	5,453	5,453	5,453
Total Demand	13,509	13,293	13,636	13,894	14,088	14,168	14,274
DeWitt							
Municipal	3,065	3,064	3,071	3,039	2,982	2,889	2,839
Industrial	154	184	199	212	225	236	254
Irrigation	102	159	132	108	87	69	54
Steam-Electric	0	0	0	0	0	0	0
Mining	58	64	67	68	68	70	71
Livestock	1,689	1,689	1,689	1,689	1,689	1,689	1,689
Total Demand	5,068	5,160	5,158	5,116	5,051	4,953	4,907
Lower Basin							
Victoria							
Municipal	13,664	14,590	15,614	16,378	16,884	17,435	18,034
Industrial	24,323	28,726	32,095	35,035	27,962	40,578	43,520
Irrigation	6,708	9,936	8,576	7,402	6,388	5,514	4,759
Steam-Electric	2,197	1,757	1,478	30,802	38,282	54,623	71,720
Mining	3,015	3,944	4,511	4,906	5,308	5,721	6,041
Livestock	1,085	1,085	1,085	1,085	1,085	1,085	1,085
Total Demand	50,992	60,038	63,359	95,608	95,909	124,956	145,159
Refugio							
Municipal	1,191	1,249	1,287	1,282	1,299	1,312	1,302
Industrial	0	0	0	0	0	0	0
Irrigation	850	69	69	69	69	69	69

Steam-Electric	0	0	0	0	0	0	0
Mining	6	7	8	8	8	8	8
Livestock	623	623	623	623	623	623	623
Total Demand	2,670	1,948	1,987	1,982	1,999	2,012	2,002
Calhoun							
Municipal	2,705	2,948	3,222	3,556	3,870	4,007	4,171
Industrial	42,397	49,784	54,767	59,235	63,575	67,406	72,238
Irrigation	8,077	15,568	13,654	12,096	11,041	10,285	9,581
Steam-Electric	684	569	454	530	624	738	877
Mining	28	32	35	36	37	38	38
Livestock	342	342	342	342	342	342	342
Total Demand	54,233	69,243	72,474	75,795	79,489	82,816	87,247
Total	189,997	249,588	284,806	316,192	337,990	382,333	419,716

SECTION II-A

Conservation-oriented water rates and water rate structures such as uniform or increasing block rate schedules, and/or seasonal rates, but not flat rate or decreasing block rates.

Conservation-oriented water rates are effective for retail systems, however, those who develop a reliable water supply based on a firm yield require that the supply be dependable. Retail suppliers will be encouraged to develop all plans and implement rates to encourage conservation on a retail level.

SECTION II-B

A program to assist customers in the development of conservation pollution prevention and abatement plans.

GBRA will review means and its' authority for pollution control and, subject to available resources, will participate in such plans.

SECTION II-C

A program for reuse and/or recycling of wastewater and/or greywater.

GBRA will continue to encourage the use of wastewater for golf courses, industry and residential development and other means of stretching the supply of stored water.

SECTION II-D

Other water conservation practices, methods, or techniques which are appropriate for achieving the state goal or goals of the water conservation plan.

INTRODUCTION

Irrigated agriculture may provide the best opportunity for reduction of the overall demand through conservation programs. Rice cultivation accounts for over 50 percent of all irrigation water used in the GBRA district.

The GBRA's efforts in irrigation water conservation have been and continue to be focused to promote water conservation. The system accounts for approximately 80 percent of the surface water irrigation in GBRA's ten-county service area. The GBRA's conservation activities are directed at improving the efficiency of the water delivery systems and enhancing water use efficiency on the individual farms served by GBRA system.

Three major elements comprise the GBRA conservation program:

- **Education on Best Irrigation Practices,**
- **Canal Rehabilitation and Maintenance; and**
- **Volumetric Water Pricing and Billing.**

Each of these programs are described in the following sections.

EDUCATION ON BEST IRRIGATION PRACTICES

Key elements of the on-farm water conservation education program include:

1. Working with local extension agencies to educate rice producers.
2. Establishing a row-crop rate to reduce the number of acres of marginal crops irrigated.
3. Support of crop tours and field days.

Based on the preliminary results of the "Less Water, More Rice" research program, improved cultivation and management practices (e.g., precision land leveling, multiple inlet systems, etc.) can reduce on-farm water use by 25 to 30 percent. Importantly, the conservation practices examined in the research program have been shown to significantly increase crop yield. As such, individual rice producers have a direct economic incentive to adopt the recommended conservation practices. Indications are that a majority of producers have been exposed to the "Less Water, More Rice" conservation practices and that many producers have or intend to adopt recommended practices.

CANAL REHABILITATION AND MAINTENANCE

Improving the canal conveyance efficiency, reducing power consumption and improving canal system management are goals of a rehabilitation and maintenance program. GBRA will enhance its program to improve irrigation efficiency by re-sectioning canals, rebuilding levees, and removing vegetation. GBRA will also investigate the possibility of "mothballing" lateral canals that are seldom used.

VOLUMETRIC WATER PRICING AND BILLING

As part of the Water Conservation Plan, the GBRA will continue to investigate volumetric pricing and billing in the Calhoun Canal System.

IRRIGATION WATER CONSERVATION GOALS

Water savings have already resulted from previous irrigation water conservation and rehabilitation programs however additional savings can be made. The goal of continued educational efforts, canal maintenance and possibly volumetric billing and pricing can provide additional water supplies.

APPENDIX 1

GBRA Board Policy

501 – Water Conservation

501.10 Purpose. This policy provides direction for GBRA's leadership role in assuming an adequate supply of clean water within the GBRA10-county statutory district sufficient to meet the needs of municipal, agricultural and industrial uses for the future through promoting the conservation of both ground and surface waters.

501.20 Policy

501-201 Leadership. GBRA directors and employees will exercise leadership by encouraging and where appropriate, requiring the conservation of both ground and surface waters within GBRA's statutory district as follows:

A) GBRA will promote practices and enter into cooperative efforts while avoiding duplication of other efforts.

B) GBRA's goals will be to promote the development and application of practices and technologies that improve water use efficiency, increase the beneficial reuse and recycling of water, and minimize the waste of water such that water supplies are extended.

C) GBRA will support local, state, federal and private-sector initiatives to develop, demonstrate and apply water conservation measures where appropriate.

D) GBRA will implement technical assistance, demonstrations, public information and educational programs on water conservation.

E) In the operation and management of GBRA facilities and properties, GBRA will use water efficiency measures and demonstrate water conserving technology.

F) All future water sales contracts will contain appropriate conservation and drought management conditions requiring the purchaser to provide to the maximum extent for the conservation of water, and to operate and maintain its facilities in a manner that prevents waste of water.

501.202 Technical Assistance. GBRA's efforts in technical assistance will focus on the development and implementation of local water conservation and drought contingency programs that encourage local initiative and achievement. GBRA will provide assistance in the preparation of local conservation plans.

501.202 Cooperative Efforts. GBRA will look for opportunities for cooperative efforts with the Texas Water Development Board and the Texas Commission on Environmental Quality for the development and review of water conservation plans affecting the GBRA statutory district. GBRA will also seek grants, matching funds, or other financial arrangements from public and private sources.

501.202.1 Research and Legislation. GBRA will support research, regulatory initiatives and legislation that advance the conservation and beneficial reuse of water in the GBRA statutory district. GBRA also will assist in the research and transfer of technology and information regarding cost-effective conservation measures for the benefit of water users within the statutory district.

501.203 Municipal and Industrial Water Efficiency. GBRA will integrate, as appropriate, water efficiency measures into the development and implementation of GBRA programs and projects. Such programs and projects may include, but shall not be limited to: water resources planning and demand forecasting such as the Senate Bill One Regional Water Planning Study; water and wastewater utility service studies, new projects and service agreements; water rate design; environmental programs; and energy efficiency programs.

501.204 Agricultural Water Efficiency. GBRA will support public and private-sector initiatives to develop, and apply cultivation and irrigation practices to improve on-farm water use efficiency as follows:

A) GBRA will assist with the transfer of information and technology for improving on-farm water use efficiency from research to the producer.

B) GBRA will undertake maintenance, rehabilitation and management practices, where feasible, to minimize water losses from GBRA irrigation water delivery systems.

501.205 Public Education. GBRA will cooperate in the distribution of water conservation materials to water users in GBRA's statutory district. GBRA will include water conservation information as a part of education programs.

501.30.1 Responsibility.

501.301 General Manager. The General Manager is responsible for the development of the water conservation program and will prepare the necessary management directives to carry out this policy.

Effective: May 16, 2007

APPENDIX 2

GBRA GUIDELINES
WATER CONSERVATION GUIDELINES

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FORWARD

GBRA was originally the Guadalupe River Authority, a water conservation and reclamation district created in 1933 as a public corporation under Section 59, Article 16 of the Constitution of Texas. It was reauthorized in 1935 as the Guadalupe-Blanco River Authority by an act of the Texas Legislature (VCS Art. 8280-106).

The guidelines for water conservation are promulgated pursuant to this GBRA policy under the authority granted to the GBRA under the Texas Water Code, Section 11.037.

Each person, association of persons, corporation, and district authorized by law to carry out irrigation powers that is conserving or supplying water for any of the purposes authorized by Chapter 11, Texas Water Code may make and publish reasonable guidelines relating to water conservation, as defined by Subsection (8) (B), Section 11.002, Texas Water Code.

The many benefits of water conservation include:

- Extends available water supplies and reduces the risk of shortage during periods of extreme drought;
- Reduces wastewater flows;
- Provides a larger utility customer base over which to spread capital and other costs
- Improves the reliability and quality of water utility service;
- Reduces water and wastewater utility operating costs;
- Reduces customer costs for water service;
- Improves the performance of wastewater treatment systems; and
- Enhances environmental and recreation values.

GBRA intends to pursue an aggressive role in promoting efficient water use and the beneficial reuse of reclaimed water. By adopting these guidelines, GBRA's commitment to conserving water is affirmed.

GUIDELINES FOR WATER CONSERVATION

ARTICLE 1. PURPOSE

1.0 The purpose of these guidelines is to extend existing surface and groundwater supplies through conservation and beneficial reuse and thereby to assure an adequate supply of clean water within the GBRA 10-county district. These guidelines apply to all GBRA municipal, industrial and irrigation water sale contracts (specifically excluding water service agreements or contracts between GBRA and downstream irrigation districts or irrigation companies), all water and wastewater utility service agreements and all GBRA facilities.

ARTICLE 2. DEFINITIONS

2.1 Acre-foot of water: Enough water to cover one acre of land one foot deep. One acre foot of water is equal to 325,851 gallons of water.

2.2 Applicant: A person, association of persons, or other entity who has submitted a water conservation plan to GBRA, and who has provided all information required by these guidelines.

2.3 Beneficial use: Use of the amount of water which is economically necessary for a purpose authorized by law, when reasonable intelligence and reasonable diligence are used in applying the water to that purpose.

2.4 Customer: A person, association of persons, or other entity to whom a water sale contract has been issued.

2.5 Domestic use: Use of water by an individual or a household used for drinking, washing, or culinary purposes; for irrigation of lawns, or of a family garden and/or orchard when the produce is not sold; for watering of domestic animals; and for water recreation for which no consideration is given or received. If the water is diverted, it must be diverted solely through the efforts of the user.

2.6 Drought of record: The drought which occurred during the critical drought period. That critical drought period is the period of time during which the reservoir system was last full and refilled, and the storage content was at its minimum value. The current drought-of-record occurred during the period from 1946-1957.

2.7 Firm water: A supply of water that is available even during a repeat of the conditions of the historic drought of record.

2.8 Industrial Water Sale Contract: Contracts for uses of water associated with the operation of some industrial or mining process. The industrial use of water is defined as water used in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, including commercial feedlot operations, commercial fish production, and the development of power by means other than hydroelectric. The use of water for mining purposes, including hydraulic use, drilling,

washing sand and gravel, and oil field re-pressuring also falls under industrial water sale contracts.

2.9 Interruptible water: A supply of water that is not defined as firm water. Such supplies are diverted under a contract or resolution approved by the GBRA Board and is usually run-or-river water.

2.10 Irrigation Water Sale Contract: A contract for uses of water that entail direct applications of raw water. Irrigation uses may include, but are not limited to, the following: agricultural production, water applied to golf courses, athletic fields and other landscaped areas.

2.11 Non-potable water: Water that is not suitable for direct human consumption.

2.12 Municipal Water Sale Contract: A contract for raw water which is to be treated by the Purchaser to a potable quality and supplied to users by a centralized water supply system. Municipal use is defined as the use of treated water for domestic purposes, fighting fires, sprinkling streets, flushing sewers and drains, watering parks and parkways, and recreational purposes, including public and private swimming pools, the use of treated water in industrial and commercial enterprises supplied by a municipal distribution system without special construction to meet its demands, and for the watering of lawns and family gardens. Municipal use also includes the application of municipal sewage effluent upon land sites, pursuant to a Texas Water Code, Chapter 26, permit, where:

a) the primary purpose of the application is the treatment and/or necessary disposal of such effluent;
b) the application site is a park, parkway, golf course, or other landscaped area owned by the owner of the permitted sewerage system; or
c) the effluent applied to such site is generated within an area for which the commission has adopted a no-discharge rule.

2.13 Potable Water: Water that is suitable for direct human consumption.

2.14 Primary Customer: A customer who diverts water directly from a river or stream, Canyon Reservoir, or a GBRA irrigation canal and delivers all or a part of that water to a secondary customer.

2.15 Secondary Customer: A water user who does not divert water directly from a river or stream, Canyon Reservoir or a GBRA irrigation canal, but who receives water from a primary customer.

2.16 Wastewater Effluent: Water discharged after the treatment of domestic or industrial sewage.

2.17 Water Conservation: Those practices, techniques, and technologies that reduce the consumption of water, reduce the waste of water, improve efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.

2.18 Water Sale Contract: A contractual agreement between GBRA and a Purchaser for the sale of raw water under GBRA's Certificates of Adjudication or permits.

2.19 Water Customer: A person, association of persons, or other entity to whom a water sale contract has been issued.

ARTICLE 3. AUTHORITY

3.0 These guidelines are promulgated in accordance with Section 11.037(b), of the Texas Water Code, the GBRA Act, and GBRA Board Resolution dated October 30, 1998.

ARTICLE 4. PROCESSING OF WATER CONSERVATION PLANS

4.1 Preparation of the Water Conservation Plan. The applicant shall submit to the GBRA for review and approval a water conservation plan. This plan shall be prepared in accordance with Article 5.0 of these rules. Prior to submittal of the plan, the applicant (or applicant's representative) is encouraged to discuss the scope and content of the plan with GBRA staff. GBRA staff shall review and approve all water conservation plans. In considering approval of a water conservation plan, the staff shall consider the best management practices, the best available techniques and technologies, the financial capability of the applicant, the term of the contract, lease, or easement and other such factors. The Applicant shall implement the water conservation plan as approved.

4.2 Review and Approval of Water Conservation Plan. GBRA shall conduct a review of the plan for administrative completeness. If the plan is not determined to be administratively complete, GBRA staff shall notify the applicant and shall detail the deficiencies. The applicant shall have thirty (30) working days to file appropriate additional information to correct such deficiencies. If such information is not provided within said time period, then the plan shall be considered withdrawn.

After a plan has been determined to be administratively complete, GBRA staff shall conduct a technical review as necessary and appropriate. The technical review period is the period of time beginning with the determination that the plan is administratively complete and continuing for a period not to exceed thirty (30) calendar days. After the appropriate technical review has been completed, the applicant shall be notified regarding whether the plan has been approved or rejected.

Unless GBRA staff is able to establish good cause for exceeding the above-mentioned time limitations for either, approval or rejection of a plan, failure of GBRA to make such a determination shall result in said plan being deemed approved.

4.3 Appeal of Rejection of Plan. If an Applicant believes that its water conservation plan was improperly returned, or that the reasons cited for rejection of the plan were not consistent with these rules, the applicant may appeal the decision. Any appeal must be made in writing and directed to the GBRA General Manager or his designee. The

General Manager or his designee shall promptly review any such appeal and shall either agree with the staff's decision to return and/or reject the plan or shall approve the plan.

4.4 GBRA Board Approval. All applicable water sale contracts, affecting GBRA lands and GBRA water and wastewater utility service agreements will not be brought to the Board of Directors for approval until a water conservation plan has first been approved by GBRA staff or the General Manager or his designee in accordance with Section 4.3.

ARTICLE 5. WATER CONSERVATION PLAN REQUIREMENTS

5.0 The water conservation plan shall effectively address all appropriate methods for reducing water consumption and water waste, methods for improving water use efficiency and methods for increasing the beneficial reuse and recycling of water. The plan shall include a long-term water conservation plan and a drought contingency or emergency water management plan. Applicant shall explain reasons for not including a particular measure in the conservation plan.

The required information may be given in either narrative or outline format.

5.1 Water Sale Contracts.

5.1.1 Municipal Water Sale Contracts.

(a) Water and Wastewater Utility Profile.

A profile of an applicant's water and wastewater utility system should be developed in order to identify the goals and emphasis of the plan. This profile shall include, at a minimum, the following:

(1) Service area population: current population and estimated population at build-out or at the end of the contract term.

(2) Water Utility Data.

(a) Number of water service connections, by use sector if available (residential, industrial, commercial, public);
(b) Percent of connections metered;
(c) Monthly water consumption for previous two (2) years (by use sector, if available);
(d) Average daily use for previous two (2) years;
(e) Peak day demand for previous two (2) years;
(f) Percent of water use unaccounted for; and
(g) Description of system: peak daily water production and distribution capacity; number of plants, wells, and storage tanks; system constraints; and planned capital improvement projects.

(3) Wastewater Utility Data (if the customer also operates a wastewater system).

(a) Average monthly wastewater flows for previous two (2) years;
(b) Peak monthly wastewater flows for previous two (2) years;
(c) Percent of water service connections using private sewage on-site facilities (i.e., septic systems);
(d) Description of wastewater system, system constraints; and planned capital improvement projects;

(4) Financial Data

(a) Current and projected (if available) water rates;
(b) Current and projected (if available) wastewater rates; and
(c) Connection and/or impact fees.

(b) Long-range Conservation Plan

A water conservation plan specifies and explains the actions that an applicant will take to implement a water conservation program. The implementation of the water conservation plan is considered to be the water conservation program.

(1) The long-range plan shall, at a minimum, include:

(a) An evaluation of the customer's water and wastewater system and customer water use characteristics to identify water conservation opportunities and set water conservation goals (e.g., reduced peak water demand, reduced wastewater flows).

(b) Education and public information programs. Applicants should implement a program of continuing public education and information to inform and/or remind their customers about ways to save water. At a minimum, GBRA water customers are required to distribute published information on water conservation to their retail customers once a year and provide such information to new retail customers when they apply for service. Customers should also conduct or participate in at least one other type of annual educational water conservation activity. Assistance with, the implementation of a public education program is available from the GBRA.

(c) Universal metering and meter repair and replacement. All water users should be metered, including public facilities. For new multifamily dwellings that are easily metered individually (such as duplexes and fourplexes), each living unit should be metered separately. A regularly scheduled maintenance program of meter repair and replacement will need to be established in accordance with the following time intervals:

(1) Production (master) meters - test once a year;
(2) Meters larger than 1" - test once a year;

(3) Meters 1" or smaller - test once every 10 years.

(d) Water utility distribution system leak detection and repair. A leak detection audit should be conducted at regular intervals. If records indicate that unaccounted for water losses are greater than fifteen (15%) percent from the quantity diverted, meters should be inspected. After inspection, if unaccounted for water is still significant, the utility should initiate a full-scale leak detection and repair program. Sources of unaccounted for water include leaks in mains and services, defective hydrants, abandoned services, unmetered water used for fire fighting or other municipal uses, inaccurate or leaking meters, illegal hook-ups, and unauthorized use of fire hydrants.

(e) Water rates. Utilities should adopt a water rate structure that encourages water conservation. Such a rate usually takes the form of an increasing block rate, a seasonal load rate or an excess use rate. At a minimum the applicant should adopt a uniform rate structure. Rate structures in which the unit cost of water decreases as consumption increases and flat rates are not usually acceptable.

(2) The long-range plan may also include other measures that the customer deems appropriate. These may include, but are not limited to, measures such as:

(a) codes and ordinances which require the use of water-conserving technologies;
(b) measurement and control of excessive pressure in the distribution system;
(c) ordinances to promote efficiency and avoid waste;
(d) commercial and residential audits for indoor and landscape water uses-;
(e) plumbing fixture replacement and retrofit programs;
(f) recycling and reuse of reclaimed wastewater and/or gray water; and
(g) other measures as may be applicable.

(c) Drought Contingency or Emergency Water Management Procedures. This plan shall include the following:

(1) definition of trigger conditions signaling the start of an emergency period;
(2) demand management measures (i.e. time of day or day of week water use restrictions);
(3) measures to educate and inform the public concerning the plan;
(4) means of implementation and enforcement;
(5) termination procedures ending the emergency period.

5.1.2 Industrial Water Sale Contracts.

(a) Water Use Profile. This profile shall include:

(1) Monthly use over previous two (2) year period; and
(2) Estimated use, by category (processing, cooling, employee-related) at the end of the contract period.

(b) Water Conservation Measures. A water conservation plan shall include the following measures:

(1) Use of water conserving plumbing fixtures (as defined in Article 5.1.1.) in new construction and/or plumbing fixture retrofits where technically and economically feasible;

(2) Use of state-of-the-art equipment and/or process modes including, if necessary, justification of any proposed use of less efficient equipment or process modes;

(3) Water reuse, where possible, for processing, cooling, landscape irrigation and other non-potable uses;

(4) Employee education and awareness.

(c) Drought Contingency or Emergency Water Management Procedures. Applicant shall comply with the GBRA Drought Contingency Plan as outlined in Article 5.1.4.

5.1.3 Irrigation Water Sale Contracts for Water Customers other than the Calhoun Canal System.

(a) Water Use Profile. This profile shall include:

(1) Monthly water use over previous two (2) year period, if applicable; and
(2) A site map showing irrigated areas and the layout of irrigation equipment.

(b) At a minimum, a water conservation plan shall include the following measures:

(1) Irrigation Inspection. Conduct periodic irrigation system inspections and perform necessary adjustments/repairs to eliminate leaks, overspray or clogging.

(2) Irrigation testing and scheduling. The irrigation system should be tested for uniformity of spray or flood as well as the application rate. Irrigation testing should be conducted for each area capable of independent control. Maintenance zones shall be identified, and irrigation schedules including frequency and duration should be developed for these zones.

(3) Seasonal irrigation scheduling. Irrigation scheduling will be adjusted to reflect changes in seasonal irrigation requirements.

(4) Equipment Upgrades. Equipment upgrades should be implemented where technically and economically feasible. Examples of upgrades include automatic controllers, rain shut-off devices, sod moisture monitors, and installation of water conserving irrigation equipment.

(5) Leak detection. Irrigation system shall be checked for leaks at least once a year.

(6) Maintenance schedule. Maintenance zones shall be established which reflect plant type and level of care. Examples of items to include in the plan are mowing and fertilization frequency, clipping disposal, sod aeration, etc.

(7) Employee education and training. Applicant is required to provide and carry out training for landscape maintenance staff in the proper implementation of the applicant's water conservation plan. Applicant can distribute literature, acquire videotapes, and conduct seminars on information relating to this top. Assistance with employee training may be available from the GBRA.

(c) The plan may also include other measures that the customer deems appropriate. These may include, but are not limited to, measures such as:

(1) Integrated Pest Management (IPM). The purpose of an Integrated Pest Management program is to minimize the need for applications of chemical fertilizers and pesticides thereby minimizing the use of water and the potential runoff of pollutants into water courses. Non-toxic pest control should be attempted where possible. As an attachment to the plan, the applicant must submit a material safety data sheet and a product label for each pesticide, herbicide, fungicide, insecticide, and fertilizer used.

The IPM program should be developed considering crop or plant requirements for water; nutrients, pesticides, or herbicides- sod types and permeability; rainfall frequency, patterns and amounts; runoff containment and controls; and drainage patterns of the irrigated area. The program must address fertilizer types and manufacturers, applications rates and application schedule; pesticides and herbicides to be used and justification for such use- biological pest control measures to be employed (if any); and plant replacement procedures.

(2) Future conversions. Where feasible, landscape areas should be converted to low maintenance plantings.

(3) Beneficial water reuse and recycling. Where appropriate, the applicant should identify and evaluate opportunities for the beneficial reuse and recycling of reclaimed water for irrigation or other non-potable uses. Such reuse and recycling may provide an attractive approach to extending water supplies, reduce demands on the potable water treatment and

distribution facilities, and reduce or eliminate wastewater discharges to sensitive surface waters.

(c) Drought Contingency or Emergency Water Management Procedures. Applicant shall comply with the GBRA Drought Contingency Plan as outlined in Article 5.1.4**.**

(d) Integration of GBRA Water Plans. Applicants are encouraged to develop one plan that incorporates both GBRA water conservation and nonpoint source pollution abatement requirements.

5.1.4 Compliance with the GBRA Drought Contingency Plan

(a) The GBRA Drought Contingency Plan (DCP), as approved by the Texas Commission on Environmental Quality and modified from time to time, establishes GBRA's policy and procedures for the allocation of GBRA's stored water supply during times of drought. The scope of the DCP is essentially limited to curtailment of GBRA interruptible water supplies as determined by the TCEQ's South Texas Water Master. Firm stored water supplies are subject to curtailment only if it is determined that a drought in effect is worse than the Drought of Record.

(b) The GBRA DCP specifies actions that are to be taken by GBRA firm stored water customers during drought. These are:

(1) GBRA will request voluntary water conservation by firm stored water customers where the total storage in Canyon Reservoir is less than elevation 895 M.S.L. or 277,500 acre-feet.

(2) GBRA will request that all GBRA firm stored water customers reduce water use by their end users when the combined storage for Canyon Reservoir is at or below Elevation 890 or 245,333 acre-feet.

(3) GBRA will request that all GBRA firm water customers reduce water use by their end users when the combined storage of Canyon Reservoir is at or below elevation 885 M.S.L. or 215,615 acre-feet.

(4) During a drought determined to be more severe than the Drought of Record, GBRA will curtail and distribute the available supply of firm stored water among all of its firm stored water supply customers on a pro rata basis according to their historic demand for stored water.

(c) All GBRA firm stored water customers shall include in their required water conservation plan a statement that they will comply with GBRA Drought Contingency Plan. Customers will also specify how they will comply with this plan.

5.2 Water and Wastewater Utility-Service Agreement.

Any retail water or wastewater entity that enters into a water or wastewater utility service agreement with the GBRA shall implement the measures listed in Article 5.1.1

5.3 GBRA Facilities

All new GBRA facilities and additions to existing facilities will include water-conserving designs and facilities.

ARTICLE 6. REPORTING REQUIREMENTS

6. 1 Report Schedule

(a) All GBRA water customers shall periodically report on the progress of their water conservation program. Progress reports will be due to the GBRA every five years, with the next report due on or before January 30, 2014. Progress reports will be reviewed by GBRA staff.

(b) Water Conservation Plans should be updated periodically to reflect conditions associated with the use of water that have changed since the plan was first adopted. Any amendments to these rules that occurred after the customers plan was adopted shall be included in the updated plan. GBRA will provide advance notice of any such proposed amendments to these rules.

6.2 Content of Progress Reports

GBRA will develop a report form for customers to complete. This report shall include the following:

(a) A description of specific measures implemented. These measures will match measures included in customer's water conservation plan.

(b) Results of conservation measures. Customers should report on any observed change in water use and water demand, economic savings, and public response that occurred as a result of implementing these measures.

A summary of these reports will be developed and made available to all water contract customers.

ARTICLE 7. COMPLIANCE AND ENFORCEMENT

The applicant agrees to commence implementation of the water conservation programs listed in the water conservation plan immediately and agrees to continue these programs for the duration of the contract, lease or easement with GBRA. Failure of the applicant to implement said water conservation plan may result in GBRA taking legal action to require compliance.

APPENDIX 3

GUADALUPE-BLANCO RIVER AUTHORITY RESOLUTION ADOPTING A WATER CONSERVATION PLAN FOR WHOLESALE WATER

Whereas, the Guadalupe-Blanco River Authority (GBRA) has exercised leadership in promoting, and where appropriate, requiring the conservation of ground and surface waters within GBRA's 10-county statutory district, and

Whereas, GBRA's goals are to promote the development and application of practices and technologies that improve water use efficiency, increase the beneficial reuse and recycling of water, and minimize the waste of water such that water supplies are extended, and

Whereas, GBRA supports and assists local and state initiatives to develop and apply water conservation measures for municipal, industrial and agricultural uses where appropriate. GBRA provides technical assistance, public information and education programs on water conservation, and

Whereas, all water sales contracts contain appropriate conditions requiring conservation measures that are economically feasible, and

Whereas, GBRA's efforts in technical assistance focuses on the development and implementation of local water conservation and drought contingency programs that encourage local initiative and achievement, and

Whereas, GBRA shall support research, regulatory initiatives and legislation that advance the conservation and beneficial reuse of water in the GBRA 10-county statutory district, and

Whereas, GBRA also shall assist in the research and transfer of technology and information regarding cost effective conservation measures for the benefit of water users within the 10-county statutory district, and

Whereas, GBRA shall integrate, as appropriate, water efficiency measures into the development and implementation of GBRA programs and projects. Such programs and projects shall include but not be limited to: water resources planning and demand forecasting and management; water and wastewater utility service studies, projects and service agreements; water rate design; environmental programs, and

NOW THEREFORE BE IT RESOLVED, that the Board of Directors of the Guadalupe-Blanco River Authority does hereby adopt a Water Conservation Plan for Wholesale Water and directs the General Manager to submit a copy to the Texas Commission on Environmental Quality, to make improvements to the plan on a regular basis as consistent with sound water conservation management, and to administer and enforce the plan as adopted.

Adopted this the 29 day of April 2009.

Attest:

T.L. Walker
Chairman of the Board of Directors
Guadalupe-Blanco River Authority

Grace G. Kunde, Secretary
Board of Directors
Guadalupe-Blanco River Authority