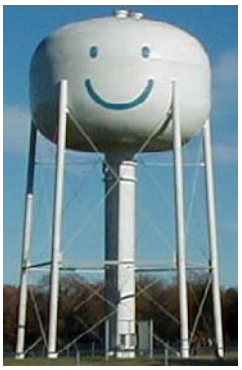
Western Bastrop County Water and Wastewater Planning Study

August 2004

STUDY PARTICIPANTS:

Lower Colorado River Authority



Aqua Water Supply Corporation

City of Bastrop

In Conjunction with:

Bluebonnet Electric Cooperative
Bastrop Independent School District
Bastrop County WCID #2
Lost Pines Groundwater District

Final Report

Western Bastrop County Regional Water and Wastewater Study

This study is the culmination of months of effort and dedication by numerous individuals within different organizations working together to create a worthwhile planning tool for the region as a whole.

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Section 1
Service Area Identification

This section provides an overview of the Study Area, including the current water demands and sewer system flows within the area of interest. The study area is part of a rapidly growing region of Bastrop County. Figure 1-1, on the subsequent page, gives a regional perspective of the area of interest.

1.1 Scope & Study Area

The Service Area's approximate north and south boundaries include the Colorado River and the Maha/Cedar Creek watershed. The Service Area's approximate east and west boundaries include the eastern boundary of the City of Bastrop and the Bastrop/Travis County line. The study area encompasses the municipality of Bastrop and the western portion of its ETJ.

Water providers in the area include the City of Bastrop, Water Control and Improvement District (WCID) #2, and Aqua Water Supply Corporation. Currently, wells are the source of all drinking water in the study area. The City of Bastrop draws from the alluvial layer; while WCID #2 and Aqua Water draw from the Carrizo Aquifer. In the future, reliance will extend to surface water, particularly the Colorado River. The Lower Colorado River Authority (LCRA) has the means to sell raw water to any entities interested in surface water treatment as evidenced by a recent contract signed with Aqua Water to purchase 6500 acre-ft/yr of Colorado River water. Additionally, Aqua Water has purchased an approximately 100 acre site for its initial 4 MGD membrane WTP.

Wastewater treatment in the study area is limited to on-site septic facilities (OSSF), the City of Bastrop WWTP, a package plant serving Elm Ridge, and a WWTP serving the McKinney Roughs Park. To the north of our study area, the LCRA owns and operates the Camp Swift WWTP. Recently, WCID#2 and the LCRA have entered into an agreement with the City of Bastrop to provide wastewater service to the Tahitian Village. The LCRA provided the collection system financing, WCID is installing the system over time and the City of Bastrop provides a dedicated capacity of 200,000 gpd. Additionally, the LCRA operates the McKinney Roughs plant, has recently received a permit for the Windmill WWTP, just north of McKinney Roughs, and is in the process of permitting a WWTP to serve the Colony. In the last State Legislative session, two new municipal utility districts (MUDs) were created: The Colony and Garfield. Both of these MUDs are discussing the possibility of building WWTPs for their service area.

While the portion of the study area served by conventional wastewater treatment is limited, it is an arena that is currently in a state of flux, partially due to demand for wastewater treatment to facilitate denser residential development.

Illustrated in Figure 1-1 is the area of interest, in more detail, with major roads and existing water and wastewater Certificate of Convenience and Necessity (CCNs). While Aqua Water provides water services to areas outside the study area, for the purposes of this study, only those facilities that are located inside the region of interest are included in the study.

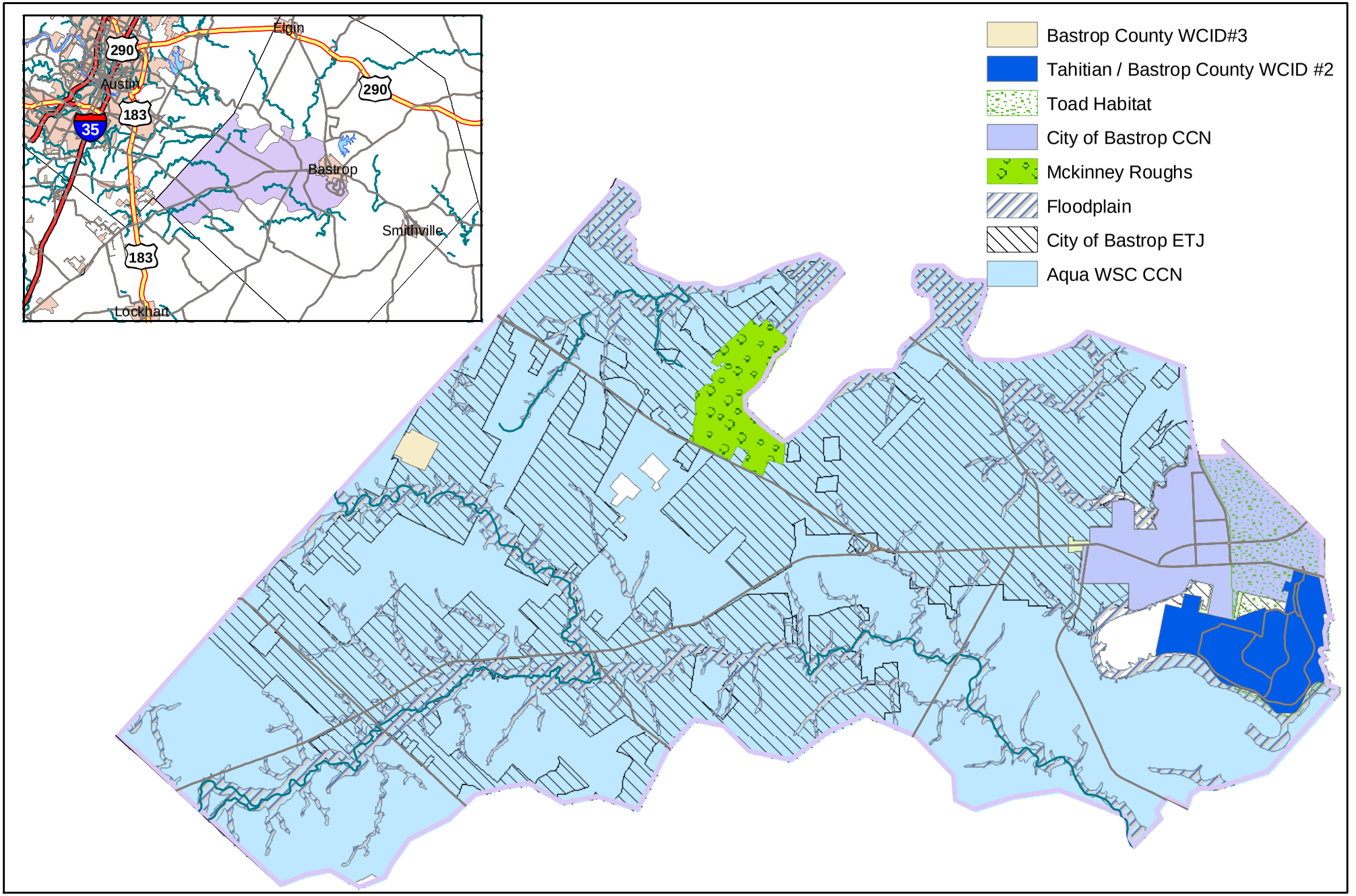


Figure 1-1
Western Bastrop Study Area

1.2 Water System Data

The following sections review the existing system data for water systems in the study area. Many sources were culled for the water system information, where multiple data exist, the number in bold indicates the value used for the remainder of the study. For a map of all the water facilities in the study area, see Figure 1-2.

1.2.1 City of Bastrop

A summary of the City of Bastrop water system is provided in Table 1-1. The total rated capacity of the wells is 3,240 gpm or 4.66 MGD, as seen in Table 1-2. Per the PBS&J report, this capacity is not realized due to piping restrictions in the discharge piping of Wells C and F and Wells D and E and is instead limited to 2,725 gpm or 3.9 MGD. Storage data is provided in Table 1-3.

	Bastrop Website	**TCEQ System Data Sheet/ Inspection**	**Bastrop Billing Records**
Number of Wells	6		
Existing Population		5,697	
Service Connections	2,220	2,139	2,243
Annual System Pumpage	435 million gallons		
System Capacity	3.5 MGD	3.514 MGD	
Service Pump Capacity		7.704 MGD	
Maximum Daily Pumpage	1.964 MGD on August 2		
Average Daily Demand	1.102 MGD	1.192 MGD	
Peaking Factor	1.78		
Total Storage Capacity	2.45 MG	2.475 MG	
Elevated Storage Capacity		1.25 MGD	

References: City of Bastrop, 2002, www.cityofbastrop.org
TCEQ Public Water System Details/Data Sheet, WWW3.tnrcc.state.tx.us/iwud/pws

Table 1-1 System Data

Entry Point	**TCEQ Water Source Code**	**Owner's Designation**	**Distribution System Pressure Zone**	**Location**	**Well Depth, feet**	**Rated gpm**
001	G0110001A	A (formerly 3)	1	City Park	60	100 (TBA)
001	G0110001B	B (formerly 4)	1	City Park	60	210
001	G0110001C	C (replaced 5)	1	City Park	60	550
001	G0110001D	D	2	Behind Pump Station	30	700-750
002	G0110001E	E	2	Behind Pump Station	30	700-750
002	G0110001F	F	2	Behind Pump Station	30	1,030
Total B through F:						**3,240 gpm**

TBA = To be abandoned

Table 1-2 Well Data from TCEQ Inspection October 31, 2000 and updated by Mike Fisher October 8, 2003

Type	Capacity, MGD	Material	Distribution System Pressure Zone	Location
Ground Storage	0.500	Concrete (1954)	1 and 2	Willow Street P.S.
Ground Storage	0.500	Welded Steel	1 and 2	Willow Street P.S.
Elevated Ground Storage	0.225	Concrete	1	Loop 150 Tank Yard
Standpipe	1.000	Welded Steel	1	Loop 150 Tank Yard
Elevated Tank	0.250	Welded Steel	2	Loop 150 Tank Yard

Table 1-3 Storage Data from TCEQ Inspection October 31, 2000

The system shares an emergency interconnect with Aqua Water Supply Corporation and WCID No. 2.

1.2.2 Bastrop County WCID #2

A summary of the Bastrop County WCID#2 water system is provided in Table 1-4. The total rated capacity of the wells is 1,050 gpm, as seen in Table 1-5. Storage data is provided in Table 1-6.

	TCEQ June 23, 2000 Inspection	TCEQ System Data Sheet	Paul Klaus October 6, 2003
Number of Wells	4		5
Existing Population	2,445	2,829	
Service Connections	807	943	1,100
Annual System Pumpage			
System Capacity	1.518 MGD or 1050 gpm	1.545 MGD	
Service Pump Capacity	2.88 MGD	2.88 MGD	
Maximum Daily Pumpage	0.790 MGD		
Average Daily Demand	0.221 MGD	0.303 MGD	
Peaking Factor			
Total Storage Capacity	0.3 MG	0.32 MG	0.4 MG
Pressure Tank Capacity		0.02 MG	0.03 MG
Elevated Storage Capacity		0 MG	

Table 1-4 System Data

Entry Point	TCEQ Water Source Code	Owner's No.	Plant No.	Location	Well Depth, feet	Estimated gpm, October 2003
001	G0110020A	1	1	Tahitian Dr. at Plant	515	50
001	G0110020B	2	1	Tahitian Dr. at Plant	735	140
002	G0110020C	3	2	E. section of subdivision	1020	350
002	G0110020D	4	2	E. section of subdivision	460	150
003		5	3	226 Riverside Dr (TH)	525	350

Table 1-5 Well Data from TCEQ Inspection October 31, 2000, November 19, 2001 and Paul Klaus October 6, 2003

Type	Capacity, MGD	Material	Location
Ground Storage	0.100	Welded Steel	Tahitian Dr. at Plant 1
Ground Storage	0.100	Welded Steel	Tahitian Dr. at Plant 1
Pressure Tank	0.005	Welded Steel	Tahitian Dr. at Plant 1
Pressure Tank	0.005	Welded Steel	Tahitian Dr. at Plant 1
Ground Storage	0.100	Welded Steel	Plant No. 2
Pressure Tank	0.01	Welded Steel	Plant No. 2
Ground Storage	0.100	Welded Steel	Plant No. 3
Pressure Tank	0.01	Welded Steel	Plant No. 3

Table 1-6 Storage Data from TCEQ Inspection October 31, 2000

The system shares an emergency interconnect with the City of Bastrop.

1.2.3 Aqua Water Service Corporation

A summary of the Aqua Water Service Corporation water system in Zones 2 and 2A is provided in Table 1-7. The total rated capacity of the wells is 4,670 gpm, as seen in Table 1-8. Storage data is provided in Table 1-9.

	TCEQ January 31,2000 Inspection	Aqua Water August 1, 2001	Aqua Water Billing Records
Number of Wells		6	
Existing Population			
Service Connections	5439		6,108
Annual System Pumpage			
System Capacity	3,870 gpm	4,670 gpm	
Service Pump Capacity	19,888 gpm		
Maximum Daily Pumpage			
Average Daily Demand			
Peaking Factor			
Total Storage Capacity	3.656 MG		
Elevated Storage Capacity	1.975 MG		

Reference: Aqua Water and TCEQ 2000 inspection

Table 1-7 Zones 2 and 2A System Data

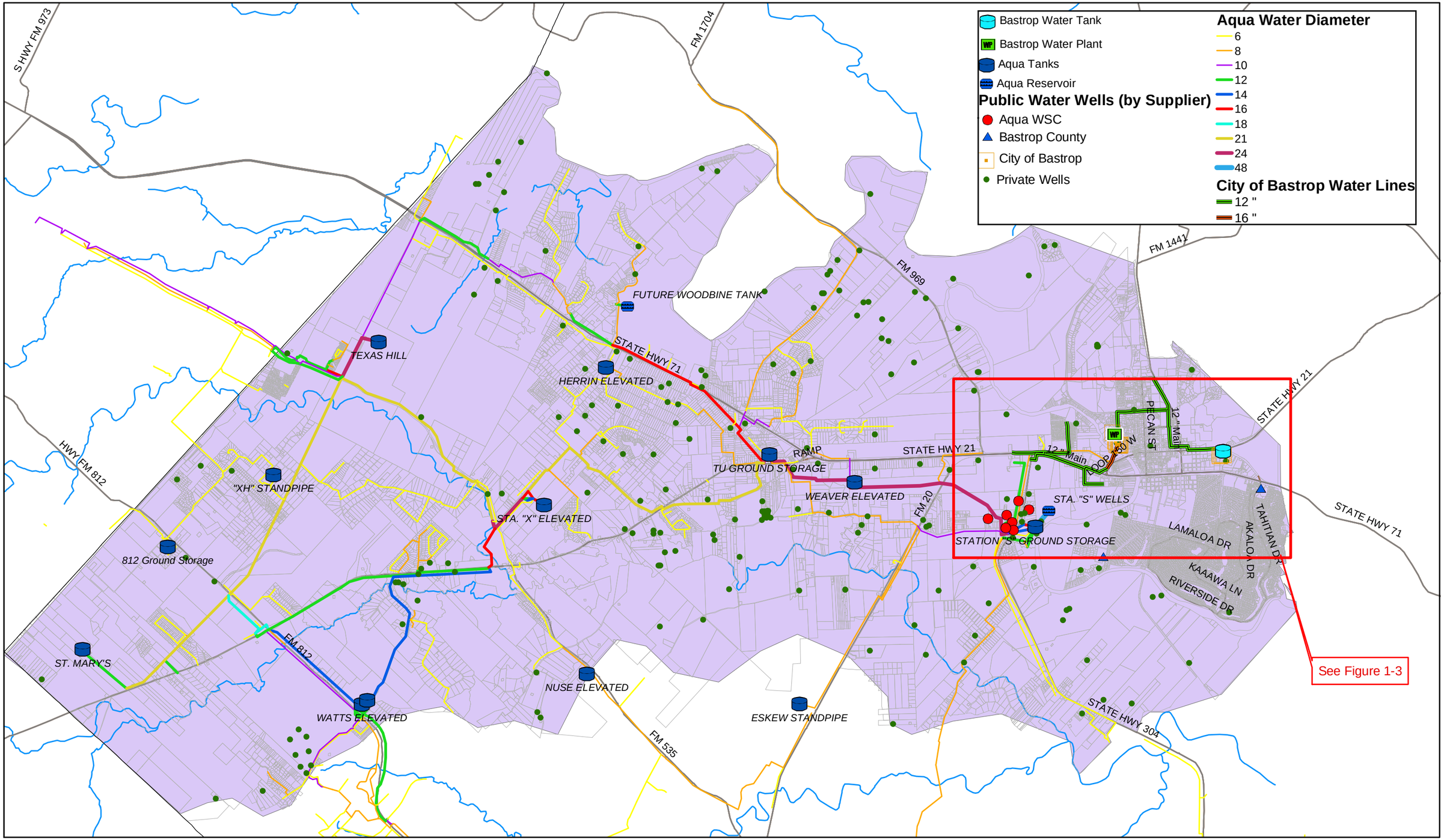
TCEQ Water Source Code	Owner's Designation	Distribution System Pressure Zone	Location	Well Depth, feet	Capacity, gpm August 1, 2001
G0110013B	S2	Zone 2	" S" Pump Station	497	335
G0110013C	S3	Zone 2	"S" Pump Station	496	555
G0110013D	S4	Zone 2	0.75 mi S. of Hwy 71 and 100 ft east of Hwy 304	529	1,290
G0110013E	S5	Zone 2	2.6 mi S. of Hwy 71and 1000 ft east of Hwy 304	615	950
G0110013New98	S6	Zone 2	"S" Pump Station		390
	S7	Zone 2	"S" Pump Station		1,150

Table 1-8 Well Data - Zones 2 and 2A

Type	Capacity, MGD	Material	Distribution System Pressure Zone	Location
Ground Storage	2 X 0.038 MG	Steel	Zone 2	1.5 mi SW of Bastrop PS S
Elevated Tank 1998	0.5 MG	Welded Steel	Zone 2	Weaver PS S
Ground Storage	2 X 0.316 MG	Steel	Zone 2	6 mi SW of Bastrop PS TU
Elevated	0.050 MG	Steel	Zone 2	1 mi of Sta. Watts PS Herrin
Elevated	0.250	Steel	Zone 2	N. of Cedar Cr PS X (Standby)
Standpipe	0.075 MG	Steel	Zone 2	PS Watterson
Standpipe	0.102 MG	Steel	Zone 2	PS Eskew
Elevated	0.075	Steel	Zone 2A	PS Nuse
Ground Storage	0.030 MG	Steel	Zone 2A	PS 812
Pressure Tank	0.0065 MG	Welded Steel	Zone 2A	PS 812
Ground Storage	0.021 MG	Steel	Zone 2A	E. of Red Rock PS Sand Hill
Ground Storage	0.031 MG	Steel	Zone 2A	E. of Red Rock PS Sand Hill
Pressure Tank	0.010 MG	Welded Steel	Zone 2A	E. of Red Rock PS Sand Hill
Standpipe	0.200 MG	Steel	Zone 2A	E. of Red Rock PS Sand Hill
Elevated	0.500 MG	Steel	Zone 2A	Pearce Lane at SH 71 PS Tx Hill
Elevated	0.25 MG	Steel	Zone 2A	Sw Bastrop Co. PS St. Mary's
Elevated	0.15 MG	Steel	Zone 2A	PS Watts
Ground Storage	0.094 MG	Steel	Zone 2A	Escondido PS XH

Table 1-9 Storage Reservoirs and Pressure Tanks – Zones 2 and 2A

The Texas Commission for Environmental Quality (TCEQ) has set guidelines, through the 30 Texas Administrative Code (TAC) Chapter 290 on minimum water system capacity requirements. There are three categories these rules regulate: source capacity (whether well water or surface water), storage capacity, and elevated storage capacity. Community water systems with more than 250 connections must provide 2 or more wells with a total capacity of 0.6 gpm per connection; a total storage capacity of 200 gallons per connection and an elevated storage capacity of 100 gallons per connection.



0 0.2 0.4 0.8 Miles

1:100,000

Sources:
Well information came from the Lost Pines Groundwater District, Texas Commission on Environmental Quality and the Texas Water Development Board.
Water system information for the Aqua Water Supply Corporation was provided by the WaterCad model maintained by Stegger & Bizzell.
Water system information for the City of Bastrop was based on existing system information in the Utility System Master Plan conducted by PBS&J.

Figure 1-2
Existing Water Distribution Systems and Well Locations

1.2.4 Water System Summary

Table 1-10 summarizes the water demand data for the study area.

Entity	Number of Connections	Average Daily Demand (MGD)	Max Day Demand (MGD)[3]	Peak Hour Demand (MGD) (1.25xMDD)[4]
Aqua Water	6,108 [1]	2.10 [2]	4.843	6.05
WCID#2	1,100	0.303	0.79	0.87
City of Bastrop	2,243	1.102	1.964	2.62

Table 1-10 Current Water Demand

[1] The number of connections for Aqua Water reflects their Zone 2 and 2A connections, which is slightly larger area than the study area.

[2] Billing data collected by Aqua Water is based on customer reporting and does not allow for accurate per connection demand calculations. Thus, a per capita assumption has been made on the average daily flow: 123 gpcd the Aqua WSC value from the TWDB *Draft Municipal Water Demand Projections by County, Utility, County-Other in Texas for 2010 - 2060* (www.twdb.state.tx.us/data/popwaterdemand/2003Projections/Demand%20Projections/Tables/HTMLTables/Municipal%20Demand_all.htm).

[3] Calculated based on multiplying the average daily demand by 2.3.

[4] Calculated based on multiplying the maximum daily demand by 1.25.

Tables 1-11 through 1-13 provide a summary of the water production capacity in the study area. For each table, the maximum number of connections, based on TCEQ guidelines, is also defined.

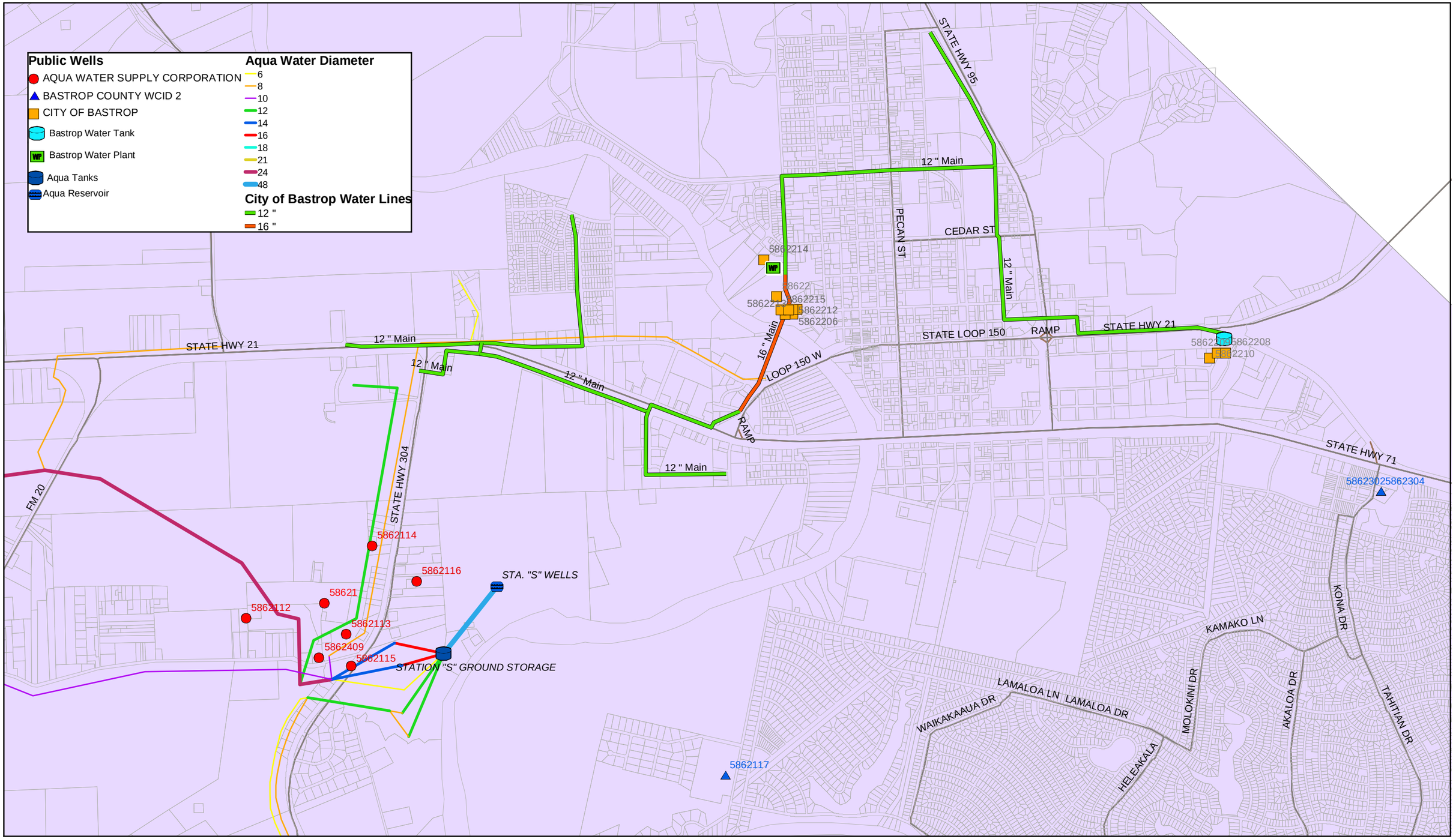
Well	Entity	Production Capacity	Maximum Number of Connections	% Capacity Utilized
Station "S" S-1 thru S-7	Aqua Water	4,670 gpm	7,750	79%
Wells 1-5	WCID#2	1,050 gpm	1,770	62%
	City of Bastrop	3,240 gpm	4,542	49%

Table 1-11 Current Well Capacity

Entity	Elevated Storage	Maximum Number of Connections	Total Storage	Maximum Number of Connections
Aqua Water	1.975 MG	23,700	3.656 MG	23,200
WCID#2	0.03 MG (pressure)		0.4 MG	
City of Bastrop	1.475 MG	14,705	2.475 MG	12,375

Table 1-12 Current Water Storage

Illustrated in Figure 1-3 are the location of these facilities, along with available distribution system data in the study area.



Sources:
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Water system information for the Aqua Water Supply Corporation was provided by the WaterCad model maintained by Stegger & Bizzell.
Water system information for the City of Bastrop was based on existing system information in the Utility System Master Plan conducted by PBS&J.

Figure 1-3
Existing Well Locations, by Provider and State ID

1.3 Wastewater Flows

For wastewater flow data, wastewater records from each entity were requested, as well as the number of connections that each entity serves in the study area. While the Bastrop County WCID#2 has wastewater customers, and is responsible for billing these customers, the flows from BC WCID#2 are treated by the City of Bastrop WWTP under an agreement with the City of Bastrop, LCRA, and BC WCID #2.

Entity	Number of Connections	Average Flow (MGD)	Peak Flow (MGD)
WCID#2	280	N/A	N/A
City of Bastrop	2,007	0.5907	1.108

Table 1-13 Current Wastewater Flows

No flow monitoring information was available within the study area.

Note, while there is a WWTP at McKinney Roughs, its flows are limited to the McKinney Roughs Nature Park and associated Learning Center.

1.4 Wastewater Treatment Capacity

For wastewater treatment systems, information on the capacity of each of the following components was requested: wastewater treatment, pumping facilities, and collection facilities for each entity. Tables 1-14 through 1-16 provide a summary of the City of Bastrop wastewater treatment capacity, the only wastewater treatment plant within the study area.

WWTP	Owner	Treatment Capacity
City of Bastrop	City of Bastrop	1.06 MGD permitted (will expand to 1.4 MGD in 2003)
McKinney Roughs	LCRA	0.25 MGD

Table 1-14 Current WWTP Facilities

WWTP	Owner	Treatment Capacity
Windmill Ranch	LCRA	Permit Issued (7/10/02) 0.50 MGD
The Colony	LCRA	Draft Permit Pending Three Proposed Phases: Initial 0.10 MGD; Interim 0.45 MGD; Final 0.90 MGD

Table 1-15 Proposed WWTP Facilities

Pumping Facilities	Entity	Capacity
Riverside Grove Lift Station	City of Bastrop	400 gpm
HEB Lift Station	City of Bastrop	450 gpm
River Lift Station	City of Bastrop	450 gpm
Tahitian Village Lift Station	City of Bastrop	450 gpm

Table 1-16 Current Pumping Facilities

Illustrated in Figure 1-4 are the locations of these entities along with the limited collection system information provided for this task.

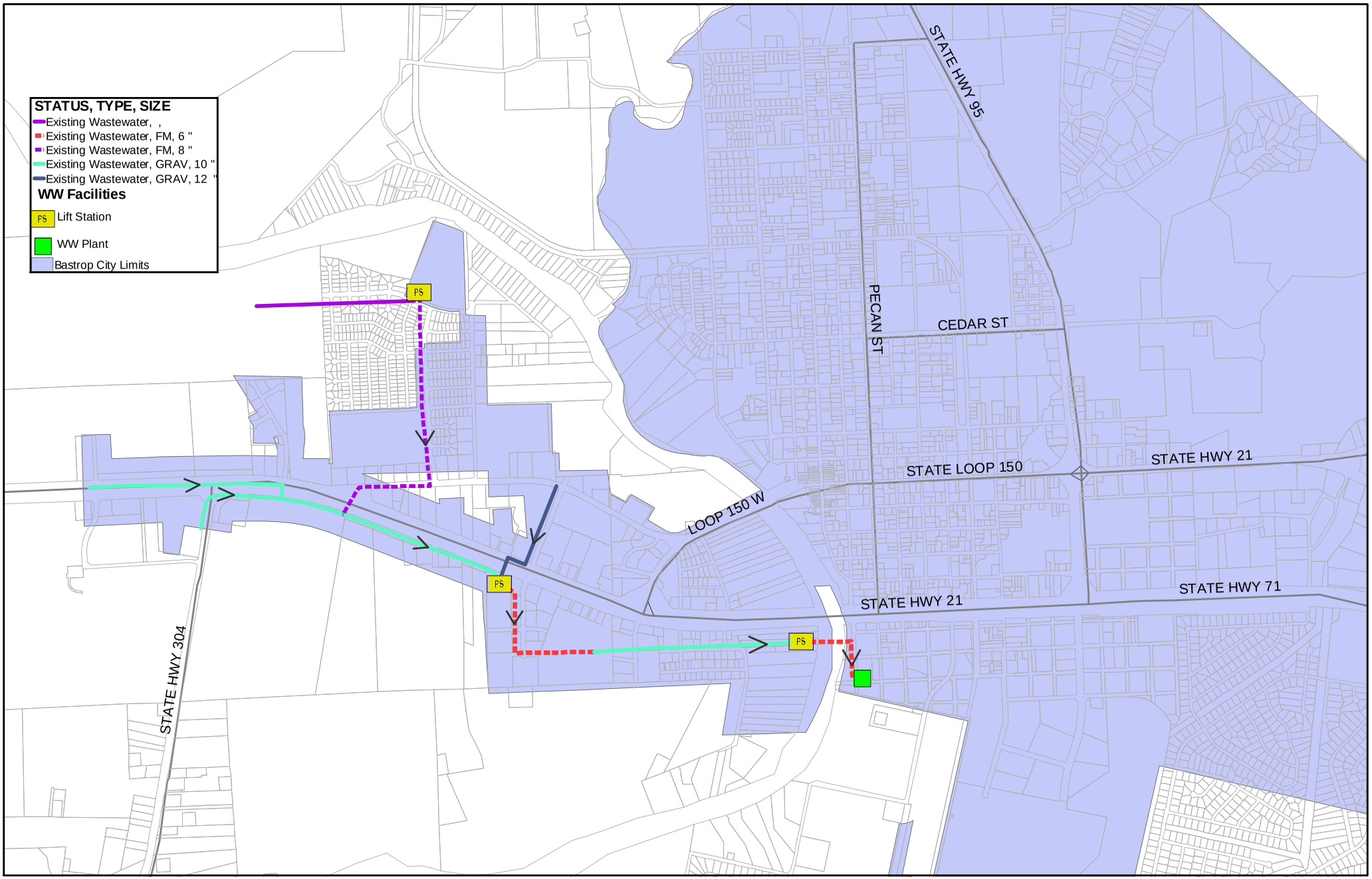


Figure 1-4
Existing Wastewater Collection Systems

Source:
Wastewater system information for the City of Bastrop was based on existing system information in the Utility System Master Plan conducted by PBS&J.

Section 2
Determination of Water and Wastewater Flows

This section provides an explanation of the water demands and sewer system flow values developed for this Master Plan. A description of the current population, water demands, and wastewater flows for the study area is first presented along with information on the residential developments currently underway. Using traffic serial zone data for population projections in 5-year increments through 2030, the development of future land use and future flows is described.

2.1 Existing Conditions

2.1.1 Population

The population of Bastrop County has experienced significant growth over the past decade. Figure 2-1 illustrates the population growth that has occurred within the study area since 1990.

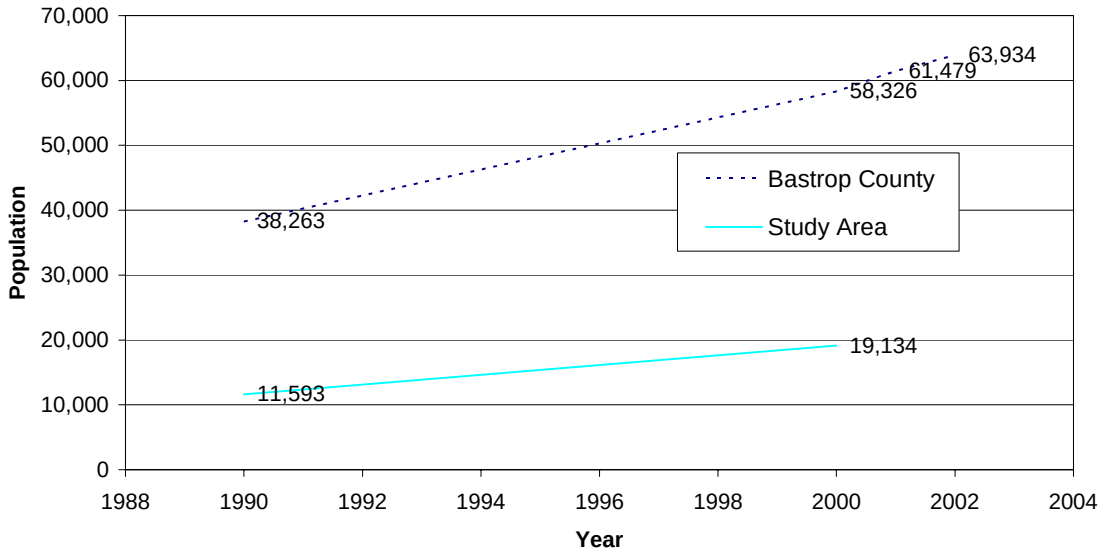


Figure 2-1 Population Growth in the Study Area
Source: US Census and CAPCO TSZ data

2.1.2 Current Water Demands

As indicated by the entities involved, the current number of water connections in the area is 9,500. The average demand per connection varied significantly between the three entities: City of Bastrop water use is 491 gpd per connection, while the Bastrop County WCID #2 average demand per connection is 276. Aqua Water average water demand was based on TWDB data, which estimated it at 123 gallons per capita per capita per day (gpcd), or 344 gpd per connection [The average household size according to the 2000 census data is 2.8 people per household]. The City of Bastrop number is understandably higher than the other two entities, as they have a large

commercial customer base. The BC WCID#2 per connection demand would translate into a per capita flow of 99 gpcd, which, while in the range of values often seen in literature, appears a little low for the type of growth anticipated in this region. For the purposes of this study, 125 gpcd, or 350 gpd per connection, will be used for Aqua Water and BC WCID #2, and 496 gpd per connection will be used for the City of Bastrop for determination of average daily demand.

However it is not only average daily flow values that need to be estimated. TCEQ requires water providers to have 0.6 gpm per connection of secure raw water capacity. The study participants have selected 0.8 gpm per connection as their max day target; because it better reflects the type of growth that is occurring in the study area.

2.1.3 Current Wastewater Flows

Base Wastewater Flows

As indicated by the entities involved, the current number of wastewater connections in the area is 2,300 and the average wastewater flow per connection is 294 gpd. Using the assumption of 2.8 people per connection, the per capita wastewater flow is 105 gpcd. This served as the 2003 base.

Infiltration / Inflow Assumptions

Unfortunately, there has been no flow monitoring efforts in the area, thus infiltration / inflow data is unavailable. The City of Bastrop provided the peak flows that they have observed at their treatment plant, often seeing peaking factors of 2, but sometimes as high as 3 times average daily flows. Without more data, a study specific I/I factor for the area is difficult to determine. The methodology used in the Lower Brushy Creek Wastewater Master Plan is being suggested for use in this study:

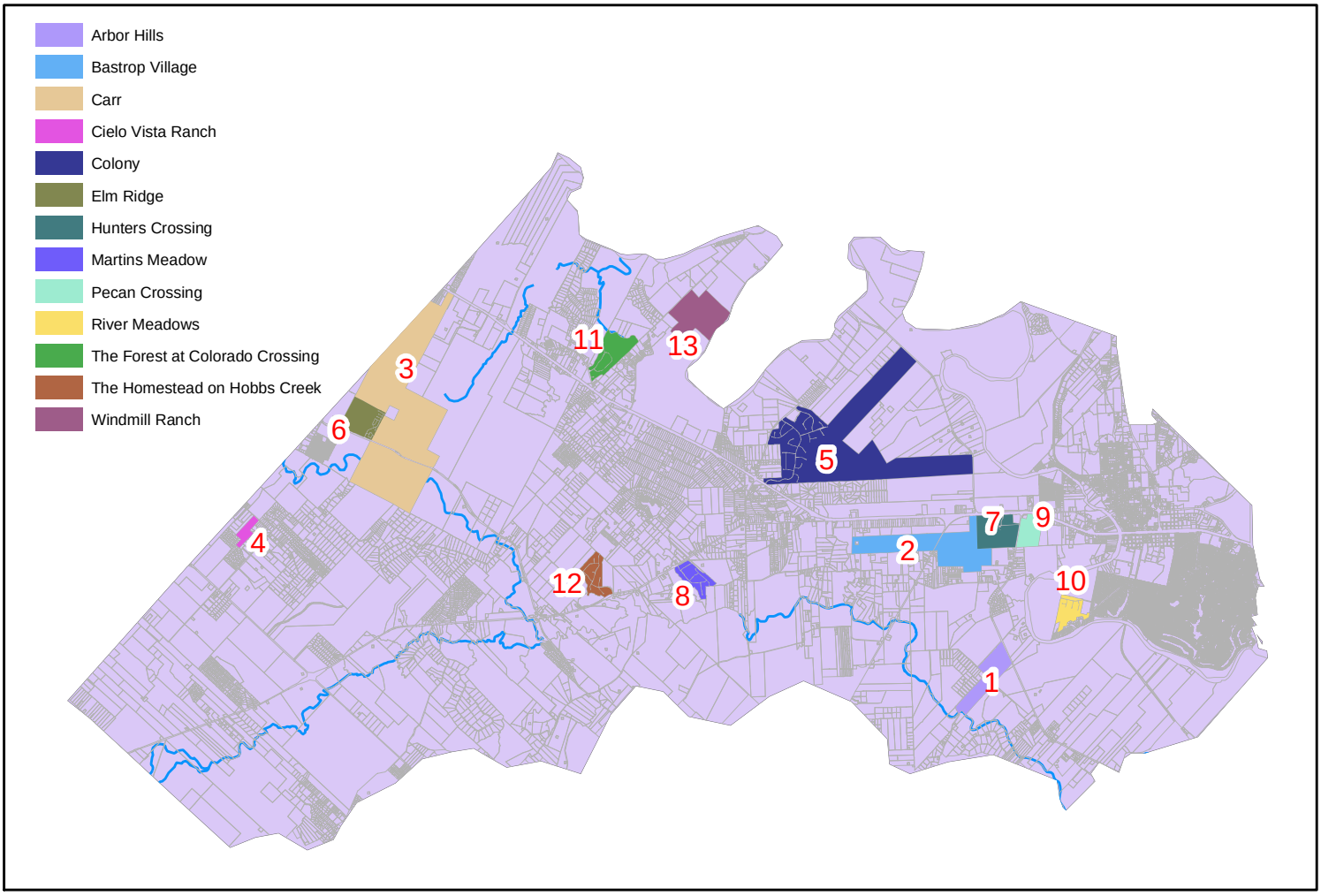
- Base wastewater flow (not including infiltration) was assumed to be 105 gpcd.
- Peak dry weather flow was calculated using the formula

  $Q_{peak\text{-}dry}=(18+(0.0206*Q_{BWWF})^{.5})/(4+(0.0206*Q_{BWWF})^{.5})\ X\ Q_{BWWF}$

  where Q is in gpm.
- Peak wet weather flow was calculated as

  $Q_{peak\text{-}wet}= Q_{peak\text{-}dry} + 750$ gpad

  where gpad is gallons per acre per day.
- Pipes should not exceed 80 percent capacity at the peak wet weather flow.



Source: BISD report, conducted by DeskMap and Conversations with Project Particpants.

Figure 2-2 Proposed Developments

		Current Parcels	Total LUEs	% Subdivided	Acreage	Buildout Assumptions
1	Arbor Hills	55	108	51%	271	by 2005
2	Bastrop Village (Weaver Tract I&II)		2,500	0%	710	First 1,000 by 2015; second phase by 2030
3	Carr	10	8,000	0%	2,324	First homes in 2020, build out by 2035
4	Cielo Vista Ranch		130	0%	60	by 2010
5	Colony	274	4,000	7%	1,343	by 2015
6	Elm Ridge	241	860	28%	234	by 2015
7	Hunters Crossing		1,162	0%	278	by 2025
8	Martins Meadow	110	110	100%	139	by 2005
9	Pecan Crossing		400	0%	144	by 2020
10	River Meadows	50	120	42%	132	by 2015
11	The Forest At Colorado Crossing	56	99	57%	233	by 2005
12	The Homestead On Hobbs Creek	124	124	100%	166	by 2005
13	Windmill Ranch (Woodbine)		1,732	0%	408	by 2015
	Total	**920**	**19,345**		**6,442**	

Source: BISD report, conducted by DeskMap and Conversations with Project Particpants.

Table 2-1 Proposed Developments

2.2 Future Development Underway

Over the past few years there has been a dramatic increase in subdivision development in the study area. While some of these developments have been completed and are already being served water by Aqua Water, there are still nearly 15,000 lots where developers anticipate building in the near future. Bastrop ISD recently funded a demographic study, conducted by DeskMap, which included a tabulation of all future developments in the area. Figure 2-2 illustrates the location of the subdivisions presently being developed. A summary of the size and status of these subdivisions is provided in Table 2-1.

2.3 Future Conditions

2.3.1 Population

Three sources of population projections at a county level were available: the CAPCO traffic serial zone (TSZ) projections, the Texas Water Development Board (TWDB), and the projections from the Texas State Data Center. These three published population projections are shown in Figure 2-3.

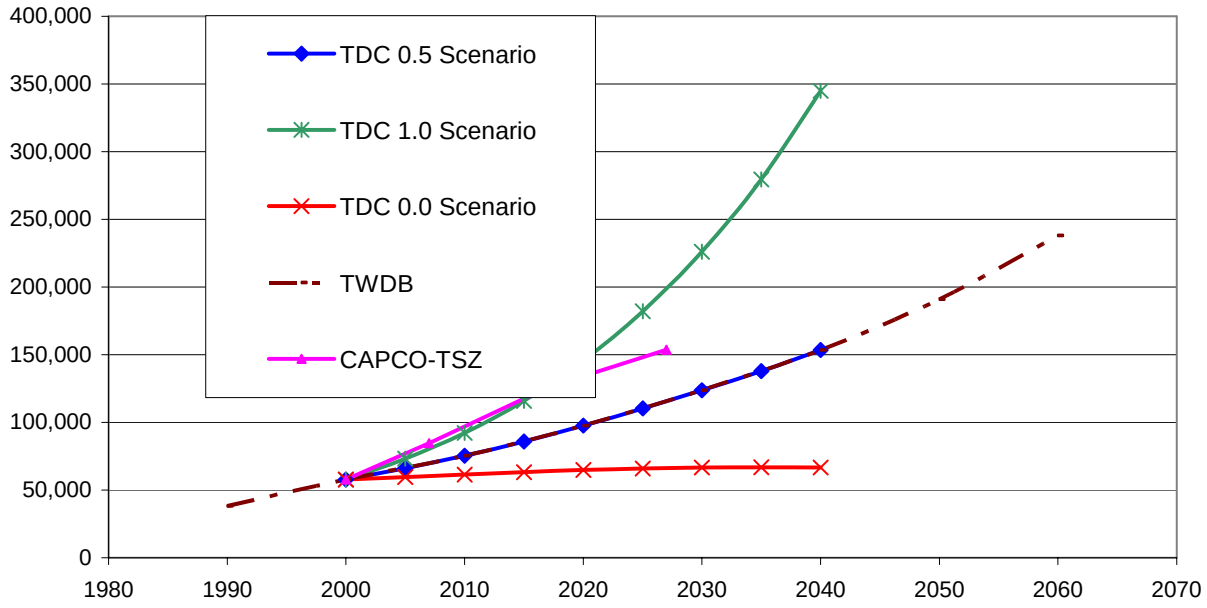


Figure 2-3 Bastrop County Population Projections

One of these projections, the CAPCO TSZ projections, is available in smaller geographical divisions, known as Traffic Serial Zones (TSZ). Using the population densities of the TSZs in the study area, a smaller, study area population projection was calculated. The TSZs of the study are shown in Figure 2-4.

The TSZ study area population projections are compared with the developments currently underway in Figure 2-5. The development data and build out assumptions from Table 2-1 were the basis for population projections. The timing of the developments might vary from the build out assumption presented in Table 2-1, but as can be seen in Figure 2-5, if these assumptions are used, they match the TSZ projections. A brief comparison between historic Bastrop and Williamson County growth rates can be found in the appendix.

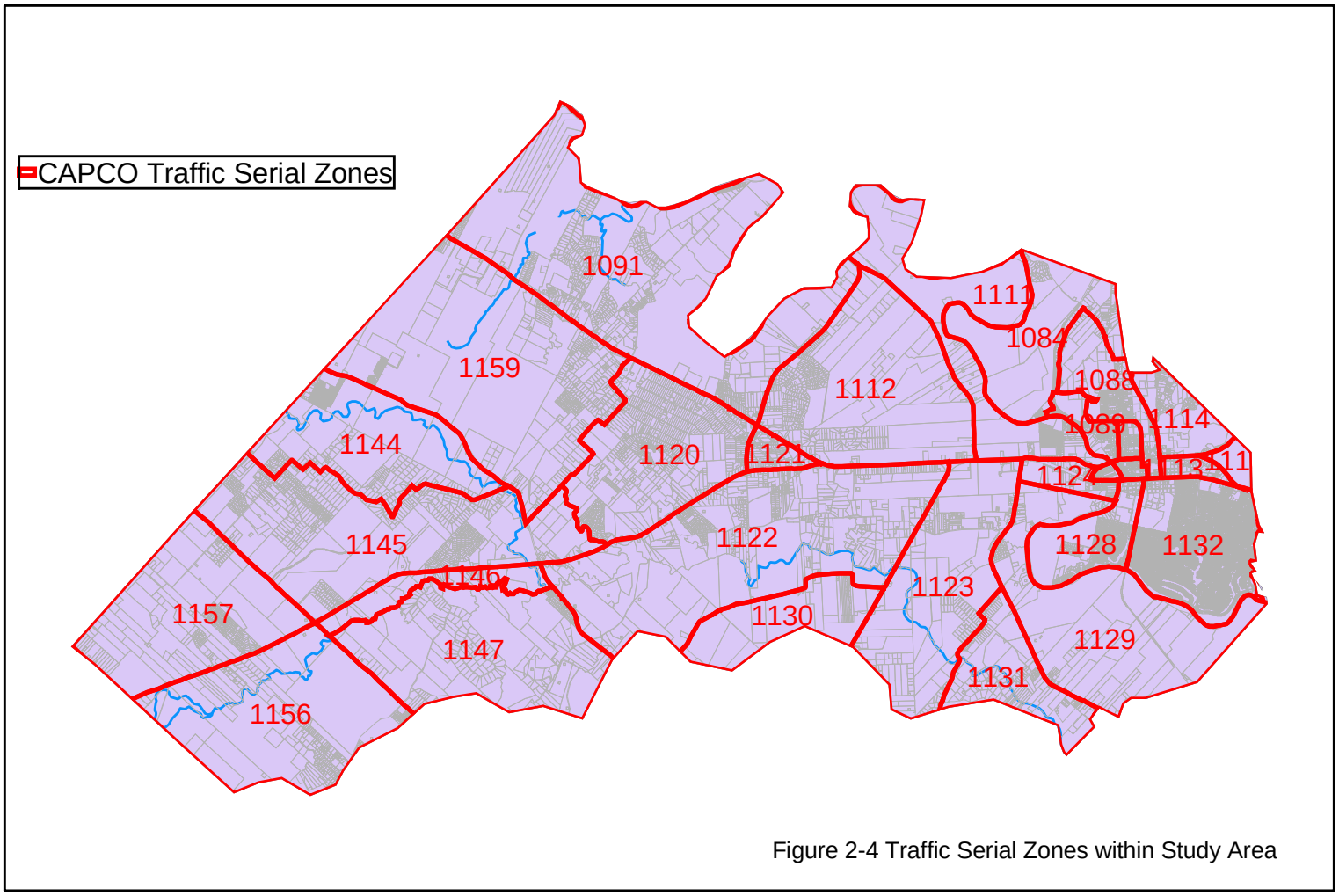


Figure 2-4 Traffic Serial Zones within Study Area

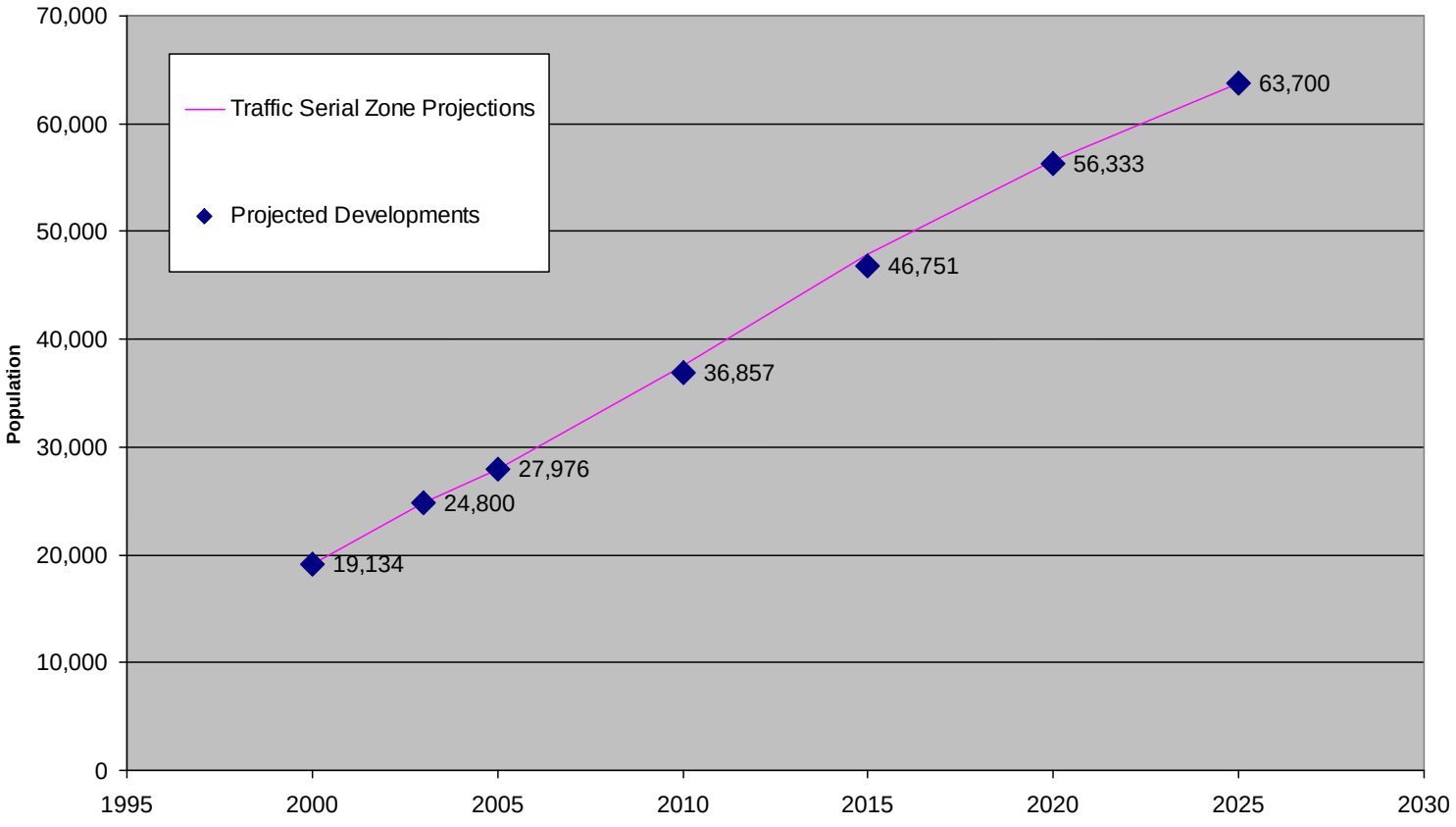


Figure 2-5 Study Area Population Projections

Figure 2-6 illustrates the current parcel division in the study area, with the current developments highlighted. Any single parcel labeled as large development being converted into single family homes would obviously change the development patterns in the study area. However, whichever parcels develop, the pattern will remain the same, that the denser, suburban development, beyond that development just to the west of Bastrop is very spread out – both in terms of distance, but also in terms of natural drainage patterns, as illustrated by the sewersheds in Figure 2-6.

Figures 2-7 through 2-14 illustrate the growth patterns projected for the study period. In addition to the large subdivision development, not reflected on the maps, there is projected to by some infilling in the Tahitian Village Subdivision (approximately 5,000 new people over the course of the 30-yr study period). Likewise there will be limited infilling in the eastern part of the Bastrop City limits, east of the river and north of Highway 71 (an increase of 3,000 people to this population).

Watersheds

Proposed Development

Parcel Size & Description

0-1 Acres: High Density

1-10 Acres: Medium Density

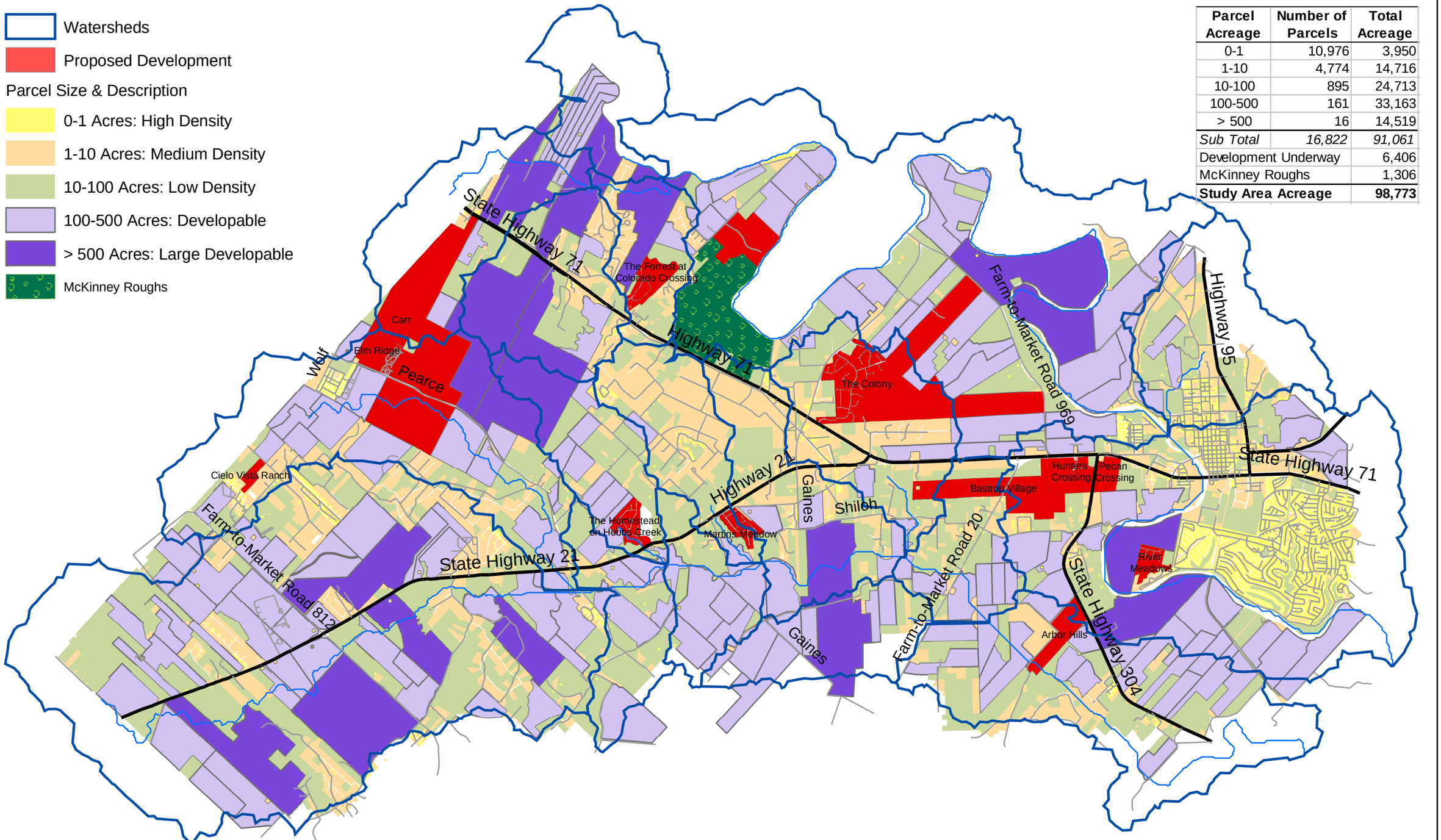
10-100 Acres: Low Density

100-500 Acres: Developable

> 500 Acres: Large Developable

McKinney Roughs

Parcel Acreage	Number of Parcels	Total Acreage
0-1	10,976	3,950
1-10	4,774	14,716
10-100	895	24,713
100-500	161	33,163
> 500	16	14,519
Sub Total	*16,822*	*91,061*
Development Underway		6,406
McKinney Roughs		1,306
Study Area Acreage		**98,773**



N W E S

0 1.25 2.5 5 Miles

1:100,000

Figure 2-6 Parcel Size and Distribution

CDM

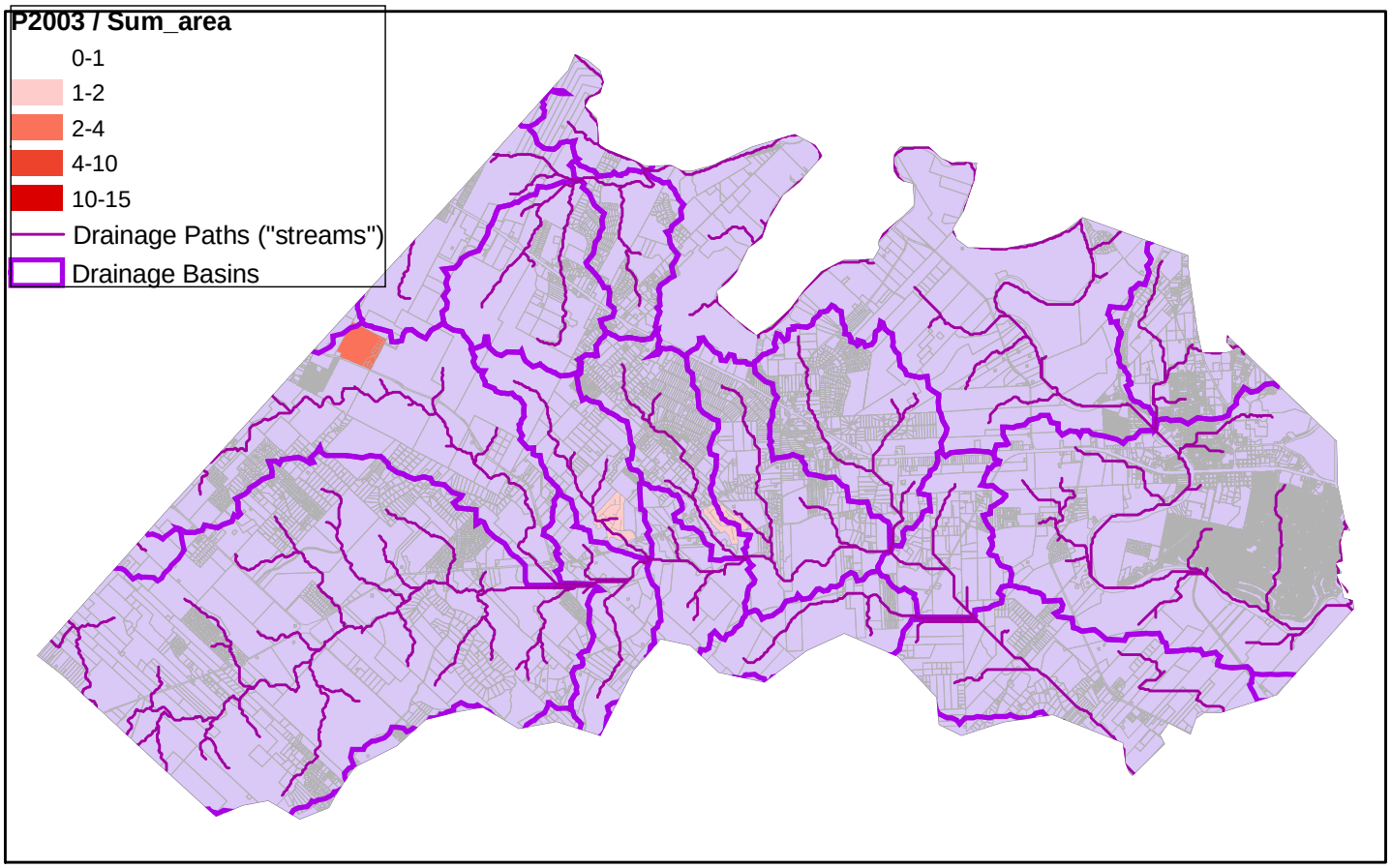


Figure 2-7 New Development, 2003

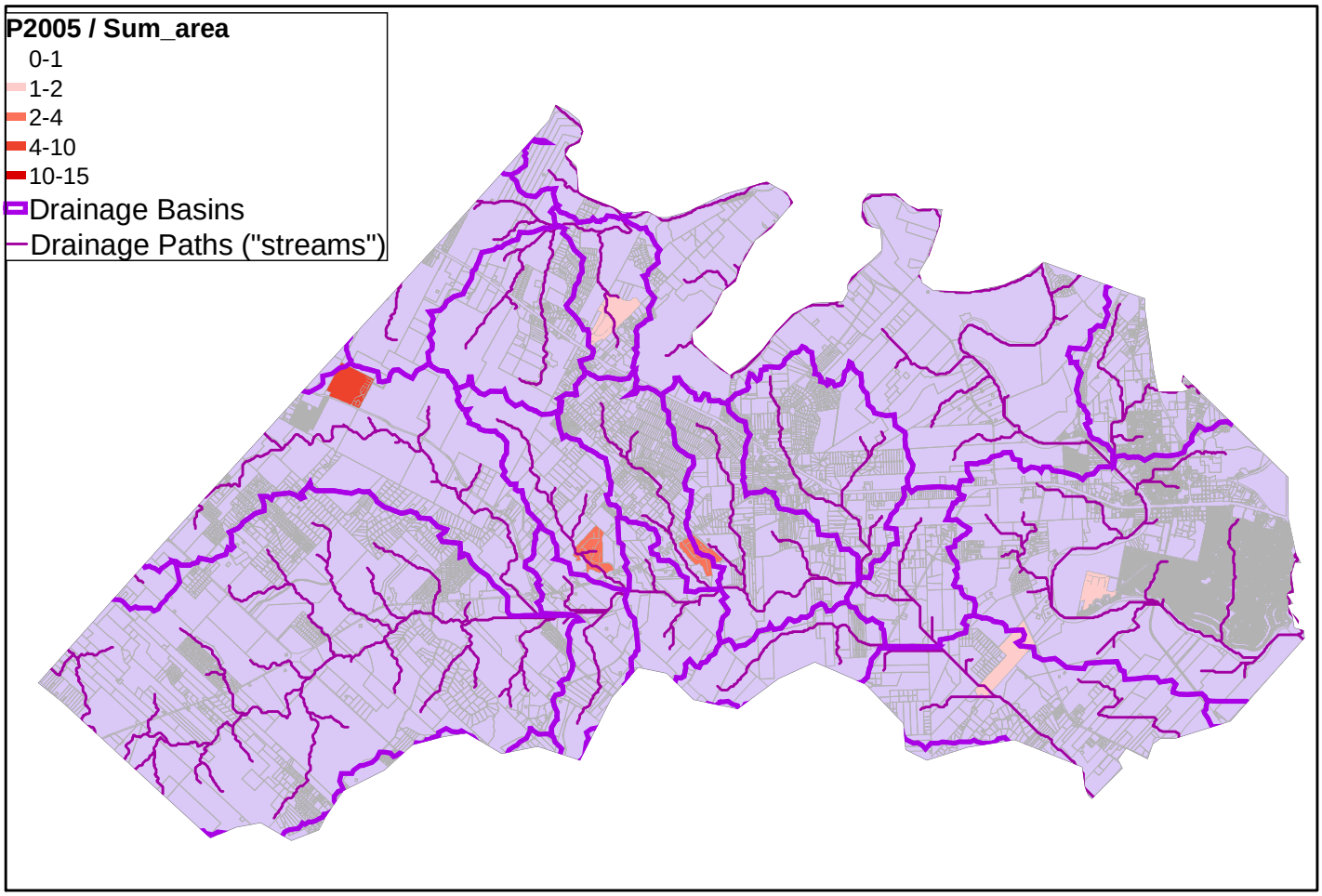


Figure 2-8 New Development, 2005

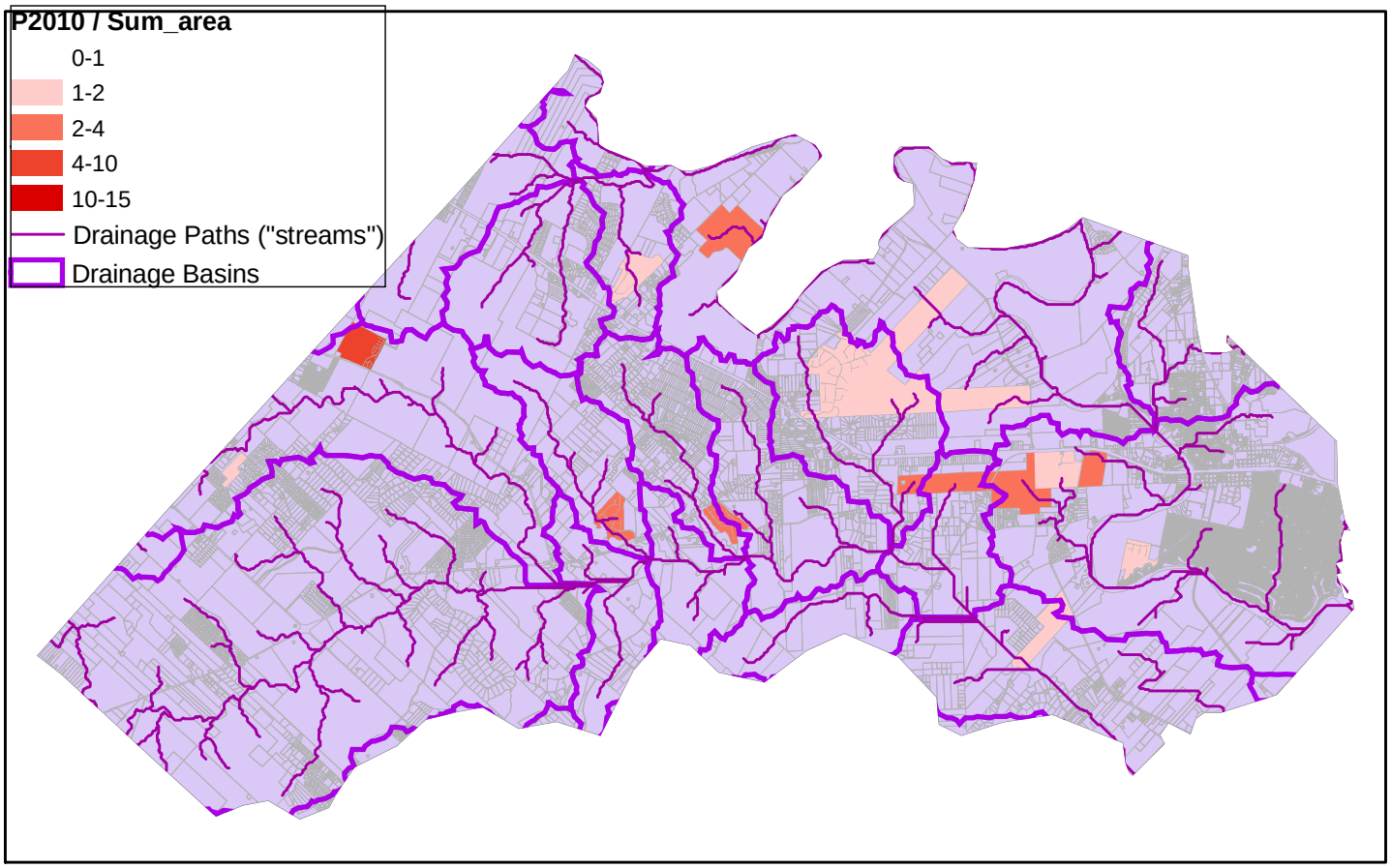


Figure 2-9 New Development, 2010

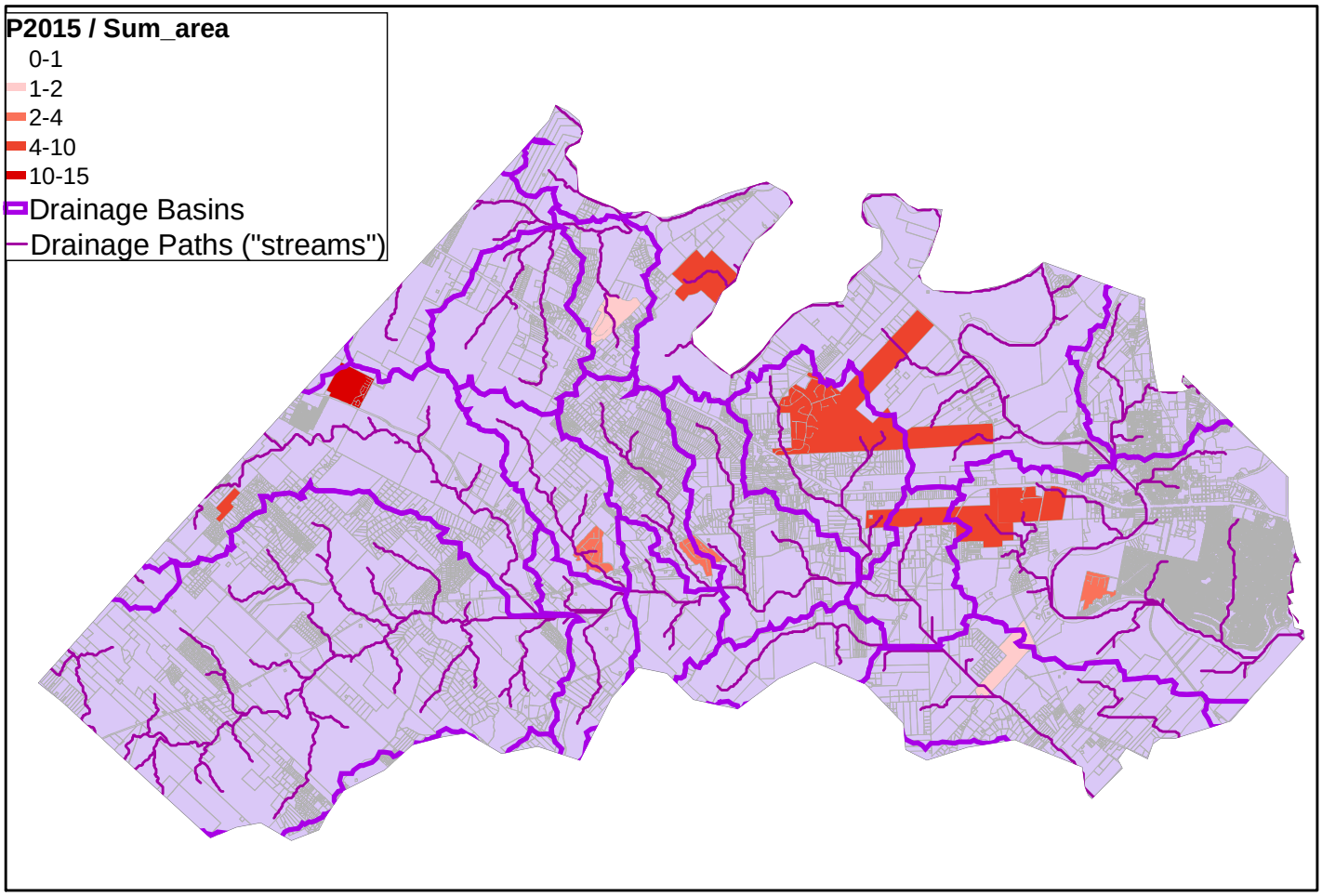


Figure 2-10 New Development, 2015

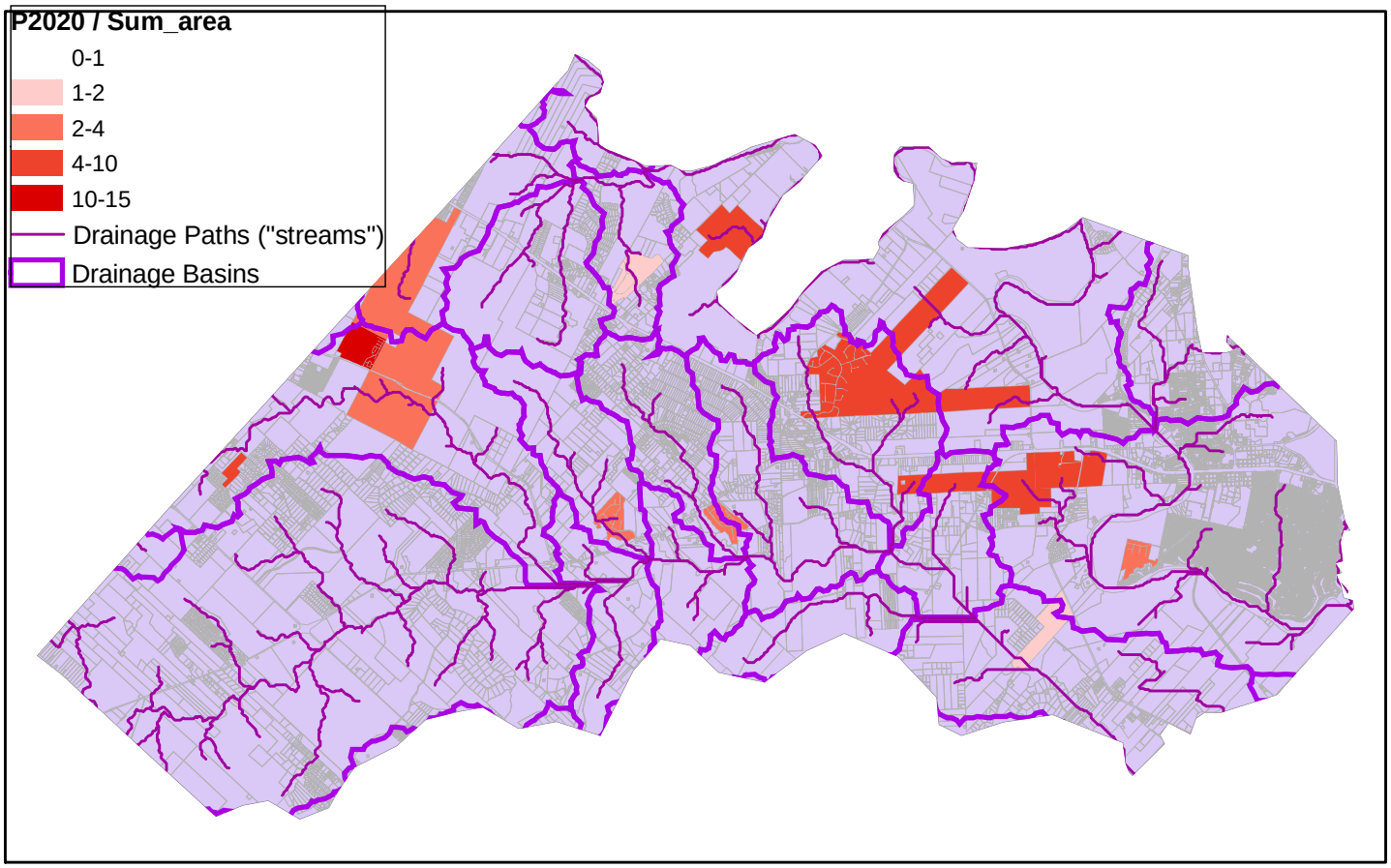


Figure 2-11 New Development, 2020

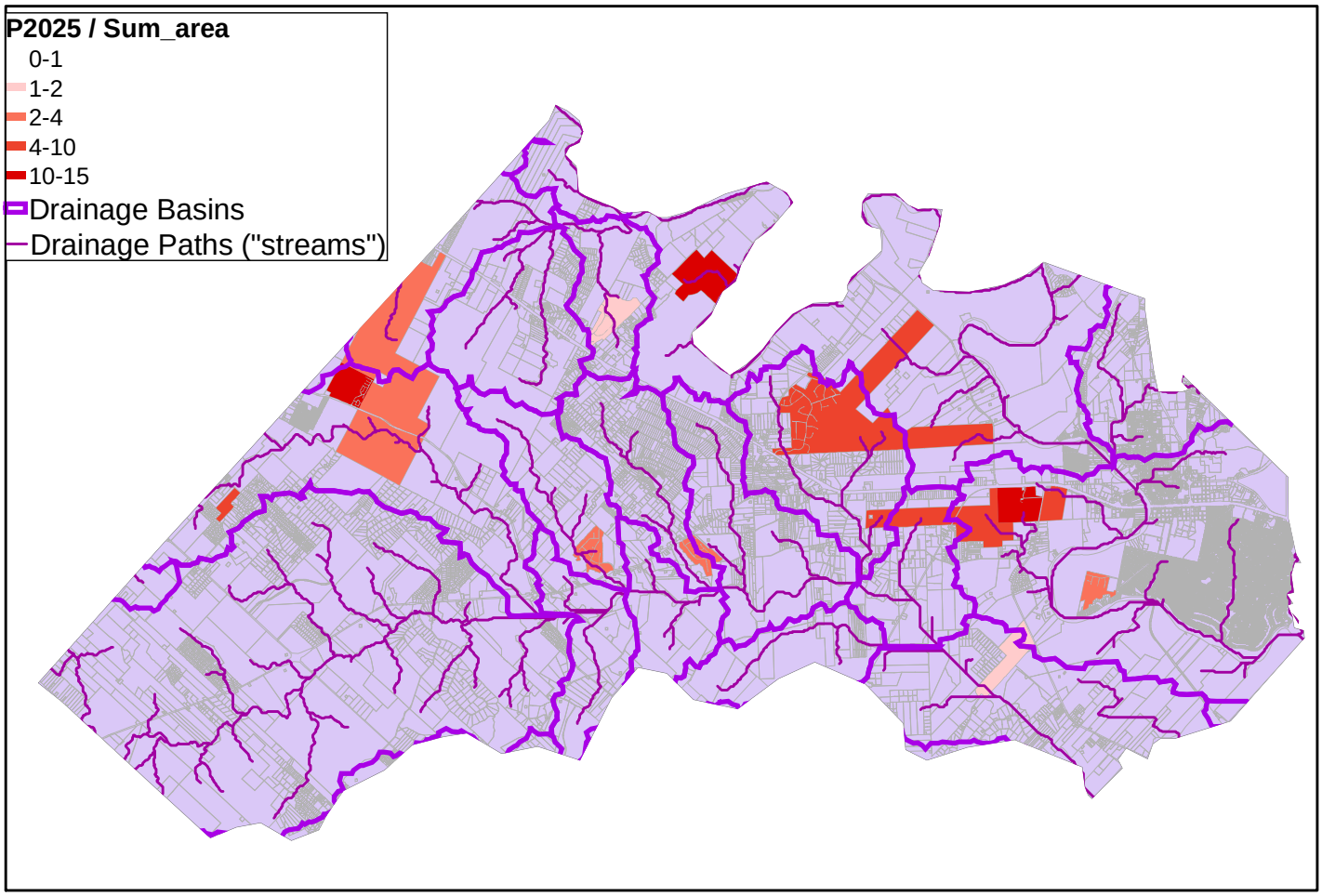


Figure 2-12 New Development, 2025

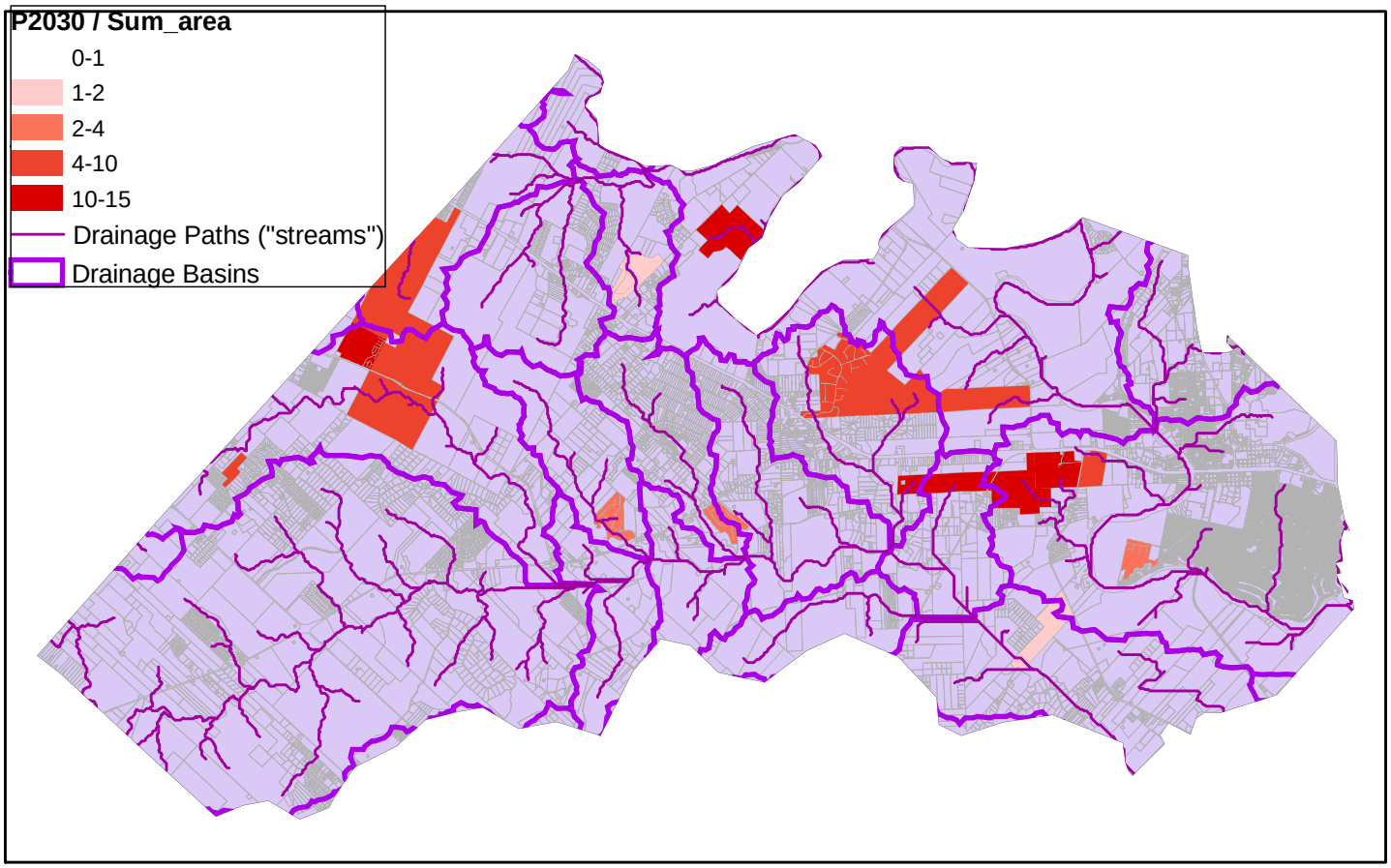


Figure 2-13 New Development, 2030

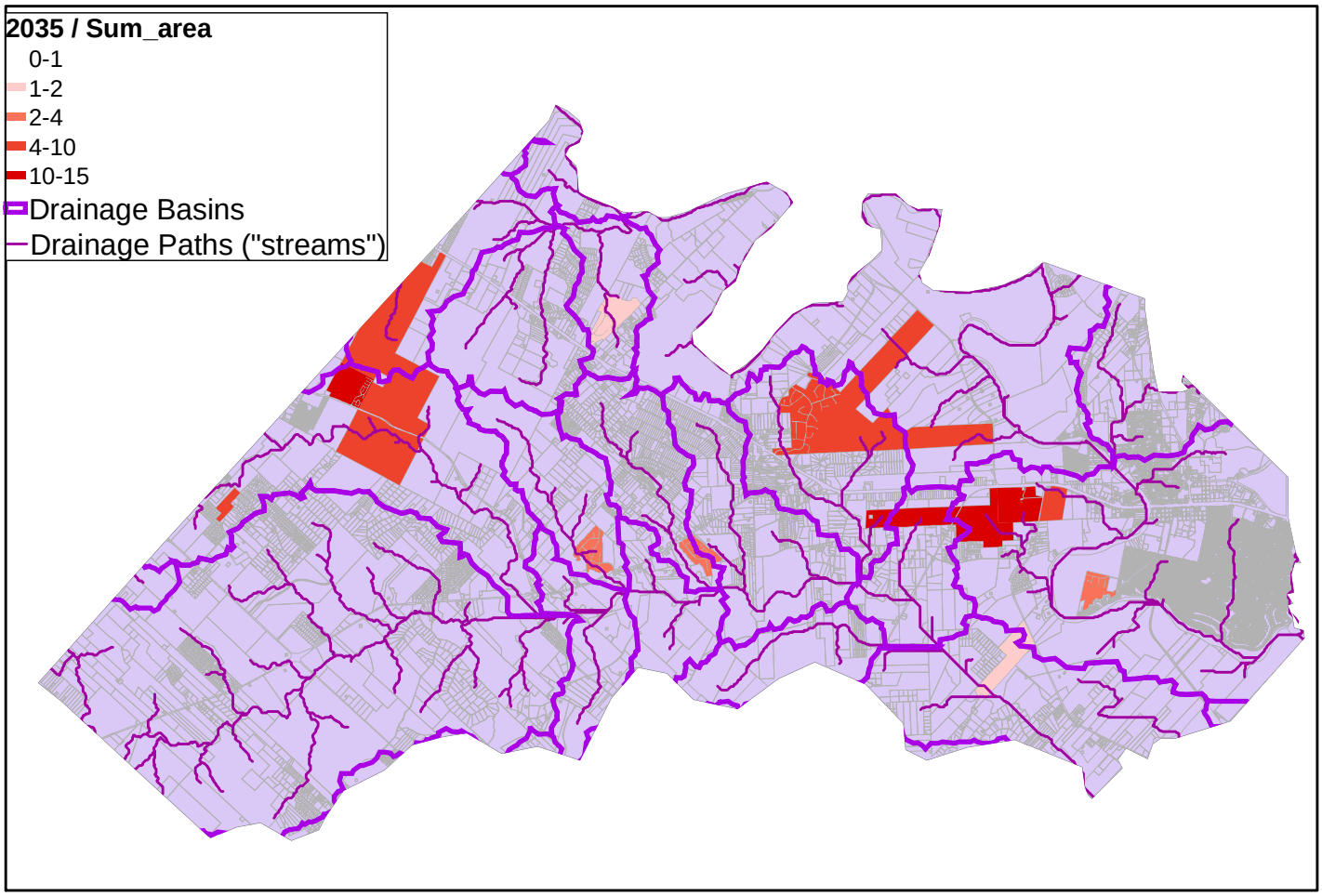


Figure 2-14 New Development, 2035

2.3.2 Projected Water Demands

Based on the TSZ population projections presented in the previous section, the location of proposed developments, and a review of other studies in the area, the population projections developed in the last section were divided between the water providers, as shown in Table 2-2 and illustrated in Figure 2-15.

Population Projections by Water Provider	2003	2005	2010	2015	2020	2025	2030	2035	2060
AquaWater [1]	15,400	*17,400*	23,900	*32,300*	39,000	*43,900*	49,400	*55,800*	*105,000*
WCID#2 [2]	3,100	3,300	3,800	4,400	5,100	5,900	6,800	7,900	12,000
City of Bastrop [3]	6,300	7,200	9,900	*11,200*	12,500	*13,900*	*15,200*	*16,500*	25,100
SubTotal	**24,800**	**27,900**	**37,600**	**47,900**	**56,600**	**63,700**	**71,400**	**80,200**	**142,100**

Table 2-2 Population projections by water provider

Notes: [1] Aqua Water population was based assumptions from Malcolm Pirnie's July 1999 Water Supply Cost Evaluation Technical Memorandum.
[2] WCID#2 values were based on the assumption of a continued 3% rate of infilling / year.
[3] City of Bastrop population was based on PBS&J's March 2002 West Bastrop Growth Area Utility Master Plan. For years not provided, the population was interpolated based on the neighboring data points.
[4] The population projections for the Traffic Serial Zone projections were given for the following years: 2000, 2007, 2017, 2027. The population was interpolated based on the neighboring data points.
[5] Colony MUD and Garfield MUD populations are included in Aqua Water's Population projections, as they fall within Aqua's CCN.

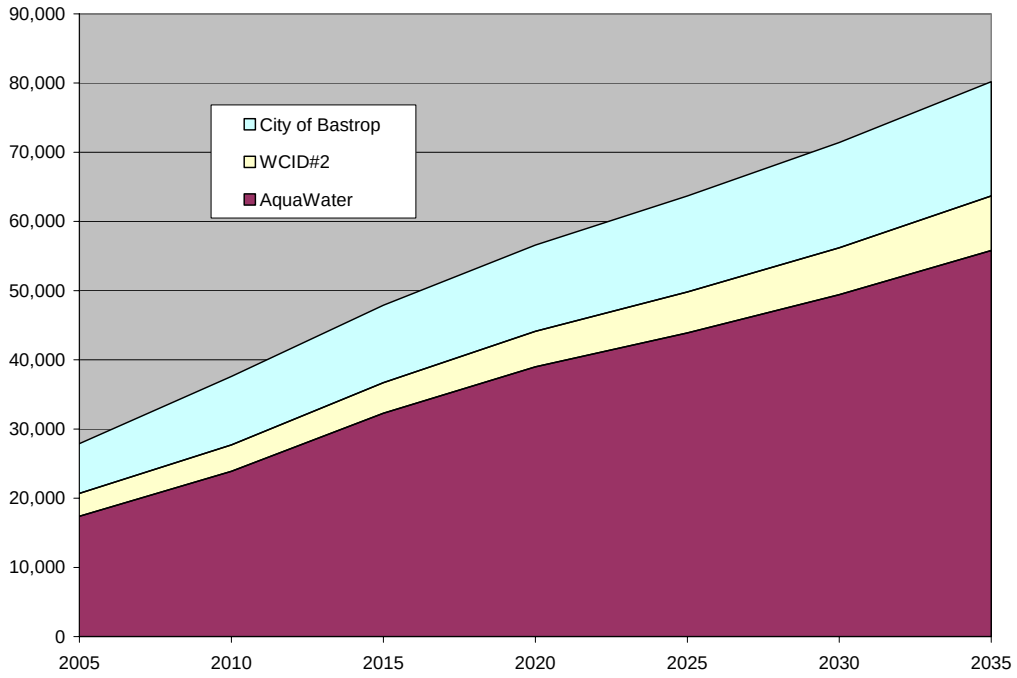


Figure 2-15 Population Projections by Water Provider

2.3.3 Projected Wastewater Flows

Based on the TSZ population projections presented in the previous section, the location of proposed developments, and a review of other studies in the area, the population projections developed in the last section were divided between the probably wastewater service areas, as shown in Table 2-3 and illustrated in Figure 2-16.

Population Projections by Wastewater Provider	2003	2005	2010	2015	2020	2025	2030	2035
OSSF	18,491	18,833	23,219	23,006	23,391	24,662	24,306	24,706
Bastrop	5,820	6,320	9,010	11,300	14,615	16,444	18,500	18,700
Elm Ridge	489	1,247	1,871	2,494	2,494	2,494	2,494	2,494
Garfield MUD					5,000	9,000	15,000	23,200
The Colony		1,500	3,500	11,100	11,100	11,100	11,100	11,100
	24,800	**27,900**	**37,600**	**47,900**	**56,600**	**63,700**	**71,400**	**80,200**

Table 2-3 Population Projections By Wastewater Service Area

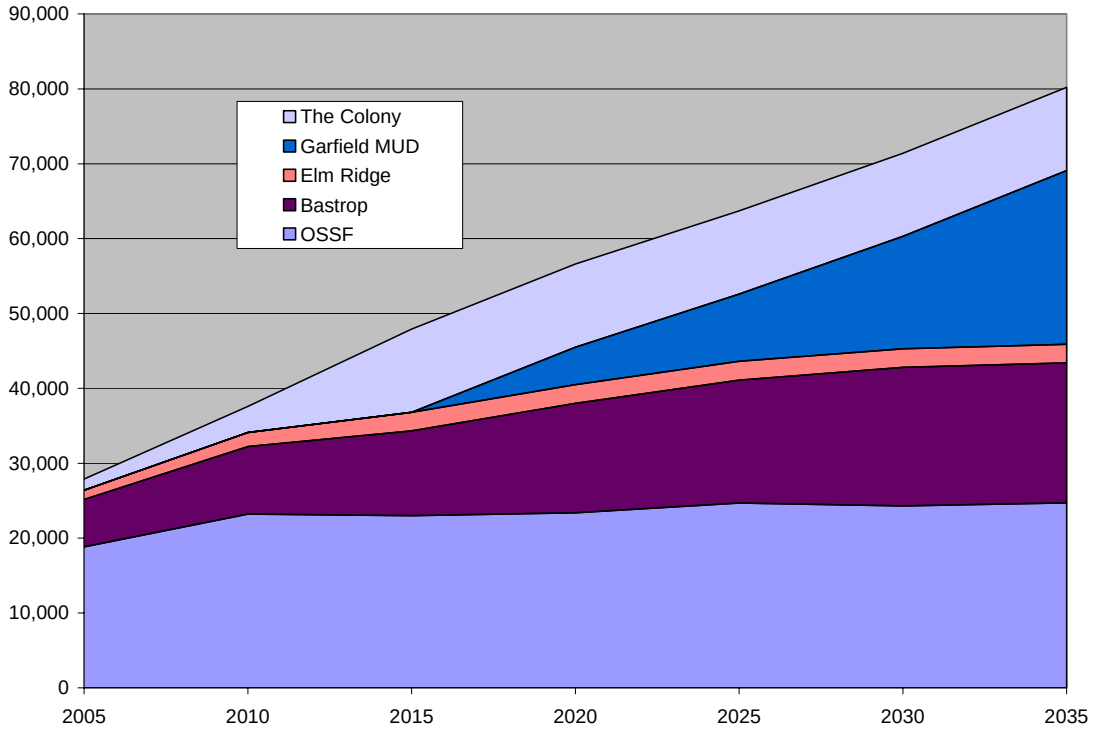


Figure 2-16 Population Projections by Wastewater Service Area

Section 3
Jurisdictional Regional Utility Service Plan Development

This section provides a review of existing organizational structures, and evaluates current and alternative arrangements, including entities becoming a retail & wholesale provider with inter-municipal agreements with other participants.

3.1 Entities and Roles

Texas has many types of entities that can provide water and wastewater service, with the Western Bastrop study area being no exception. The authority and rights of each of these entities are established in the Texas Water Law, with the exception of the Water Supply Corporations, which are organized under Article 1434(a), Vernon's Texas Codes Annotated. The following entity types currently exist in the study area, with a review of each entities authority to serve water and wastewater service needs and raise capital:

Water Supply Corporation (WSC):

Aqua Water Supply Corporation is the only WSC in the study area. WSCs are non-profit, member –owned and member-controlled corporations organized under Article 1434(a), Vernon's Texas Codes Annotated. As such, WSCs are subject to the laws and regulations governing the operations of non-profit corporations. In most cases, the funding to construct WSC's water plants and pipelines comes from loans provided by the Rural Economic and Community Development Service or the Texas Water Development Board. Aqua Water's primary source of funding for capital projects is a cooperative bank. CoBank is a farm credit system serving the agribusiness, rural communications, energy and water systems. The funds to finance CoBank loans come from the sale of Farm Credit System securities to investors in the national and international money markets. Due to the market acceptance and attractiveness of Farm Credit securities, CoBank can offer competitive interest rates. Loan repayments and daily operational costs are generally paid off with revenue from water sales. Reserve funds established by capital recovery fees, developer contributions and other forms of private finance are other means of developing the water system. The WSC's board of directors sets the WSC's rates. The rates set by the board of directors are not subject to review or approval by the TCEQ unless ten percent of the ratepayers petition the TCEQ to review the board's decision changing rates. (Source: *Water Supply Corporations Frequently Asked Questions*, TNRCC, 1995, www.tnrcc.state.tx.us/admin/topdoc/gi/047.pdf)

Municipality: City of Bastrop

The City of Bastrop is an incorporated city, as stated in its home rule charter: "The City shall be a **home rule city, with full power of local self-government**, including the right to amend this Charter. It shall have all the powers possible for a city to have under the constitution and the laws of the State of Texas, together with all the implied powers necessary to carry unto execution all the powers granted.

In keeping with state law, the City shall have the **power to borrow money on the credit of the City for any public purpose** not now or hereafter prohibited by state law and shall have the right to issue all general obligation bonds, revenue bonds, funding and refunding bonds, time warrants and other evidence of indebtedness as now authorized or as may be authorized to be issued by cities in Texas. … The Council **shall have the power under the provisions of state law to levy, assess and collect an annual tax** on taxable property within the City not to exceed the maximum limits set by the Constitution and laws of the state of Texas." The Texas Local Government Code, Title 13 Water and Utilities, Chapter 402 specifically allows a municipality to own and operate water and wastewater system inside and outside their corporate boundaries. (www.cityofbastrop.org/homerulecharter.htm)
(www.capitol.state.tx.us/statutes/lgtoc.html)

Water Control Improvement District (WCID):

The two WCIDs in the study area are Bastrop County WCID #2, serving Tahitian Village, and BC WCID#3, serving Elm Ridge. The statute governing WCIDs is the Texas Water Code, Chapter 51. WCIDs have broad authority to supply and store water for domestic, commercial, and industrial use; to operate sanitary wastewater systems; and to provide irrigation, drainage, and water quality services. Like most districts, WCIDs have the power to incur debt, levy taxes, charge for services and adopt rules for those services, to enter contracts, to obtain easements and to condemn property. WCID's do, however, require voter approval for revenue bonds. (Source: *Water Disctrict Update*, TNRCC, February 1999, www.tnrcc.state.tx.us/permitting/waterperm/ud/99-01.pdf and *Texas Water Districts: A General Guide*, TNRCC, March 2000 www.tnrcc.state.tx.us/admin/topdoc/gi/043.pdf)

Municipal Utility District (MUD):

While there are no MUDs presently functioning in the study area, two MUDs were approved in the last State Legislature (78th session) which still must be approved by the City of Bastrop, as they are within the City's ETJ. These MUDs are the Colony, which will serve the Colony development, and Garfield, which will serve the Carr property.

The statute governing MUDs is the Texas Water Code, Chapter 54. Under this statute, MUDs may engage in the supply of water, conservation, irrigation, drainage, fire fighting, solid waste (garbage) collection and disposal (including recycling activities), wastewater (sewage) treatment, and recreational facilities. A MUD has taxing

authority and is often used by developers to recover a portion of their initial investment without having to add the total cost of infrastructure to the lot price. A publicly elected Board of Directors manages and controls all of the affairs of the MUD subject to the continuing supervision of the TCEQ. The Board establishes policies in the interest of its residents and utility customers. A MUD may adopt and enforce all necessary charges, fees and taxes in order to provide district facilities and service.

(Source: *Water Disctrict Update*, TNRCC, February 1999, www.tnrcc.state.tx.us/permitting/waterperm/ud/99-01.pdf and *Texas Water Districts: A General Guide*, TNRCC, March 2000 www.tnrcc.state.tx.us/admin/topdoc/gi/043.pdf)

River Authority:

The River Authority in the study area is the Lower Colorado River Authority (LCRA). LCRA is a Texas conservation and reclamation district operating with no taxing authority.

River authorities are "special law" districts that operate major reservoirs and sell untreated water on a wholesale basis. They may have responsibility for flood control, soil conservation, and protecting water quality. Many river authorities also generate hydroelectric power, provide retail water and wastewater services, and develop recreational facilities. Most river authorities have no authority to levy a tax, but can issue revenue bonds based on the revenues projected to be received from the sale of water or electric power. (Source: *Water Disctrict Update*, TNRCC, February 1999, www.tnrcc.state.tx.us/permitting/waterperm/ud/99-01.pdf and *Texas Water Districts: A General Guide*, TNRCC, March 2000 www.tnrcc.state.tx.us/admin/topdoc/gi/043.pdf)

Groundwater Conservation District (GCD):

While not a district created to provide water and wastewater in the service area, the Lost Pines Groundwater District will increasingly have a role to play in groundwater supply in the region. In 1997 the Texas Legislature, in passing Senate Bill 1, expressly recognized groundwater conservation districts as the state's preferred method of groundwater management. The first GCD was created in 1949 over the Ogallala aquifer in the Texas Panhandle. Presently, there are 67 confirmed districts and 20 that still need to be confirmed by voters through local elections. Every confirmed groundwater conservation district in Texas is statutorily required (Texas Water Code 36.1071 and 36.1072) to develop, and have certified by the TWDB, a comprehensive groundwater management plan that addresses groundwater management goals for the district. These goals include: providing for the efficient use of groundwater; controlling and preventing the waste of groundwater; controlling and preventing subsidence; addressing conjunctive water management, drought and natural resource issues; and groundwater conservation. (Source www.twdb.state.tx.us/gcd%20web.htm)

3.1.1 Aqua Water Supply Corporation

Aqua Water Supply is a nonprofit corporation owned by its members, who are its customers, each having one share. Aqua is governed by an eight-member board of directors who are elected by the members, one from each of the eight zones within Aqua's service area.

Aqua began in the 1970s when the U.S. Farm and Home Administration extended loans and grants to spur start-up water systems all over the U.S. to provide safe drinking water at reasonable prices to rural areas. Prior to then, rural residents in the area often hauled water or used cisterns. There were some scattered community wells, but the quality varied from location to location. Since its earliest days to today, Aqua's mission has been to ensure a safe, reliable water supply for its members.

A majority of the study area is within Aqua's existing water Certificate of Convenience and Necessity (CCN), as seen in Figure 3-1. While Aqua Water is not currently in the wastewater collection or treatment business, Aqua does bill for other entities in areas neighboring the study area (i.e. Wastewater for LCRA in Camp Swift area). Additionally, Aqua is considering obtaining the WCID#3 WWTP and becoming a wastewater collection and treatment provider. In order to become a wastewater service provider, Aqua has applied to the TECQ for a wastewater CCN that coincides with their water CCN.

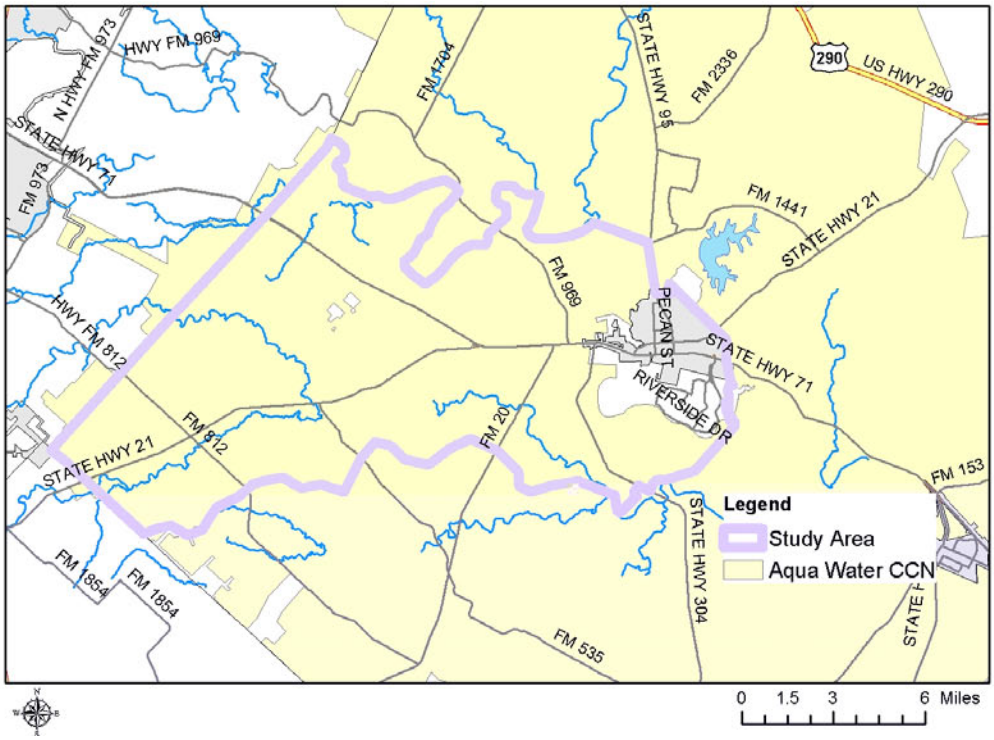


Figure 3-1 Aqua Water CCN

3.1.2 LCRA

On Nov. 10, 1934, Gov. Ferguson signed the bill creating the Lower Colorado River Authority. The new entity had jurisdiction over the lower portion of the river, with authority to store and sell water, generate electricity, prevent flood damages, and implement reforestation and soil-conservation programs. In the 1990s, LCRA expanded into a new area: operating retail water and wastewater utilities. Many communities in the basin requested this assistance to bring aging and overburdened utilities into compliance with state and federal clean-water standards. LCRA owns or operates more than 30 systems, providing reliable service to residents, while also maintaining high treatment standards that will protect the basin's water quality.

In Bastrop County, LCRA owns and operates Camp Swift WWTP, north of the study area. In the study area itself, LCRA operates the McKinney Roughs WWTP, serving their educational facilities there. They have a permit approved for the Windmill Ranch WWTP, just north of McKinney Roughs. Additionally, a permit is pending for the LCRA to construct a WWTP on the Colorado River to serve the Colony development.

Additionally, the LCRA has significant raw water rights in the Colorado River, and will play a role in at least providing raw water for any surface water plant in the study area.

3.1.3 City of Bastrop

Bastrop was incorporated under the laws of Texas on December 18, 1837. The community then comprised of a courthouse, a hotel, a stockade, a gunsmith shop, a general store, and a number of residences. From 1950 through the 1970s Bastrop's population ranged between 2,950 and 4,050. The 1980s brought new challenges for the community, as Austin grew eastward. In 1990 the population was 4,044. Residents had restored many historic buildings, and commuters from Austin moved to Bastrop. As a consequence of the town's proximity to Austin, rapid growth has occurred along the Highway 71 Corridor to Austin. With the establishment of the Austin Bergstrom International Airport within 20 minutes of Bastrop, the city is poised for continued growth and activity in the 21st Century.

The City of Bastrop began operating its first well, providing water to Bastrop citizens, in the 1930s. The City first began providing wastewater service in 1975.

The City of Bastrop CCN includes the City and some outlying area, but only a small percentage of the study area. There has been some modification to the Aqua Water and City of Bastrop CCN on the western boundary of the City of Bastrop CCN, where it is beneficial for both parties since it allows more efficient operation of pressure planes.

While a majority of the study area is not within the City's CCN, a majority of the study area is within Bastrop's extra territorial Jurisdiction (ETJ), thus Bastrop has some control of development in a majority of the study area.

3.1.4 WCIDs

The WCIDs in the study area are limited to their respective neighborhoods – i.e. Elm Ridge and Tahitian Village. Over time, they have set up facilities for their needs – i.e. water wells in WCID #2 and a package WWTP in WCID #3. These entities also serve as customers of the three entities listed above; for example: WCID#2 has entered into an agreement with LCRA and the City of Bastrop for wastewater service.

3.1.5 MUDs

In the last State Legislature, two MUDs in the area were approved: The Colony and Garfield MUDs. They still have to be approved by the City of Bastrop, due to their location within the City's ETJ and must be voted into existence by action of the City Council. These MUDs can choose to create their own water and wastewater systems or serve as customers of the entities mentioned above. The Colony is already entering into agreements with Aqua Water for water service and the LCRA for wastewater service. Development within the Garfield MUD is on a longer time frame than the Colony, thus plans for their water and wastewater are not know at this time.

3.2 Upper Trinity Regional Water District: Lessons Learned

The Upper Trinity Regional Water District is governed by a Board of Directors appointed by its members and is considered to be a model regional agency. The creation of the District began in 1985 when a group of Denton County municipalities and water utilities matched a $4,000 grant received from the Texas Water Development Board to study water supply issues in Denton County. A Committee was formed that included representatives from the City of Denton, the City of Lewisville, the County of Denton, and many of the smaller towns inside the county. The County took the leadership role. The Committee determined the following:

- There was not an adequate water supply to support expected population growth,
- Ground water was in short supply,
- The region needed to make a transition to surface water supply thereby reserving the existing groundwater for rural citizens, and
- That it was feasible to develop a locally owned and managed regional system.

The County received the funds and served as the Committee's Treasurer. In order to join the committee, a $2,000 fee was required as a base contribution, with additional funds based on population. This funding allowed the Committee to conduct studies and general business. There were about 25 members of the Committee. One of the key components of the success of this committee was the dedication to giving high regard to the sovereignty and individuality of each interested party.

A consultant hired by the Committee visited each committee member individually and asked three questions: "What do you want? What do you see in your future? What don't you want?" One of the first lessons learned was "never let attorneys get involved in the development of the agreement. Let the stakeholders figure out what they want, then let the attorneys review it for legal considerations." Another question the consultant asked as he surveyed the Committee was, "what would be a perfect future for your entity?" The success of the development of the District was to let the potential members get involved.

One of the key components in the creation of the District was the determination of the service area. The Committee decided that to be a member of the Steering Committee (and ultimately the District), all or part of any member's service area must be in Denton County. Another key point that worked for the Committee is that they made decisions for themselves, not transferring that responsibility to the consultant, but using the consultant to gather information and make recommendations.

The Committee had to decide if they wanted to join an existing entity or create a new one. If they chose to create a new one, it would be best to be legislatively created. An entity created by State statute has more power and authority, and can write their own charter and name their own jurisdiction and powers.

Once the decision was made, the Committee had to wait a year until the Texas Legislature reconvened. That delay gave the Committee members time to get full support from the groups that they represented. Each entity passed a resolution supporting the creation of the District. During this time, the Committee remained active; creating the non-profit organization that would serve as the legal entity. The Board of the non-profit was a subcommittee of the Steering Committee. This initial Board would be the new Board for the Regional Water District until a new one was established consistent with the State statute. Much care was taken to ensure that no one felt rushed or pressured or left out.

In the creation of such a regional authority it is important to;

- Talk to all appropriate members of the interested parties, not just the one or two that take the most public or active role,
- Do not allow the process to be politicized (one way to do that is to prohibit politicians from serving on the District Board),
- Work very hard to build consensus on all issues,
- Avoid coming to the table with preconceived decisions,
- Avoid coming to conclusions too quickly, and
- Do not take any votes on institutional issues until an agreement is reached.

The Committee realized very quickly that the "Dallas" model for providing water and wastewater service was not what they wanted. The "Dallas" model was for one entity to hold all the water rights and make all the decisions for all the customers, both retail and wholesale. The entities in Denton County wanted more say in decisions concerning their service.

There were 25 members on the original Steering Committee. They were water suppliers, cities, and the county. The consultant used the issues and resolutions from the meetings to write the enabling statute. The District later brought in the City of Irving as a special member after an amendment to the statute was approved that allowed the District to add a member that did not meet the original statute criteria. The statute was also modified to allow the District to assume jurisdiction over stormwater (by contracts with cities with stormwater jurisdiction).

One of the challenges was to provide comfort for all the entities. The inherent distrust between the large cities and small cities, the urban and the rural entities, etc. forced the creation of two classes of Board members with different kinds of voting rights. Participating (permanent) Members are those members that met certain criteria and agreed to a 30-year contract with the District that includes annual membership fees based on the service (annual volume) received and the population they serve. In return, they have one vote each on all policy, planning, and administrative issues. There is also have a dampened weighted vote (1 vote for each 4 mgd service contracted for with a 25% cap on votes for any one entity) for any item concerning commitment of funds, capital expenditures. For this determination, water and wastewater service quantities are combined.

After the initial 10-year period, some contract members have been designated "Growth Participating Members" because they eventually will become participating members due to their growth but that growth has not yet occurred.

The District provides service based on "take or pay." The Committee did not feel that the District needed to have "taxing powers." The "take or pay" charge was established to provide a minimum operating budget and to be able to provide service and pay all expenses from revenues. The District does not charge impact fees.

One of the unique features of the enabling statute is that it created a membership entity without any members named in the legislation. The statute established a two-year period during which members could join the District. To be a member of the District, the entity must be publicly owned, in the utility business, and all or part of its service area must be in Denton County. Privately owned water supply corporations cannot be members although they can enter into contracts with the District. There is also a provision in the statute that allows private entities to convert to member status if they become a public entity at some point. The District Board does include one at-large voting member who is responsible for representing any and all of the privately owned entities that have contracts with the District. After the initial two-year sign-up

period and until the Board had been in existence for 10 years, the Board could decide about adding new members. The Board currently has 27 members.

By statute, the District provides only wholesale service. The exception is that the District can create a retail utility if there is a special need. That sub-district would get a seat on the District Board.

Application to the Western Bastrop Study Area

There are a number of similarities between the reasons for the creation of the Upper Trinity River Regional Water District and the current conditions in Western Bastrop County. In the mid 1980s, Denton County was experiencing unprecedented growth. Several of the water purveyors were concerned with meeting the anticipated demands for potable water from their existing groundwater sources. The water systems consisted of both public and private entities that had established service areas that covered most of Denton County. Ultimately, the water purveyors in Denton County were able to convert to surface water sources for the urban areas without relinquishing control of their individual service areas.

The issue of long-term water service was soon understood to be a countywide issue and not isolated to a few water purveyors. The exclusive use of groundwater was not probable for the area given the anticipated growth. The up front capital cost for each entity to convert to partial or total surface water was high. The cost to each entity could be reduced if they shared the surface water treatment capital, operation and maintenance cost. These common concerns lead the separate entities to establish a committee to evaluate options of providing service in the future.

Western Bastrop County has experienced significant population growth that is expected to continue. The currently available ground water supply may not be sufficient to meet the future water demands of the area. A conversion to surface water for at least a portion of the study area will be necessary to meet future demands.

The issue of wastewater treatment has not reached the same level of concern in western Bastrop County as future water supply. The majority of the area is rural and the use of on-site sewage facilities has been the practice for many years. The anticipated growth is expected to be much denser, urban type where OSSF may not be the best alternative for wastewater treatment. A regionalized approach to wastewater conveyance and treatment provides the same cost savings to the separate entities as the provision of regionalized water service did for Denton County.

3.3 Possible Arrangements

If one were starting from scratch, having one entity providing all the water and wastewater services in a region would be the most efficient operation – it would limit duplicity of efforts, reduce maintenance costs, etc. However, the manner in which this Western Bastrop area has grown has lent itself to a number of players – the City of Bastrop providing service within the City, the Aqua Water Service Corporation providing service in the rural area, and WCIDs appearing to fill the gap between the two.

The Western Bastrop area has recently entered into a new era of growth, where the developments themselves are spread out, but the densities within these developments are suburban, rather than rural densities. As the entities providing water and wastewater service try to adapt to this new growth there are a number of issues that need to be addressed under any scenario.

Some of these issues include billing, planning, customer confusion on "who to call for service / problems" and general / routine operational issues such as: fire protection, irrigation demands, backflow prevention, and street repairs. One of the goals of this study is to develop arrangements that could minimize problems arising from 3+ entities undertaking these efforts in house, which affects all players involved.

3.3.1 Bi-party / Inter-local Agreements

To continue along the current path would mean that entities would continue to interact on a one-on-one basis, entering into bi-party agreements to provide water or wastewater services as the need arises, as well as interlocal arrangements. While this allows for much flexibility, it is not very proactive in planning and seeking arrangements to address common needs in the future. An inter-local agreement would be a more formal arrangement between the parties to provide water and wastewater services. An Inter-local agreement would establish a written "Memorandum of Operation" that would clarify which entity would provide service where. Although this is done formally through the CCN process, it would allow for pre-established understanding and agreements for one entity to provide service on a temporary basis if the "official" service provider was not able to provide service initially. Also, it could establish wholesale arrangements from entity to entity, and it allows the entities to work out details and arrangement between them before there is a crisis.

3.3.2 Creating a new Regional Authority

Using the Upper Trinity Regional Water District as a model, one alternative is to create a regional entity to provide wholesale or retail water and wastewater in the area. In many ways this could be the most ideal arrangement, as billing, planning, maintenance, and overall service responsibility would all be centralized. Every customer that benefits from the water and wastewater service in the area would be sharing the cost of providing reliable water and wastewater. To further develop this alternative, it is useful to look at the water and wastewater service independently.

Regional Water Supply Authority

Like the Upper Trinity example, a regional entity could own and operate the treatment plants and provide wholesale service to District members.

Aqua is in the process of designing and building the first surface water treatment plant that will serve customers within the study area. That plant could be expanded to serve the City of Bastrop and WCID #2 if (when) they need additional water, or when wells have to be taken off line or if some future requirements were to dictate that the well water be treated. This would reduce the cost for Bastrop and WCID#2, and Aqua should share in the cost savings - or - Aqua could sell treated water on a wholesale basis to Bastrop and WCID#2 which would save them the up front capital cost.

The Aqua WSC surface water plant will provide water to customers within the study area. The groundwater currently utilized to serve those customers will then be available to future demands. The decisions of how and where that ground water will be utilized could then be made on a regional basis. This groundwater could be dedicated to the more rural areas of the study. Thereby assuring long term water at a low cost to rural areas, with denser suburban areas paying for the surface water.

A sub-alternative in this developing water landscape is that the plant could either belong to Aqua or be transferred to a self sufficient, regional authority that would take on the up front capital cost of expansions and provide wholesale water to all entities. A single regional water entity (whether surface water or groundwater) would have less O&M cost for all entities. This has been demonstrated by both LCRA and BRA in the Operation and Maintenance of their facilities. Operators and Maintenance activities would be coordinated so that fewer staff, spare parts, etc. are necessary.

Another advantage is that by combining water production (surface and/or ground) it may be possible that fewer wells and less total treatment capacity would be required to meet the demands of the study area.

Regional Wastewater Authority

Unlike water service in the area, the number and coverage of CCNs in the wastewater arena are limited to the City of Bastrop, WCID#2 and WCID#3 boundaries. There would be a major role for a regional authority in planning for wastewater service to the study area before more wastewater CCN "islands" get created.

Like the regional water authority discussion, a regional wastewater authority would also have the benefit of a single entity reducing O&M costs. Also, a regional entity could allow entities to obtain service without the significant up-front capital costs of WWTPs.

3.3.3 Creating a new Regional Committee

Taking one of the lessons from the UTRWD, "never let attorneys get involved in the development of the agreement. Let the stakeholders figure out what they want, then let the attorneys review it for legal considerations." While creating a Regional District might not be feasible, there might be a value in creating a regional committee, where entities can share their planning efforts and development concerns without territorial issues. This committee would be a planning organization that has as much power or authority as the stakeholders want it to have. For example, this committee could be the "keeper" of the region's master plan; requiring all future water and wastewater projects to adhere to this regional master plan.

3.4 Evaluations of Arrangements

There are advantages and disadvantages for all possible operating scenarios. The selected operating structure for either water or wastewater service must be acceptable to all entities involved. The existing service providers have a legal right to exist in the study area and continue in operation as they have for many years.

3.4.1 Water Service

All areas of Western Bastrop County are within an existing water CCN. Each entity has sufficient water capacity for the current demand and has plans to increase water production to meet future demands as development occurs. Aqua WSC and the City of Bastrop are the major suppliers of potable water in the study area and they currently have plans to bring additional water supply capacity on-line prior to the time it is actually needed. They are being pro-active to ensure that there is water available when needed and to enhance their current operations.

Without the willingness of the existing water purveyors to create a regional authority it will not happen. There appears to be willingness between the existing entities to work together on planning studies, such as this one. The most logical approach would be for the separate entities to enter into interlocal agreements or contracts with each other to establish formal procedures detailing their relationships and interactions and continue to provide service within their existing areas.

3.4.2 Wastewater Service

Aqua WSC has submitted an application for a wastewater CCN that will coincide with their existing water CCN, giving Aqua the ability and obligation of providing wastewater service in the study area. The City of Bastrop currently provides wastewater service to the City and some surrounding areas. The areas not currently served by the City of Bastrop are more rural and less densely populated. Providing centralized wastewater service to the existing rural areas is not economically feasible.

Although a single regional wastewater authority is a possibility, it is not very likely given that the current need for wastewater service is provided by the City of Bastrop and the major areas that will need wastewater service in the future are located within the proposed Aqua WSC Certificate of Convenience and Necessity. It is anticipated

that the majority of new development in the study area will be more urban in nature and centralized wastewater service will be required. Some of the new development may be in Municipal Utility Districts that have not been established and the provider of wastewater service could be through the MUD's or through wholesale service agreements with the City of Bastrop or Aqua WSC.

In March 2004, the Lower Colorado River Authority, Aqua Water Supply Corporation, and the City of Bastrop entered into a Memorandum Of Understanding (MOU) regarding retail and wholesale wastewater service in Bastrop County. The MOU includes all of the land area in this study.

The MOU includes the creation of a regional committee to meet on a quarterly basis to discuss plans for capital expenditures in wastewater facilities, designs of additional facilities and other planning issues. This committee will accomplish the purposes described in Section 3.3.3 Creating a Regional Committee.

The MOU also includes the concepts described in Section 3.3.1 Bi-Party / Inter-Local Agreements. The MOU establishes the agreed upon retail sewer service areas from the study area. It also establishes a process for provision of service, typically along the boundary of a CCN, where the designated retail provided is not able to provide service when it is requested. The agreement also establishes design and construction standards and a process to share information on future service request.

The MOU allows the three parties to provide wastewater service to the study area in a coordinated, cooperative effort that will ensure joint planning of retail and wholesale wastewater and utility systems, and treatment infrastructure locations and capacities in conjunction with current and future plans. The cooperative work of the LCRA, Aqua Water Supply Corporation and the City of Bastrop creates the basis of a regional authority while allowing the parties to continue to serve their individual service areas.

Section 4
Regional Wastewater Treatment Facility Alternatives

A water quality management strategy to protect the Colorado River downstream of Austin is the Colorado River Watershed Rule, which was adopted into the Texas Administrative Code (30 TAC 311, Subchapter E) in October 1986. The Rule applies to the Colorado River downstream of Longhorn Dam to Smithville and all of its tributaries including Cedar Creek. This rule requires all domestic sewage discharging into the mainstem of the Colorado River to be treated at a minimum to 10 BOD, 15 TSS, 2 Ammonia Nitrogen and 5 DO limits and requires all domestic sewage discharging in the tributaries of this portion of the Colorado River to be treated at a minimum to 5 BOD, 5 TSS, 2 Ammonia Nitrogen and 1 Phosphorus. All units are expressed in milligrams per liter. These proposed alternatives must comply with the Colorado River Watershed Rule.

This section provides an assessment of the existing wastewater treatment facilities in the Study Area and an evaluation of the infrastructure alternatives for treating wastewater in the future, through 2035. The alternatives evaluation includes discussion of collections systems and wastewater treatment plants. The final recommendation is based on quantitative and qualitative considerations.

4.1 Existing and Planned Wastewater Facilities

The following is a description of all known treatment facilities that exist in the study area, as well as those that are planned for installation in the near future. The locations of these facilities, as well as areas where significant growth is expected, are shown in Figure 4-1 on the subsequent page. Customers who are not served by these existing treatment plants are utilizing on-site septic facilities (OSSF).

4.1.1 Existing Facilities

The City of Bastrop Wastewater Treatment Plant (WWTP) is located just east of the Colorado River, on the southwest side of the City of Bastrop. The current capacity of the plant is 1.06 MGD, utilizing an extended aeration biological treatment process, followed by chlorine disinfection. Capacity will be increased when the previous wastewater treatment plant, constructed in 1975, is returned to service. The older plant is adjacent to the current treatment facility and will increase the permitted capacity to a total of 1.40 MGD by the end of 2003.

The Bastrop WWTP currently serves all of the City of Bastrop, a portion that stretches west of the Colorado River. It also serves several subdivisions west of the river, which are located just outside of the current Bastrop City limits. The current average flow at the Bastrop WWTP is approximately 0.60 MGD. An additional 0.20 MGD of capacity is dedicated to the Tahitian Village development, immediately to the south. This capacity is sufficient for a total of 800 Tahitian Village connections, (currently,

there are 280 connections). Through continued infill of Tahitian Village this demand could increase to a maximum of 2.0 MGD in 2035.

In the short term, approximately 0.60 MGD of unused capacity will be available when the original plant is reactivated. If all wastewater flows originating west of the Colorado River are eventually re-routed to a new wastewater treatment facility, proposed later in this Memorandum, the available capacity could be adequate to serve the City of Bastrop through 2035, depending on the rate of expansion of service in the Tahitian Village area.

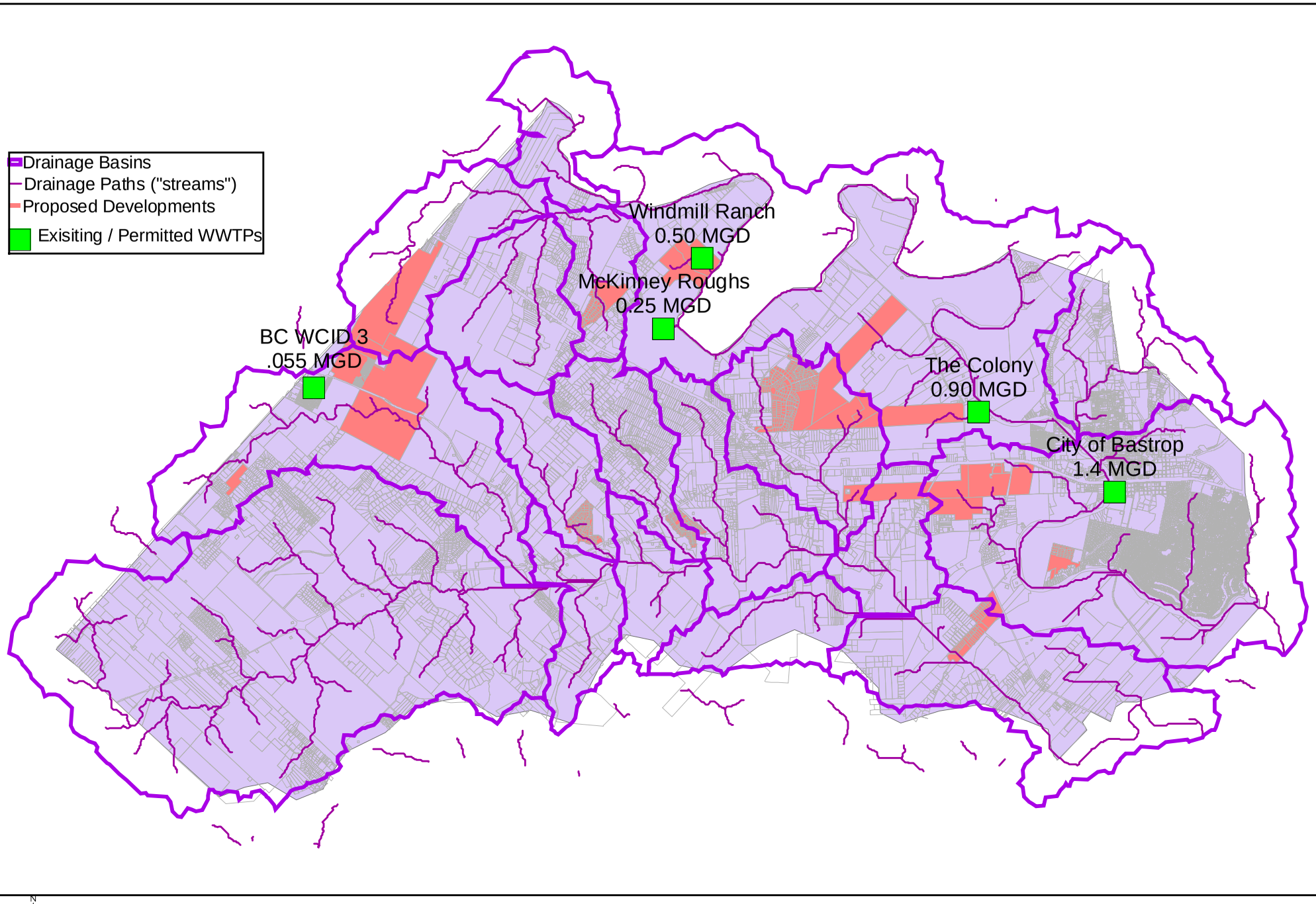


Figure 4-1
Proposed/Exisiting WWTP Facilities and Projected Developments

The McKinney Roughs WWTP, owned and operated by the LCRA, is located in the north-central part of the study area, and serves the McKinney Roughs Park. The plant has a permitted capacity of 0.25 MGD, which is assumed to be adequate for the period of time considered in this study.

On the west side of the study area lies the Bastrop County Water Control and Improvement District (WCID) #3 WWTP. The plant currently serves the Elm Ridge development and has a permitted capacity of 55,000 gpd. The plant will require an upgrade in treatment capacity in order to facilitate future build-out of the Elm Ridge subdivision. It is anticipated that the WCID #3 WWTP will serve the Elm Ridge subdivision until the neighboring development, contained within the Garfield Municipal Utility District (MUD), becomes populated. At that time, a larger treatment facility may be built further downstream, and the existing facility will be used to serve customers located west of the study area.

4.1.2 Planned Facilities

A permit from the Texas Commission on Environmental Quality (TCEQ) has been approved for a 0.50 MGD capacity WWTP in the Windmill Ranch development. Located just north of McKinney Roughs, Windmill Ranch is going to be a hotel and resort with meeting facilities and an 18-hole golf course. Neither the Windmill Ranch WWTP nor the McKinney Roughs WWTP is situated in a location that would make it convenient for them to receive flows from additional sources. Therefore, while these WWTPs will be included in the study, they do not offer sufficient capacity for regionalization.

A TCEQ permit is currently pending for The Colony WWTP, in the eastern part of the study area. There are three proposed phases: initial 0.10 MGD, interim 0.45 MGD, and final 0.90 MGD. The plant will serve the Colony development, which currently has about 500 residents. Until the plant is constructed, all residents of the Colony will use OSSF for their wastewater treatment. It is anticipated that existing lots that are sufficient to permit OSSFs and will continue to utilize septic systems, rather than tie into the WWTP, even after The Colony WWTP is brought online.

The City of Bastrop has retained engineering services and has begun planning activities for a new wastewater treatment plant serving the area west of the Colorado River. This plant, referred to as the West Bastrop WWTP, is forecast to come online by 2010 at an initial capacity of 1.5 MGD.

4.1.3 Service Areas

The Regional Wastewater Master Plan for Western Bastrop County must address the City of Bastrop and the three main areas of growth identified in Section 2 and illustrated in Figure 4-1. These areas are the West Bastrop ETJ (including the developments of Bastrop Village, Hunters Crossing, and Pecan Crossing), the Colony MUD (serving the Colony development), and Elm Ridge/Garfield MUD (including the developments of Elm Ridge and Carr).

City of Bastrop, East of the River

While the City of Bastrop population is expected to grow significantly over the course of this study period, most of this growth is anticipated on the west side of the City. Limited population growth is expected to occur within the existing Bastrop city limits due to Houston Toad habitat, the Bastrop State Park, and existing land use. By some projections, the eastern part of the City may grow by 3,000 people by 2035, resulting in 315,000 gpd of additional wastewater flow. Depending on growing participation rates in the Tahitian Village, the 1.40 MGD capacity the Bastrop WWTP could serve the City of Bastrop, east of the River through much of the study period.

City of Bastrop, West of the River

In addition to treating all flows within the Bastrop City Limits, the Bastrop WWTP currently receives some flow from the West Bastrop ETJ via force main. As discussed in the West Bastrop Growth Area Utility Master Plan prepared by PBS&J, and presented to the City in March 2002, it makes sense to reserve the remaining capacity of the Bastrop WWTP to accommodate future growth east of the Colorado River. Therefore, new treatment facilities will be needed to serve the West Bastrop ETJ. The 2002 Master Plan called for a new treatment plant, referred to here as the West Bastrop WWTP, to be built west of the river and south of the Hunters Crossing and Pecan Crossing developments.

The Colony

The Colony development is located a couple miles northwest of the West Bastrop ETJ and is served by the Colony MUD. It is anticipated that this area will be fully developed in the next 10 to 15 years, generating a wastewater flow of more than 1.2 MGD. A permit from the TCEQ is currently pending for The Colony WWTP, which will have an initial capacity of 0.10 MGD, with additional phases resulting in an interim capacity of 0.45 MGD and a finally capacity of 0.90 MGD. This plant should be adequate for the next 10 years, but additional facilities will eventually be required.

Elm Ridge / Garfield

The final area expected to experience significant growth is Elm Ridge/Garfield MUD, in the western part of the county. The Elm Ridge development is currently home to nearly 500 people, and is being served by the existing WCID #3 WWTP. However, the treatment plant is near capacity, and will have to be expanded to accommodate the growth that is expected in Elm Ridge over the next 5 years. In approximately 15 years, the Garfield MUD will begin to develop; build out of these 8,000 lots is anticipated to take another 15 years. At the time development begins, new wastewater treatment facilities would need to be constructed in order to accommodate the increase in flow.

Other Developments / OSSF

Several other developments are expected to see some growth over the next 30 years, but are not expected to require the construction of additional wastewater treatment plants. These developments include Cielo Vista Ranch, The Homestead on Hobbs Creek, Martins Meadow, Arbor Hills, River Meadows, and The Forest at Colorado Crossing. The residential population in each of these developments is not expected to exceed 400 by the year 2035. Because the land is available, OSSF is currently the most economical means of wastewater treatment. In the future, it may be advantageous for some of these developments to send their wastewater to nearby treatment plants. However, we expect OSSF to continue to be the preferred means of treatment in most of these, and other mid-sized developments for the next 30 years.

4.2 Potential Operational Alternatives

The cost effectiveness of capitalized wastewater service is largely dependent on two factors, lot size and proximity to facilities (in terms of distance and conveyance by gravity). Both of these factors influence the cost of transporting wastewater, in terms of length of interceptors, need and cost of lift stations and force mains, and length of lateral collection lines. As seen in Figure 4-2 (which highlights where potential development might occur in each watersheds) approximately half of the study area drains directly to the Colorado River, including the high growth areas in the Colony and West Bastrop. The other major creek running through the study area is Cedar Creek, whose watershed boundary serves as the southern boundary of the study area. There is a significant portion of the Cedar Creek watershed which is already developed with lot sizes large enough to permit OSSF. Thus, for approximately 6 miles of the creek, from the confluence of Cedar Creek and Maha Creek, until just before Cedar Creek joins the Colorado, there would be little potential for wastewater service to justify the cost of an interceptor in that portion.

Illustrated in Figure 4-2 is the current land development dynamic of this study area in terms of wastewater. Developments are occurring in isolated pockets throughout the study area with higher densities than are traditionally seen in this region. However, these developments are not located around a single area or even in one or two watersheds. Even if the developments being discussed today would move to some of the highlighted parcels in Figure 4-2 as potential developments, the dynamic would be the same. Two regional wastewater treatment alternatives were developed taking into consideration the resulting population distribution.

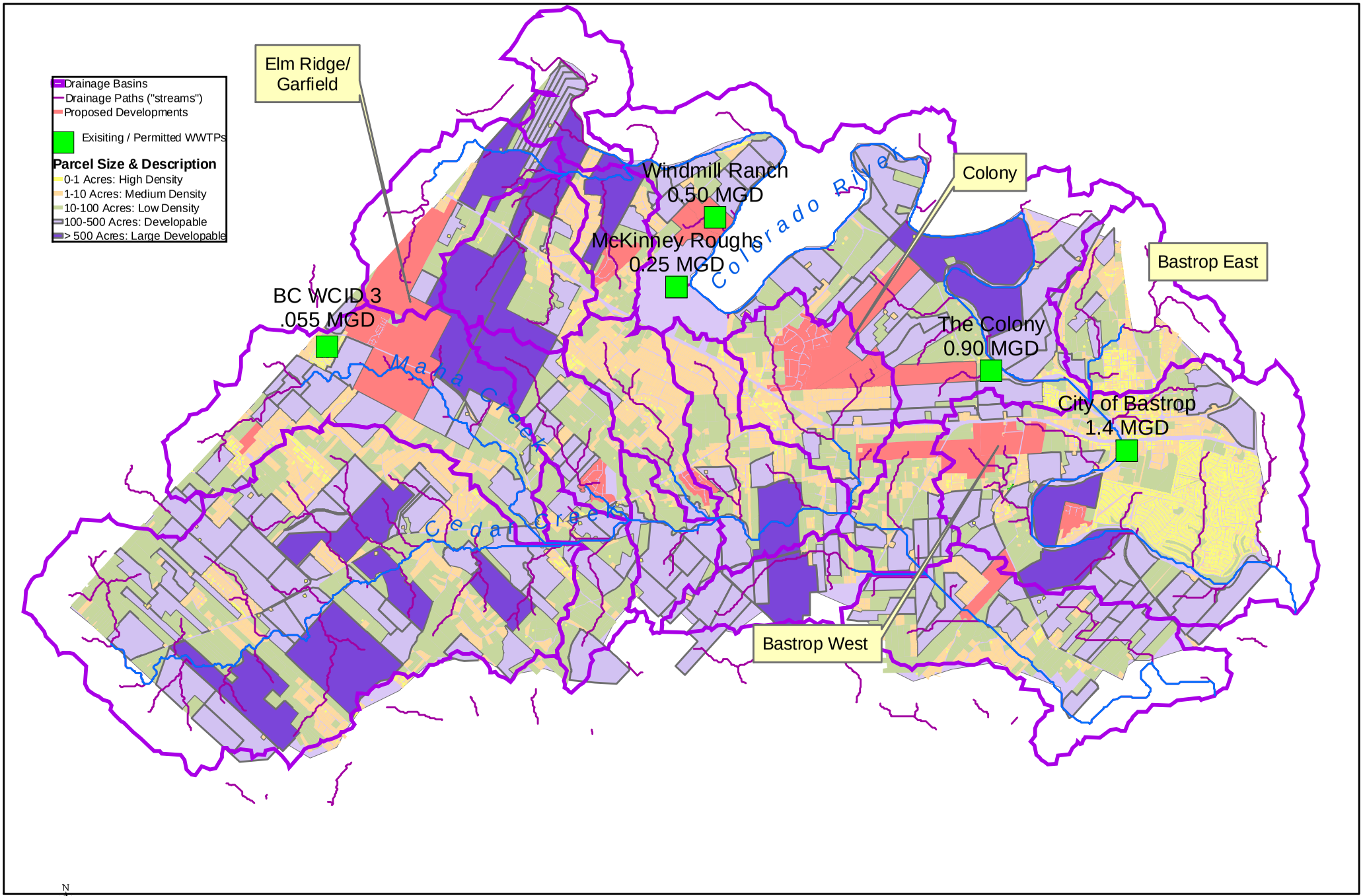


Figure 4-2
WWTP Facilities, Wastersheds, Projected Developments and Parcel Size

4.2.1 Alternative 1: Regional Treatment

The first planning alternative proposed for the study area is centered on the construction of a single regional treatment plant that will eventually serve Elm Ridge/Garfield MUD as well as the West Bastrop ETJ. The expected wastewater flows and the treatment plants to which they will be sent are shown, by region, in Table 4-1.

	2003 Flow (gal/day)	2005 Flow (gal/day)	2010 Flow (gal/day)	2015 Flow (gal/day)	2020 Flow (gal/day)	2025 Flow (gal/day)	2030 Flow (gal/day)	2035 Flow (gal/day)
Garfield MUD	-	-	-	-	525,000	945,000	1,575,000	2,436,000
WW Service					Regional	Regional	Regional	Regional
Elm Ridge	51,000	131,000	131,000	262,000	262,000	262,000	262,000	262,000
WW Service	WCID #3 WWTP	WCID #3 WWTP	WCID #3 WWTP	WCID #3 WWTP	Regional	Regional	Regional	Regional
The Colony	53,000	158,000	368,000	1,166,000	1,166,000	1,166,000	1,166,000	1,166,000
WW Service	OSSF	The Colony	The Colony	The Colony	The Colony	The Colony	The Colony	The Colony
West Bastrop Sites		32,000	282,000	512,000	850,000	1,031,000	1,237,000	1,237,000
WW Service		Regional	Regional	Regional	Regional	Regional	Regional	Regional
Miscellaneous Sites	1,942,000	1,977,000	2,438,000	2,416,000	2,456,000	2,590,000	2,552,000	2,594,000
WW Service	OSSF	OSSF	OSSF	OSSF	OSSF	OSSF	OSSF	OSSF

Table 4-1 Alternative 1: Wastewater Flow Contributions by Development Site

A treatment plant serving the West Bastrop ETJ will need to be operational before 2010, so as not to exceed the capacity of the Bastrop WWTP. Under Alternative 1, a Regional WWTP would be constructed approximately one mile south of the Bastrop Village development (see Figure 4-3).

Initially, the Regional WWTP would only serve the West Bastrop ETJ, and the wastewater collection system may require one or more lift stations. In the meantime, the WCID #3 WWTP would continue to serve the Elm Ridge development. The WCID #3 WWTP would need to be expanded one or more times in order to accommodate growth of the Elm Ridge development, until about 2020, when the Garfield MUD begins to develop. By this time, a wastewater collection system would be constructed to convey flow from the Elm Ridge development and the Garfield MUD to the Regional WWTP. Also by this time, the Regional WWTP would require expansion. Due to the topography of the region, the collection system would function almost entirely by gravity.

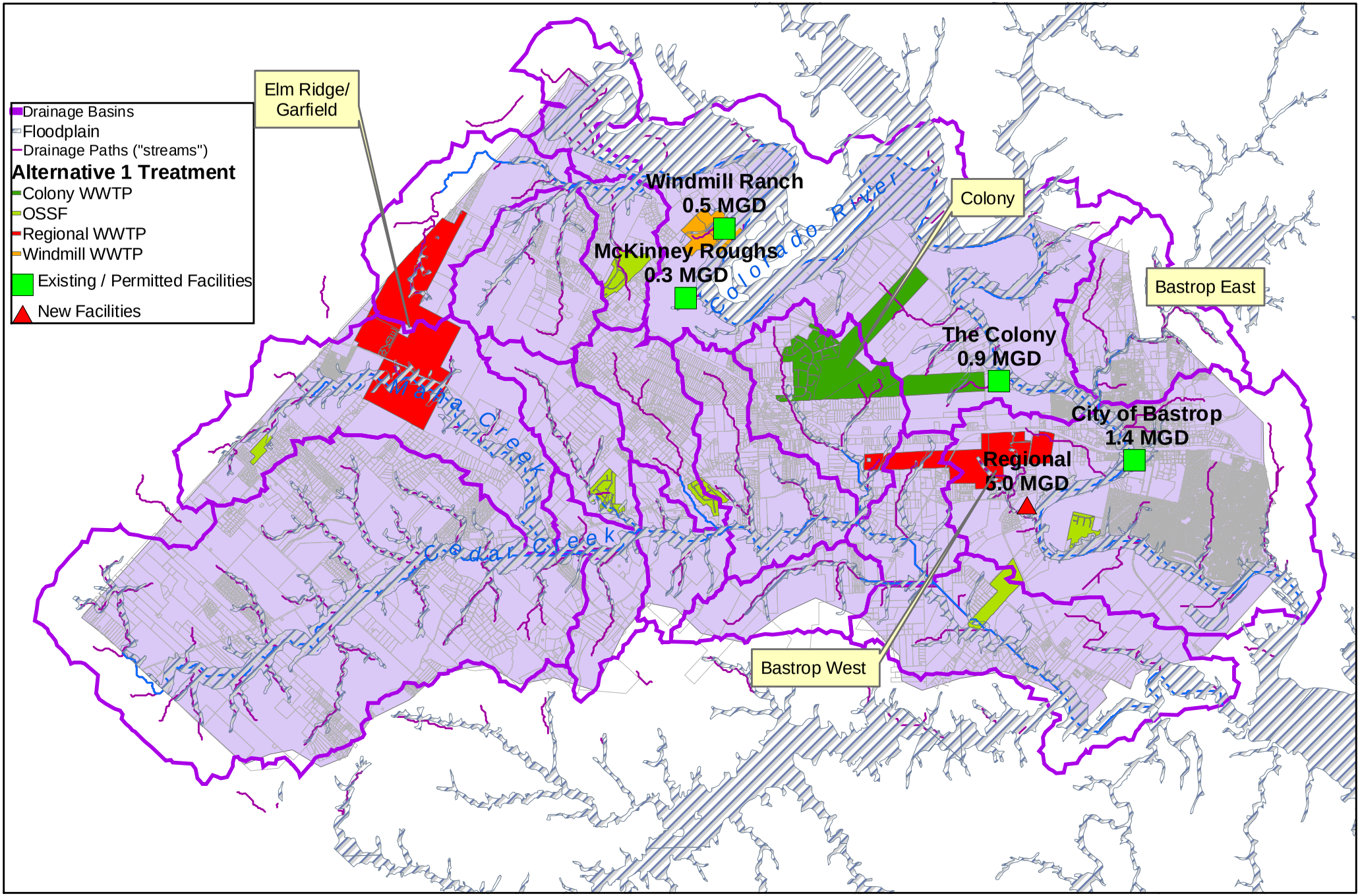


Figure 4-3
Alternative 1

The initial phase of the Colony WWTP will probably be constructed in 2005 and will be able to serve the Colony development for approximately 10 years, until additional facilities are required. In 2015, the Colony WWTP can be upgraded or a wastewater interceptor can be constructed to send the flow to the Regional WWTP. Significant modifications to the existing Colony wastewater collection system may be required, including one or more lift stations.

The wastewater flows for the treatment plants proposed under Alternative 1 are summarized in Figure 4-4, note wastewater being treated by OSSF are not included in this figure.

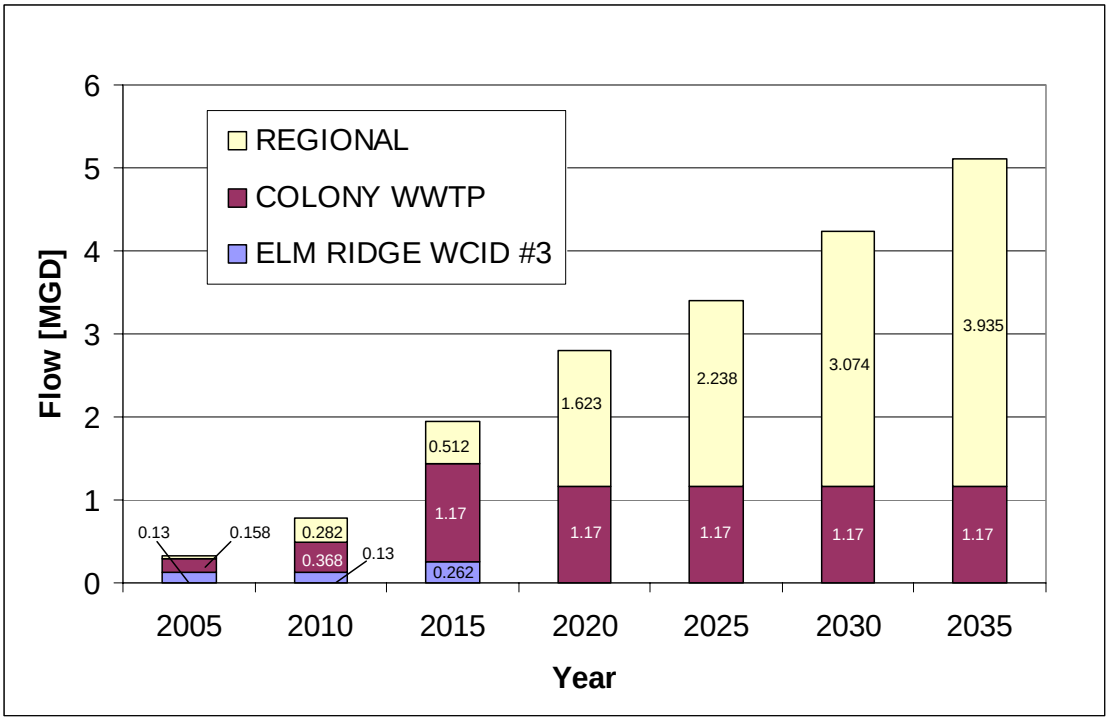


Figure 4-4 Alternative 1: Wastewater Treatment Plant Influent Flow Projections

4.2.2 Alternative 2: Local Treatment

The second alternative for wastewater management in the study area involves the construction of two new treatment plants - one to serve the West Bastrop ETJ and, at a later date, one to serve Elm Ridge/Garfield MUD. The expected wastewater flows and the treatment plants to which they will be sent are shown, by region, in Table 4-2.

	2003 Flow (gal/day)	2005 Flow (gal/day)	2010 Flow (gal/day)	2015 Flow (gal/day)	2020 Flow (gal/day)	2025 Flow (gal/day)	2030 Flow (gal/day)	2035 Flow (gal/day)
Garfield MUD	-	-	-	-	525,000	945,000	1,575,000	2,436,000
WW Service					Cedar Creek WWTP	Cedar Creek WWTP	Cedar Creek WWTP	Cedar Creek WWTP
Elm Ridge	51,000	131,000	131,000	262,000	262,000	262,000	262,000	262,000
WW Service	WCID #3 WWTP	WCID #3 WWTP	WCID #3 WWTP	WCID #3 WWTP	Cedar Creek WWTP	Cedar Creek WWTP	Cedar Creek WWTP	Cedar Creek WWTP
The Colony	53,000	158,000	368,000	1,166,000	1,166,000	1,166,000	1,166,000	1,166,000
WW Service	OSSF	The Colony WWTP	The Colony WWTP	The Colony WWTP	The Colony WWTP	West Bastrop WWTP	West Bastrop WWTP	West Bastrop WWTP
West Bastrop Sites		32,000	282,000	512,000	850,000	1,031,000	1,237,000	1,237,000
WW Service		West Bastrop WWTP	West Bastrop WWTP	West Bastrop WWTP	West Bastrop WWTP	West Bastrop WWTP	West Bastrop WWTP	West Bastrop WWTP
Miscellaneous Sites	1,942,000	1,977,000	2,438,000	2,416,000	2,456,000	2,590,000	2,552,000	2,594,000
WW Service	OSSF	OSSF	OSSF	OSSF	OSSF	OSSF	OSSF	OSSF

Table 4-2 Alternative 2: Wastewater Flow Contributions by Development Site

The West Bastrop WWTP would be built between 2005 and 2010, to handle flows from the West Bastrop ETJ. The location identified in Figure 4-5 allows for most of the area to convey flow by gravity. The western portion of Bastrop Village reaches into two other drainage basins, and would require one or more lift stations to send flow to the West Bastrop WWTP. Under this alternative the Colony WWTP would be decommissioned by 2025 and flows pumped to an expanded West Bastrop WWTP.

The WCID #3 WWTP would serve Elm Ridge until about 2020, as discussed in Alternative 1. Upgrades to the treatment plant would be required along the way. In approximately 2020, in response to the development of the Garfield MUD, a new treatment plant would be constructed to the southeast (see Figure 4-5). The new Cedar Creek WWTP would receive flow from both Elm Ridge and the Garfield MUD by gravity, and the Elm Ridge WCID #3 would be decommissioned. The treatment plant would be located near the confluence of the Maha and Cedar Creeks providing gravity wastewater transmission service to both watersheds. Siting a new treatment plant at this location saves the upfront capital expenditures that would be required to carry the flow to a single regional facility on the Colorado River.

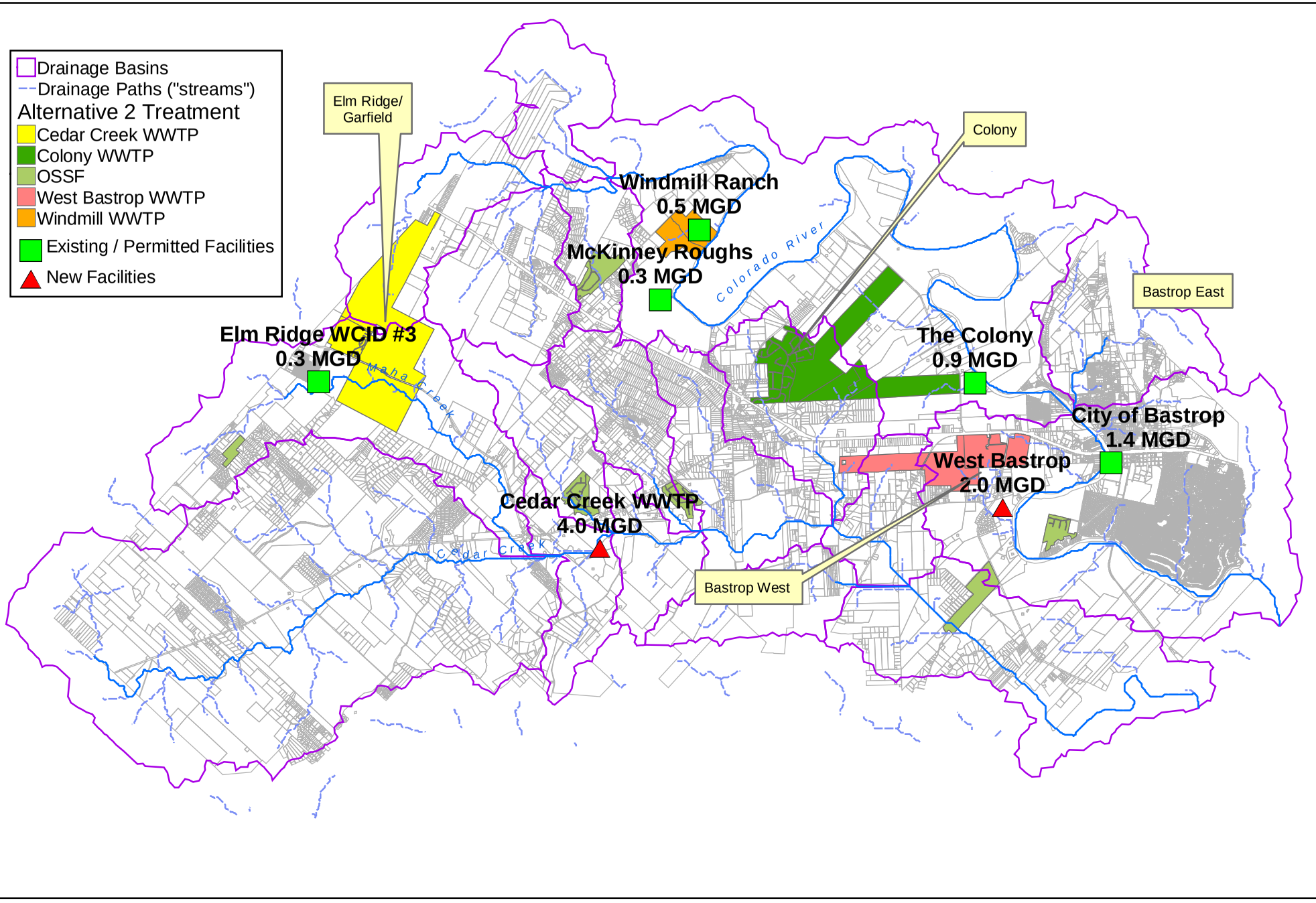


Figure 4-5
Alternative 2

The wastewater flows for the treatment plants proposed under Alternative 2 are summarized in Figure 4-6.

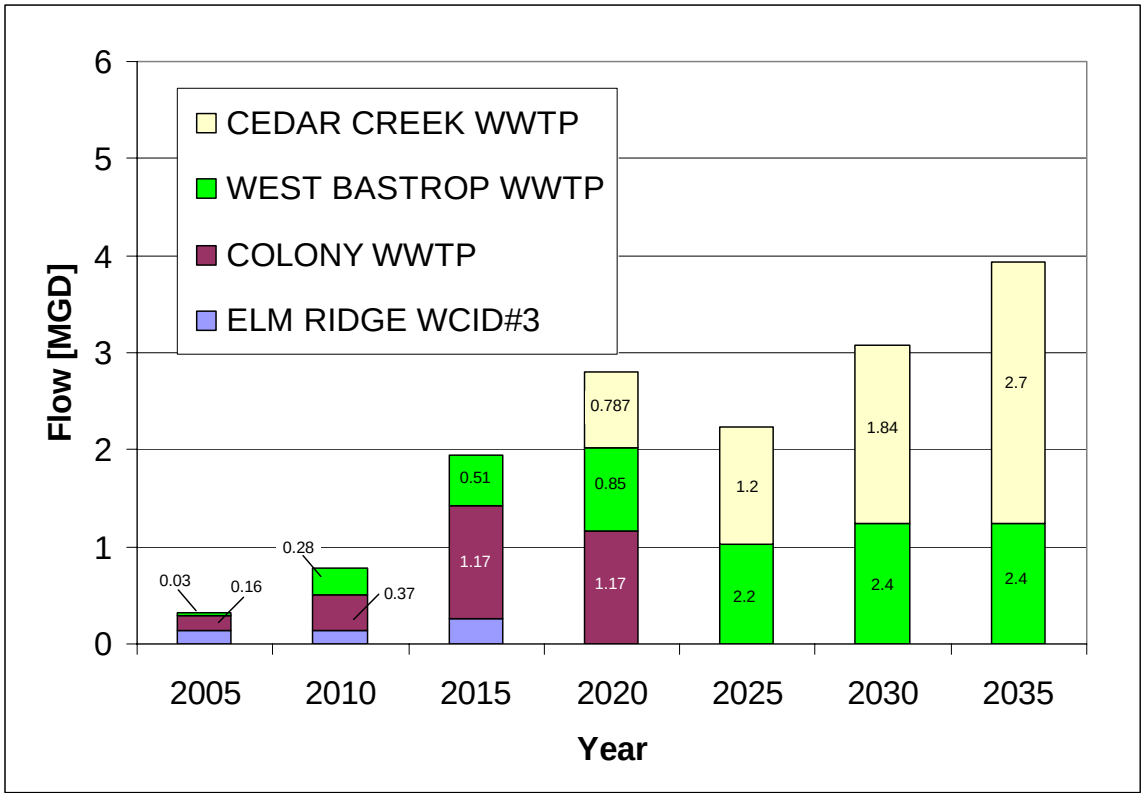


Figure 4-6 Alternative 2: Wastewater Treatment Plant Influent Flow Projections

4.3 Evaluation of Alternatives and Recommendation

Both quantitative and qualitative factors must be used in evaluating the two alternatives presented above. A preliminary cost opinion is presented, with the objective of providing a quantitative means of comparing the alternatives. The estimates are suitable for making broad judgments between the two alternatives, but lack sufficient accuracy for budgeting actual capital improvement funds. More detailed analysis will be provided in Section 6, Facility Plan.

The costs were developed using "rule-of-thumb" estimating techniques. A unit cost of $4.50 per gallon treated per day was used for the construction of entirely new facilities. For expansion of existing plants, a cost of $3.25 per gallon of additional capacity per day was used, since basic infrastructure (roads, buildings, utilities) already exists. The wastewater treatment plants in the study area are slated for expansion in response to wastewater flow projection to ensure plant capacity remains below 75% as stated in TCEQ guidelines. For wastewater transmission, an installed cost of $171 per linear foot was used.

The main advantage of the regional system (Alternative 1) is that there would be at least one less wastewater treatment plant to operate and maintain. As growth continues in the central and western portions of the study area, additional wastewater flow could be accepted at the regional site, and the topography will accommodate a gravity collection system.

There are disadvantages, however, associated with constructing the seventeen-mile trunk main that would be required between the Garfield MUD and the Regional WWTP. The cost of planning, easement acquisition, and construction will be considerable, as indicated in Table 4-3.

Elm Ridge WCID #3 WWTP		
2005	Expand to 175,000 gpd	$ 390,000
2015	Expand to 350,000 gpd	$ 569,000
Colony WWTP		
2015	Expand to 1.4 MGD	$ 1,625,000
	Build 7,900 ft Interceptor	$ 1,351,000
Regional WWTP		
2005	Build 0.7 MGD	$ 3,150,000
	Build 19,800 ft Interceptor	$ 3,386,000
2020	Expand to 3.0 MGD	$ 7,475,000
	Build 90,000 ft Interceptor	$ 15,390,000
2030	Expand to 5.25 MGD	$ 7,313,000
	Total	$ 40,649,000

Table 4-3 Alternative 1: Facility Cost Estimate

There is also a strong possibility that flow in the trunk main could become septic, which would require the installation of odor control equipment at one or more locations along the pipeline. Finally, the decision to build a regional facility requires a level of commitment that would significantly reduce the amount of flexibility that would otherwise be available to handle the ever-changing needs of the area in the future.

The advantages of Alternative 2 over Alternative 1 are two-fold. Alternative 2 is relatively simple to implement because the treatment facilities are located closer to the areas that they serve, and therefore require less cumbersome collection systems. This consideration results in a lower overall cost when compared to Alternative 1, as seen in Table 4-4.

Elm Ridge WCID #3 WWTP			
2005	Expand to 175,000 gpd	$	390,000
2015	Expand to 350,000 gpd	$	569,000
Colony WWTP			
2015	Expand to 1.4 MGD	$	1,625,000
	Build 7,900 ft Interceptor	$	1,351,000
West Bastrop WWTP			
2010	Build 0.7 MGD	$	3,150,000
	Build 5,280 ft Interceptor	$	903,000
2020	Expand to 1.2 MGD	$	1,625,000
	Build 9,240 ft Interceptor	$	1,580,000
2025	Expand to 3.2 MGD	$	6,500,000
2030	Build 5,280 ft Interceptor	$	903,000
Cedar Creek WWTP			
2020	Build 1.6 MGD	$	7,200,000
	Build 38,280 ft Interceptor	$	6,549,000
2030	Expand to 3.6 MGD	$	6,500,000
	Total	$	38,845,000

Table 4-4 Alternative 2: Facility Cost Estimate

Alternative 2 also provides a greater degree of flexibility, because decisions that are made concerning the needs of one area will not affect the decisions made for another area. The disadvantage is that Alternate 2 requires the construction, operation, and maintenance of an additional treatment facility. However, these costs will be offset by the savings realized from having two localized collection systems. Because of its flexibility and lower overall cost, CDM recommends the second alternative.

Section 5
Regional Water Treatment Facility Alternatives

5.1 Description of Existing Facilities

There are three water service providers in the Study area: the City of Bastrop, Bastrop County Water Control and Improvement District No. 2 (BC WCID#2), and Aqua Water Supply Corporation.

5.1.1 City of Bastrop

The City of Bastrop draws water from the alluvial layer. The alluvium occurs as river-bottom land in and below the floodplain of the Colorado River. The City of Bastrop used this ground water source for drinking water from the 1930's until 1965. The City returned to this source again in 1989 and has operated wells to remove the ground water from this alluvial aquifer continuously since that date. In the interim time, the City of Bastrop has wells in the Simsboro aquifer, which have since been sold to Aqua Water.

The system is categorized by TCEQ as a Public Water System (PWS No. 0110001, CCN No. 1198). The system is designated by TCEQ as a ground water system not under the influence of surface water and currently has a Superior rating. For a map of the service area and information on system production, see Section 1.2 of Section 1.

5.1.1.1 Existing Water Well and Distribution Systems

The State issued operating boundaries for the City of Bastrop CNN includes the City limits and areas west of the Colorado River adjacent to Aqua Water's CNN. The entire service area of the City of Bastrop water production facilities is within the Study area. The City currently operates 6 wells: A, B, C, D, E, and F. Wells D, E, and F are located in the floodplain of the Colorado River behind the water plant on Willow Street and North of Farm Street. They are identified in the drilling logs as river wells. The distance of the wells from the Colorado River ranges from 200 feet to approximately 800 feet. Wells D and E have operated with as much as 18-20 feet of Colorado River water over the wells. Drilling log data from the Texas Water Development Board well database are included in the appendix.

Wells C and F and Wells D and E share discharge piping. The City intends to abandon Well A in the near future. Well F is the newest well and has been in operation approximately 2 years.

Water is withdrawn from the aquifer and chlorinated. Polyphosphate is also added at the Willow Street pump station to sequester manganese from Wells A, B, and C. Treatment of all of the well water includes addition of fluoride to prevent dental cavities.

The City operates five storage tanks, one elevated and four ground tanks with a total storage capacity of approximately 2,450,000 gallons. The elevated storage tank and the two

ground storage tanks located on Loop 150E are designed to maintain distribution system pressure. All wells and storage facilities are located on the east side of the river.

A description of the existing distribution system is provided in the 2002 "West Bastrop Growth Area Utility Master Plan" report prepared for the City of Bastrop by PBS&J. A 16-inch water main and an 8-inch water main carry water across the river. The distribution system has two pressure zones. Zone 1 serves areas near the river and has a design elevation of 536 ft. Zone 2 is located east of the river and serves higher elevations with a design elevation of 655 ft. The water system distribution piping is approximately 50% PVC with the remaining piping primarily ductile iron.

The total rated capacity of the wells is 3,240 gpm or 4.66 MGD. Per the PBS&J report, this capacity is not realized due to piping restrictions in the discharge piping of Wells C and F and Wells D and E and is instead limited to 2,725 gpm or 3.9 MGD.

5.1.1.2 Water Quality

Data from the 2002 Drinking Water Quality Report is shown in Table 5-1, 5-2 and 5-3.

Year	Constituent	Highest Level of Any Sampling Point	Range of Detected Levels	MCL	MCLG	Unit of Measure
2002	Barium	0.136	0.136-0.136	2	2	ppm
2002	Fluoride	0.389	0.389-0.389	4	4	ppm
2002	Nitrate	1.83	1.83-1.83	10	10	ppm
2002	Chromium	1.77	1.77-1.77	100	100	ppb
2002	Gross alpha adjusted	1.8	.0000-1.8000	15	0	pCi/L
2002	Gross beta emitters	3.9	3.3000-3.9000	50	0	pCi/L

MCL, Maximum Contaminant Level
MCLG, Maximum Contaminant Level Goal

Table 5-1 Inorganics

Year	Constituent	The 90th Percentile	No. of Sites Exceeding Action Level	Action Level	Unit of Measure
2001	Lead	5.2000	1	15	ppb
2001	Copper	1.1300	2	1.3	ppm

Table 5-2 Lead and Copper

Year	Constituent	Average of All Sampling Points	Range of Detected Levels
2002	Chloroform	1.925 ppb	1.2000-3.0000
2002	Bromoform	6.025 ppb	4.1000-8.9000
2002	Bromodichloromethane	6.85 ppb	4.6000-9.6000
2002	Dibromochloromethane	13.475 ppb	10.0000-17.1000

Table 5-3 Unregulated Contaminants

Additional raw and treated water quality data for chemical parameters are shown in the appendix. No bacteriological data were available. The data included are snapshots of the water quality for the City and are not sufficient to compare the water from Wells A, B, and C and Wells D, E, and F. However, given that the former require sequestering of manganese and the later do not, it is probable that the quality in other respects is also slightly different.

Based on the data obtained from TCEQ, the water would be described as Very Hard. The hardness of the water is greater than 250 mg/L as CaCO3 due to calcium and magnesium concentrations. Hard water is significant as it forms scale in water heaters, boilers, and piping and consumes soap to form a lather.

Sodium, chloride, and total dissolved solids concentrations are approximately 35, 50, and 450 mg/L, respectively. All concentrations are well within the TCEQ Secondary Standards for Drinking Water. Manganese is the only constituent which does not consistently meet those standards.

The pH is relatively low at 7.4 and 7.2 for Wells D and E. Data for Wells A and B indicate that those Wells may have higher pH values, which is consistent with the TCEQ treated water data for April 24, 2002 which represents a blend of the wells.

5.1.1.3 Ground Water Rule

Geologists have observed springs along the Colorado above the water level in the river indicating that Colorado River receives water from the bank storage of the alluvium (Follett USGS, 1970). Because of the nature of the geology, Follett also concluded that during flood conditions that the river, in some locations, could be temporarily influent to the alluvium. While this is not a proven conclusion, it does raise concern as to whether these wells may under certain conditions be potentially affected by surface activities. Data collected by the City of Bastrop during numerous events during which the Colorado River levels were above bank full or above flood stage, and often when water was over Wells D, E, and F, do not give any indication that if surface water became influent to the alluvial, there was degradation of the ground water quality. During the high water events, turbidity levels and chlorine demands were not unlike those of non-flood related periods.

Further, on June 1, 1993, Wells D and E were sampled, and evaluated by the TCEQ for a significant occurrence of insects or other macro organisms, algae, or large-diameter pathogens, such as *Giardia lamblia or Cryptosporidium.* The samples indicated that the wells were not under the direct influence of surface water as defined by the regulations.

However, because the wells are shallow (30 to 60 feet in depth) and in the floodplain of the river, the question of surface influence will continue to be asked and the wells will undergo continual scrutiny. The identification of a GWUDI (Ground Water Under Direct Influence) system is an important one and the question is asked to ensure protection of the public health. The continued monitoring of the shallow wells should be a priority operational procedure of the City of Bastrop system.

According to TCEQ officials, a proposed EPA Ground Water Rule revision , which is expected to become effective in 2004 nationally , will identify hydro geologically sensitive aquifers. Alluvium will likely be identified as such and monitoring requirements may increase for those systems. In hydro geologically sensitive aquifers, the regulatory agency indicates that further studies will be initiated to determine future requirements, if any, to be imposed upon such wells. TCEQ representatives also indicate that bacterial testing will be required monthly for each well, and that continuous monitoring of chlorine residual and daily documentation of four logs viral CT could also be required. Officials of the City of Bastrop maintain that those requirements, including four log removal are presently being met.

5.1.2 Bastrop County Water Control and Improvement District No. 2 – Tahitian Village

The Bastrop County Water Control and Improvement District No. 2, BC WCID #2 (PWS ID No. 0110020, CCN NO. 10990) provides ground water from the Carrizo-Wilcox aquifer and serves the Tahitian Village subdivision and part of the Pine Forest Subdivisions. The entire service area of the district is within the Study area. The district operates 5 wells. The district has fire hydrants and provides fire protection for its customers although some of the pipelines are undersized. The system is designated as a ground water system not under the influence of surface water. For a map of the service area and information on system production, see Section 1.2 of Section 1.

5.1.2.1 Existing Water Well and Distributions Systems

Water is withdrawn from the aquifer at Wells 1 and 2 (Plant 1) and chlorinated. The water pumped by Wells 3 and 4 (Plant 2) is aerated in a packed tower aerator for hydrogen sulfide removal and chlorinated. Well 5 (Plant 3) is located in Tahitian village. This well is a new well and has only been operational for approximately one month. Water from this well is chlorinated only. Drilling log data from the Texas Water Development Board well database are included in the appendix.

5.1.2.2 Water Quality

Data from the 2001 Drinking Water Quality Report are shown in Tables 5-4 and 5-5.

Year	Constituent	Highest Level of Any Sampling Point	Range of Detected Levels	MCL	MCLG	Unit of Measure
1999	Barium	0.14		2	2	ppm
2000	Fluoride	0.7		4	4	ppm
1999	Nitrate	2.1		10	10	ppb
1999	Selenium	4.7		50	50	ppb

MCL, Maximum Contaminant Level
MCLG, Maximum Contaminant Level Goal

Table 5-4 Inorganics

Year	Constituent	Average of All Sampling Points	Range of Detected Levels
1999-2001	Chloroform	1.25 ppb	1.25-1.8
1999	Bromoform	4.7 ppb	426-43.78
1999-2001	Bromodichloromethane	4.5 ppb	3-4.5

Table 5-5 Unregulated Contaminants

Additional raw and treated water quality data for chemical parameters are shown in the appendix. No bacteriological data were available. The water is of good chemical quality based on the TCEQ data. The data show a difference in the samples from the two points-of-entry (POE) into the distribution system. Based on the TCEQ data, the water would be described as Soft to Moderately Hard for readings of 46 and 92 mg/L as CaCO3 for the two POE. The values for POE No. 2 show higher mineral content. The values for sodium, chloride, and total dissolved solids are 273, 158, and 751 mg/L, respectively. The pH of the water is 8.1.

The sodium concentration is quite high at 273 mg/L. This concentration is well below the maximum contaminant level of 300 mg/L, but in combination with chloride, is sufficiently high to account for customer comments on the slight salty taste of the water.

The individual well data indicate a variation in the fluoride content from the wells with a range of <0.1 to 2.3 mg/L. In Texas, the optimal fluoride concentration to prevent dental cavities is approximately 0.8 mg/L. With the range in background fluoride level evidenced in the analytical data, fluoride addition to the supply to supplement background levels to target a 0.8 mg/L concentration is not advised.

The iron and manganese readings do not suggest that customers would experience adverse affects on or appearance of their water due to these constituents from these wells.

5.1.2.3 Ground Water Rule

The drilling logs identify the aquifer formation for Well No. 1 as the Calvert Bluff formation. The water supply for the other wells is the Wilcox aquifer and the Simsboro formation. Neither of these aquifer formations is considered to be hydrogeologically sensitive and the Ground Water Rule, when finalized, is not expected to result in additional testing for this system. The depth of the wells and distance from the Colorado River indicate that the wells would not be impacted by surface activities.

5.1.3 Aqua Water Supply Corporation

Aqua Water Supply Corporation, AWSC (PWS ID No. 0110013), also provides ground water from the Carrizo-Wilcox Aquifer to its customers. In addition to serving customers in the Study area, Aqua Water provides water to customers in other areas of Bastrop. The system is designated a ground water system not under the influence of surface water. For a map of the service area and information on system production, see Section 1.2 of Section 1.

5.1.3.1 Existing Water Well and Distribution Systems

AWSC serves customers in the Study area from the Pump Station "S". The water is pumped to Zone 2A in the eastern portion of the Study area and Zone 2 just northeast of the City of Bastrop. Approximately 80% of Zone 2 and 2A is considered to be in the Study Area.

The water is withdrawn from the aquifer using six wells. The water is disinfected with gaseous chlorine. No other treatment of the water is required. Drilling log data from the Texas Water Development Board well database are included in the appendix.

5.1.3.2 Water Quality

Data from the 2001 Drinking Water Quality Report for the utility is shown in Tables 5-6 through 5-10. Note that these values represent the water for the entire utility and not just the water from Pumps Station S.

Year	Constituent	Highest Level of Any Sampling Point	Range of Detected Levels	MCL	MCLG	Unit of Measure
1999	Barium	0.14	0.0510-0.1400	2	2	ppm
1999	Chromium	10	0.0000-10	100	100	ppb
2000	Fluoride	2	0.0000-2	4	4	ppm
2000	Nitrate	7.33	0.0300-7.300	10	10	ppm
1999	Selenium	4.7	0.0000-4.700	50	50	ppb
1999	Sodium	176	36.0000-176.000	NA	NA	ppm

MCL, Maximum Contaminant Level
MCLG, Maximum Contaminant Level Goal

Table 5-6 Inorganics

Year	Constituent	Highest Level of Any Sampling Point	Range of Detected Levels	MCL	MCLG	Unit of Measure
2001	Xylenes	0.0009	0.0000-0.0018	10	10	ppm
2001	Ethylbenzene	0.3	0.0000-0.6	700	700	ppb

MCL, Maximum Contaminant Level
MCLG, Maximum Contaminant Level Goal

Table 5-7 Organics

Year	Constituent	The 90th Percentile	No. of Sites Exceeding Action Level	Action Level	Unit of Measure
2001	Lead	3.800	1	15	ppb
2001	Copper	0.2790	2	1.3	ppm

Table 5-8 Lead and Copper

Year	Constituent	Average of All Sampling Points	Range of Detected Levels
2001	Chloroform	1.12 ppb	0.0000-3.1000
2001	Bromoform	2.06 ppb	0.0000-7.3000
2001	Bromodichloromethane	2.18 ppb	0.0000-5.4000
2001	Chloromethane	1.67 ppb	0.0000-9.7000
2001	Chlorodibromomethane	3.62 ppb	

Table 5-9 Unregulated Contaminants

Year	Constituent	Average of All Sampling Points	Range of Detected Levels	MCL	MCLG
2001	Total Trihalomethanes	22.4 ppb	22.40-22.40	100	0

Table 5-10 Disinfection By-Products

Additional raw and treated water quality data for chemical parameters are shown in the appendix. No bacteriological data were available.

The water from these wells is of good quality. It would be described as low in hardness with several of the measurements showing hardness below 30 mg/L with one value of 16 mg/L. Waters with very low hardness are often associated with corrosion problems. A brief evaluation of the stability of the water from Well Nos. 2 and 5 using the one set of data from February 9, 1998 and the RT&W model indicate slightly different stability for the two wells. LI and CCPP values for raw water from Well Nos. 2 and 5 were 0.08 and -0.31, respectively, and 0.59 and -3.23 mg/L, respectively. Addition of 2 mg/L gaseous chlorine resulted in CCPP values of -0.3 mg/L for Well No. 2 and -5.6 mg/L for Well No. 5. Based

on the model results the blended water from all the operating wells at this location may be slightly unstable and aggressive to non-PVC piping in the far reaches of the distribution system.

Sodium concentrations from Well No. 4 are quite high with recorded values of 340-360 mg/L; recorded values of chloride concentrations were 107-146 mg/L. Persons not accustomed to the water may find the water salty tasting due to the combined sodium and chloride concentrations.

Fluoride levels are variable with each of the wells with background readings generally of 0.2 to 0.4 mg/L for Well Nos. 2 and 3 and 1.3 to 1.5 for Well Nos. 4 and 5. The optimal concentration for fluoride to prevent dental cavities is 0.8 mg/L. Well Nos. 4 and 5 are slightly higher than desired; however, they routinely mix with the other wells of lower fluoride concentrations. All values are well below the MCL. Addition of fluoride to achieve the dental benefits would not be recommended due to the wide range in background concentrations in the individual wells.

Iron and manganese readings for Well S-6 are high in the one sample included from September 9, 1998. Given that this well is blended with the other wells, taste and odor complaints associated with these constituents in the water originating from this pump station would not be expected.

The data show several readings for total dissolved solids which exceed the TCEQ Secondary Standard of 1000 mg/L. Again, it is likely that since the readings for the individual wells are so variable that the blend of the wells does not exceed this standard developed to ensure the aesthetic quality of the water.

5.1.3.3 Ground Water Rule

Drilling log data indicate that all of these wells produce water from the Simsboro formation of the Carrizo-Wilcox aquifer. This aquifer formation is not designated as hydrogeologically sensitive and the Ground Water Rule, when finalized, is not expected to result in additional testing for this system. The depth of the wells and distance from the Colorado River indicate that the wells would not be impacted by surface activities.

5.2 Existing Capacity and Future Capacity Requirements

Growth is expected to occur in each of the service areas of the current providers in the Study Area. This section analyzes the ability of each of the current providers to meet the treatment capacity and distribution storage requirements of the growing populations in their respective service areas.

5.2.1 Treatment Capacity

The existing and projected water supply and treatment capacity is presented for each of the three water providers in the Study Area.

5.2.1.1 City of Bastrop

The existing capacity of the system is compared to the projected capacity requirements in Tables 5-11 through 5-14. Note that for the purpose of this evaluation, the capacity of the existing wells are assumed to be fully utilized by redesign and upgrade of discharge piping for Wells C and F and Wells D and E.

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	TCEQ Required System Capacity, MGD	TCEQ Capacity Surplus or Deficit, MGD	Additional Capacity Required per TCEQ, gpm
2003	6300	2250	4.66	1.94	2.72	0
2005	7200	2571	4.66	2.22	2.44	0
2010	9900	3536	4.66	3.05	1.61	0
2015	11200	4000	4.66	3.46	1.20	0
2020	12500	4464	4.66	3.86	0.80	0
2025	13900	4964	4.66	4.29	0.37	0
2030	15200	5429	4.66	4.69	-0.03	21
2035	16500	5893	4.66	5.09	-0.43	300

Population = 2.8 persons per connection
Required Well Capacity = 0.6 gpm/connection

Table 5-11 Additional Production Capacity Required to Meet TCEQ Requirements Based on All Wells In Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	Capacity Required to meet Aver Day Demand, MGD	Capacity Required to meet Max Day Demand, MGD	Additional Capacity Required to meet MDD, gpm
2003	6300	2250	4.66	1.10	2.59	0
2005	7200	2571	4.66	1.26	2.96	0
2010	9900	3536	4.66	1.74	4.07	0
2015	11200	4000	4.66	1.96	4.61	0
2020	12500	4464	4.66	2.19	5.14	335
2025	13900	4964	4.66	2.44	5.72	735
2030	15200	5429	4.66	2.67	6.25	1107
2035	16500	5893	4.66	2.89	6.79	1478

Population = 2.8 persons per connection
Average Day Demand = 491 gpd per connection
MDD = Maximum Daily Demand = 0.8 gpm/connection

Table 5-12 Additional Production Capacity Required to Meet Projected Maximum Daily Demand Based on All Wells in Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Firm System Treatment Capacity, MGD	TCEQ Required System Capacity, MGD	TCEQ Capacity Surplus or Deficit, MGD	Additional Capacity Required per TCEQ, gpm
2003	6300	2250	3.18	1.94	1.24	0
2005	7200	2571	3.18	2.22	0.96	0
2010	9900	3536	3.18	3.05	0.13	0
2015	11200	4000	3.18	3.46	-0.28	192
2020	12500	4464	3.18	3.86	-0.68	470
2025	13900	4964	3.18	4.29	-1.11	770
2030	15200	5429	3.18	4.69	-1.51	1049
2035	16500	5893	3.18	5.09	-1.91	1327

Population = 2.8 persons per connection
Required Well Capacity = 0.6 gpm/connection
Well F: 1,030 gpm out-of-service

Table 5-13 Additional Production Capacity Required to Meet TCEQ Requirements Based on the Largest Pump Out-of-Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Firm System Treatment Capacity, MGD	Capacity Required to meet Aver Day Demand, MGD	Capacity Required to meet Max Day Demand, MGD	Additional Capacity Required to meet MDD, gpm
2003	6300	2250	3.18	1.10	1.10	0
2005	7200	2571	3.18	1.26	1.26	0
2010	9900	3536	3.18	1.74	1.74	620
2015	11200	4000	3.18	1.96	1.96	992
2020	12500	4464	3.18	2.19	2.19	1363
2025	13900	4964	3.18	2.44	2.44	1763
2030	15200	5429	3.18	2.67	2.67	2135
2035	16500	5893	3.18	2.89	2.89	2506

Population = 2.8 persons per connection
Average Day Demand = 491 gpd per connection
MDD = Maximum Daily Demand = 0.8 gpm per connection
Well F: 1,030 gpm out-of-service

Table 5-14 Additional Production Capacity Required to Meet Projected Maximum Daily Demand Based on the Largest Pump Out-of-Service

Based on these analyses, the City of Bastrop has sufficient well capacity to meet the needs of its customers through the Year 2015 assuming all wells are in service. Since the City shares an emergency interconnect with BC WCID No.2 and Aqua Water an additional well is not required as long as the system supplying emergency service is capable of supplying at least 0.35 gpm for each connection in the combined system. Additional water supplies would be needed by 2010 if the capacity is determined with the largest well out-of-service.

5.2.1.2 BC WCID No. 2

The existing capacity of the system is compared to the projected capacity requirements in Tables 5-15 through 5-18.

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	TCEQ Required System Capacity, MGD	TCEQ Capacity Surplus or Deficit, MGD	Additional Capacity Required per TCEQ, gpm
2003	3100	1107	1.51	0.96	0.56	0
2005	3300	1179	1.51	1.02	0.49	0
2010	3800	1357	1.51	1.17	0.34	0
2015	4400	1571	1.51	1.36	0.15	0
2020	5100	1821	1.51	1.57	-0.06	43
2025	5900	2107	1.51	1.82	-0.31	214
2030	6800	2429	1.51	2.10	-0.59	407
2035	7900	2821	1.51	2.44	-0.93	643

Population = 2.8 persons per connection
Required Well Capacity = 0.6 gpm/connection

Table 5-15 Additional Production Capacity Required to Meet TCEQ Requirements Based on All Wells In Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	Capacity Required to meet Aver Day Demand, MGD	Capacity Required to meet Max Day Demand, MGD	Additional Capacity Required to meet MDD, gpm
2003	3100	1107	1.51	0.39	1.28	0
2005	3300	1179	1.51	0.41	1.36	0
2010	3800	1357	1.51	0.48	1.56	36
2015	4400	1571	1.51	0.55	1.81	207
2020	5100	1821	1.51	0.64	2.10	407
2025	5900	2107	1.51	0.74	2.43	636
2030	6800	2429	1.51	0.85	2.80	893
2035	7900	2821	1.51	0.99	3.25	1207

Population = 2.8 persons per connection
Average Day Demand = 350 gpd per connection
MDD = Maximum Daily Demand = 0.8 gpm per connection

Table 5-16 Additional Production Capacity Required to Meet Projected Maximum Daily Demand Based on All Wells in Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	TCEQ Required System Capacity, MGD	TCEQ Capacity Surplus or Deficit, MGD	Additional Capacity Required per TCEQ, gpm
2003	3100	1107	1.008	0.96	0.05	0
2005	3300	1179	1.008	1.02	-0.01	7
2010	3800	1357	1.008	1.17	-0.16	114
2015	4400	1571	1.008	1.36	-0.35	243
2020	5100	1821	1.008	1.57	-0.57	393
2025	5900	2107	1.008	1.82	-0.81	564
2030	6800	2429	1.008	2.10	-1.09	757
2035	7900	2821	1.008	2.44	-1.43	993

Population = 2.8 persons per connection
Required Well Capacity = 0.6 gpm/connection
Well No. 3 or 5: 350 gpm out-of-service

Table 5-17: Additional Production Capacity Required to Meet TCEQ Requirements Based on the Largest Pump Out-of-Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	Capacity Required to meet Avg Day Demand, MGD	Capacity Required to meet Max Day Demand, MGD	Additional Capacity Required to meet Max Day Demand, gpm
2003	3100	1107	1.008	0.39	1.28	186
2005	3300	1179	1.008	0.41	1.36	243
2010	3800	1357	1.008	0.48	1.56	386
2015	4400	1571	1.008	0.55	1.81	557
2020	5100	1821	1.008	0.64	2.10	757
2025	5900	2107	1.008	0.74	2.43	986
2030	6800	2429	1.008	0.85	2.80	1243
2035	7900	2821	1.008	0.99	3.25	1557

Population = 2.8 persons per connection
Average Day Demand = 350 gpd per connection
MDD = Maximum Daily Demand = 0.8 gpm/connection
Well No. 3 or 5: 350 gpm Out-of-Service

Table 5-18: Additional Production Capacity Required to Meet Projected Maximum Daily Demand Based on the Largest Pump Out-of-Service

Based on these analyses, the BC WCID No. 2 will need additional wells by the Year 2010 assuming all wells are in service. Since BC WCID No. 2 shares an emergency interconnect with the City of Bastrop and Aqua Water, an additional well is not required as long as the system supplying emergency service is capable of supplying at least 0.35 gpm for each connection in the combined system. Additional water supplies are currently needed to meet the desired maximum daily demand target of 0.8 gpm per connection if the capacity is determined with the largest well out-of-service.

5.2.1.3 Aqua Water Supply Corporation

The existing capacity of the system is compared to the projected capacity requirements in Tables 5-19 through 5-22.

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	TCEQ Required System Capacity, MGD	TCEQ Capacity Surplus or Deficit, MGD	Additional Capacity Required per TCEQ, gpm
2003	15400	5500	6.72	4.75	1.97	0
2005	17400	6214	6.72	5.37	1.36	0
2010	23900	8536	6.72	7.37	-0.65	451
2015	32300	11536	6.72	9.97	-3.24	2251
2020	39000	13929	6.72	12.03	-5.31	3687
2025	43900	15679	6.72	13.55	-6.82	4737
2030	49400	17643	6.72	15.24	-8.52	5916
2035	55800	19929	6.72	17.22	-10.49	7287

Population = 2.8 persons per connection
Required Well Capacity = 0.6 gpm/connection

Table 5-19 Additional Production Capacity Required to Meet TCEQ 4Requirements Based on All Wells In Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	Capacity Required to meet Aver Day Demand, MGD	Capacity Required to meet Max Day Demand, MGD	Additional Capacity Required to meet MDD, MGD
2003	15400	5500	6.72	1.93	6.34	0.00
2005	17400	6214	6.72	2.18	7.16	0.43
2010	23900	8536	6.72	2.99	9.83	3.11
2015	32300	11536	6.72	4.04	13.29	6.56
2020	39000	13929	6.72	4.88	16.05	9.32
2025	43900	15679	6.72	5.49	18.06	11.34
2030	49400	17643	6.72	6.18	20.32	13.60
2035	55800	19929	6.72	6.98	22.96	16.23

Population = 2.8 persons per connection
Average Day Demand = 350 gpd per connection
MDD = Maximum Daily Demand = 0.8 gpm/connection

Table 5-20 Additional Production Capacity Required to Meet Projected Maximum Daily Demand Based on All Wells in Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	TCEQ Required System Capacity, MGD	TCEQ Capacity Surplus or Deficit, MGD	Additional Capacity Required per TCEQ, gpm
2003	15400	5500	4.87	4.75	0.12	0
2005	17400	6214	4.87	5.37	-0.50	0
2010	23900	8536	4.87	7.37	-2.51	1741
2015	32300	11536	4.87	9.97	-5.10	3541
2020	39000	13929	4.87	12.03	-7.17	4977
2025	43900	15679	4.87	13.55	-8.68	6027
2030	49400	17643	4.87	15.24	-10.38	7206
2035	55800	19929	4.87	17.22	-12.35	8577

Population = 2.8 persons per connection
Required Well Capacity = 0.6 gpm/connection
Well S4: 1,290 gpm out-of-service

Table 5-21 Additional Production Capacity Required to Meet TCEQ Requirements Based on the Largest Pump Out-of-Service

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing System Treatment Capacity, MGD	Capacity Required to meet Aver Day Demand, MGD	Capacity Required to meet Max Day Demand, MGD	Additional Capacity Required to meet MDD, MGD
2003	15400	5500	4.87	1.93	6.34	1.47
2005	17400	6214	4.87	2.18	7.16	2.29
2010	23900	8536	4.87	2.99	9.83	4.97
2015	32300	11536	4.87	4.04	13.29	8.42
2020	39000	13929	4.87	4.88	16.05	11.18
2025	43900	15679	4.87	5.49	18.06	13.19
2030	49400	17643	4.87	6.18	20.32	15.46
2035	55800	19929	4.87	6.98	22.96	18.09

Population = 2.8 persons per connection
Average Day Demand = 350 gpd per connection
MDD = Maximum Daily Demand = 0.8 gpm/connection
Well S4: 1,290 Out-of-Service

Table 5-22 Additional Production Capacity Required to Meet Projected Maximum Daily Demand Based on the Largest Pump Out-of-Service

Based on these analyses, the Aqua Water will require additional water supplies by 2005 to supplement the existing well capacity at Pump Station S to meet the target maximum daily capacity of 0.8 gpm per connection. Interconnections with other Aqua Water pump stations can meet emergency supply requirements assuming sufficient capacity to meet the 0.35 gpm connection requirement of TCEQ. When the capacity requirements are determined with one the largest pump out-of-service the need for more water supplies becomes immediate.

5.2.1.4 Summary of Study Area Water Supply Requirements

The water supply requirements for each of the Study Area water providers are summarized in Table 5-23.

	Total Capacity Required, MGD	City of Bastrop New Capacity, gpm	BC WCID No.2 New Capacity Required, gpm	Aqua Water New Capacity Required, gpm	Total New Capacity Required, gpm	Total New Capacity Required, MGD
2003	10.21	0	0	0	0	0
2005	11.48	0	0	301	301	0.4
2010	15.46	0	36	2,159	2,159	3.2
2015	19.71	0	207	4,559	4,766	6.9
2020	23.29	335	407	6,473	7,215	10.4
2025	26.21	735	636	7,873	9,244	13.3
2030	29.37	1,107	893	9,444	11,444	16.5
2035	33.00	1,478	1,207	11,273	13,958	20.1

Table 5-23 Water Supply Requirements

Combining the available water of all the entities does not significantly change the timing or amount of acquiring or developing new supplies as shown in Table 5-24.

	City of Bastrop Excess Capacity, gpm	BC WCID No.2 Excess Capacity, gpm	Aqua Water Excess Capacity, gpm	Total Excess Capacity, gpm	Total New Capacity Required less Excess, gpm	Total Capacity Required less Excess, MGD
2003	1,436	160	264	1,860	0	0
2005	1,179	104	0	1,283	0	0
2010	408	0	0	408	1,787	2.6
2015	36	0	0	36	4,730	6.8
2020	0	0	0	0	7,215	10.4
2025	0	0	0	0	9,244	13.3
2030	0	0	0	0	11,444	16.5
2035	0	0	0	0	13,958	20.1

Table 5-24 Excess Water Supply

The portion of the service area based on water capacity requirements currently provided by the City of Bastrop, BC WCID No. 2, and Aqua Water is approximately, 25%, 13% and 62%. This division will shift to 21%, 9%, and 70% by the Year 2035 based on the current service areas of the individual providers.

Between now and 2010, Aqua Water must increase their water supplies by approximately 3.1 MGD if they are to meet the target maximum daily flow capacity for their service area. By 2015 the need increases to 6.6 MGD. By 2015, BC WCID No. 2 will also likely need additional supplies. The City of Bastrop is projected to require additional supplies by 2020.

5.2.2 Storage Capacity

TCEQ requires minimum distribution system storage of 200 gallons per connection for total ground storage (not including pressure tank storage) and a minimum of 100 gallons per connection of elevated storage capacity or a pressure tank capacity of 20 gallons per connection.

TCEQ also requires that distribution systems be sized to provide a peak hour demand in a system while maintaining system pressures of at least 35 psi. Where fire protection is provided, the distribution systems must be capable of providing the peak day demand plus a fire demand while maintaining system pressures of at least 20 psi. City of Bastrop

Existing total ground storage and elevated storage capacities are compared to TCEQ requirements for current and projected populations in Tables 5-25 and 5-26, respectively.

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Total Storage Capacity, MG	Total Storage Required per TCEQ, MG	Total Storage Surplus per TCEQ Requirements, MG
2003	6300	2250	2.475	0.45	2.03
2005	7200	2571	2.475	0.51	1.96
2010	9900	3536	2.475	0.71	1.77
2015	11200	4000	2.475	0.80	1.68
2020	12500	4464	2.475	0.89	1.58
2025	13900	4964	2.475	0.99	1.48
2030	15200	5429	2.475	1.09	1.39
2035	16500	5893	2.475	1.18	1.30

Population = 2.8 persons per connection
Required Total Storage = 200 gal/connection

Table 5-25 Existing and Projected Total Storage Requirements

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Elevated Storage Capacity, MG	Elevated Storage Required per TCEQ, MG	Elevated Storage Surplus per TCEQ Requirements, MG
2003	6300	2250	1.25	0.23	1.03
2005	7200	2571	1.25	0.26	0.99
2010	9900	3536	1.25	0.35	0.90
2015	11200	4000	1.25	0.40	0.85
2020	12500	4464	1.25	0.45	0.80
2025	13900	4964	1.25	0.50	0.75
2030	15200	5429	1.25	0.54	0.71
2035	16500	5893	1.25	0.59	0.66

Population = 2.8 persons per connection
Required Elevated Storage = 100 gal/connection

Table 5-26 Existing and Projected Elevated Storage Requirements

5.2.2.1 BC WCID No. 2

Existing total ground storage and elevated storage capacities are compared to TCEQ requirements for current and projected populations in Tables 5-27 and 5-28, respectively.

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Total Storage Capacity, MG	Total Storage Required per TCEQ, MG	Total Storage Surplus or Deficit per TCEQ Requirements, MG
2003	3100	1107	0.400	0.22	0.18
2005	3300	1179	0.400	0.24	0.16
2010	3800	1357	0.400	0.27	0.13
2015	4400	1571	0.400	0.31	0.09
2020	5100	1821	0.400	0.36	0.04
2025	5900	2107	0.400	0.42	-0.02
2030	6800	2429	0.400	0.49	-0.09
2035	7900	2821	0.400	0.56	-0.16

Population = 2.8 persons per connection
Required Total Storage = 200 gal/connection

Table 5-27 Existing and Projected Total Storage Requirements

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Pressure Tank Capacity, MG	Pressure Tank Capacity Required per TCEQ, MG	Pressure Tank Surplus or Deficit per TCEQ Requirements, MG
2003	3100	1107	0.03	0.02	0.01
2005	3300	1179	0.03	0.02	0.01
2010	3800	1357	0.03	0.03	0.00
2015	4400	1571	0.03	0.03	0.00
2020	5100	1821	0.03	0.04	-0.01
2025	5900	2107	0.03	0.04	-0.01
2030	6800	2429	0.03	0.05	-0.02
2035	7900	2821	0.03	0.06	-0.03

Population = 2.8 persons per connection
Required Pressure Tank Storage = 20 gal/connection

Table 5-28 Existing and Projected Elevated Storage Requirements

5.2.2.2 Aqua Water Supply Corporation

Existing total ground storage and elevated storage capacities are compared to TCEQ requirements for current and projected populations in Tables 5-29 and 5-30, respectively.

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Total Storage Capacity, MG	Total Storage Required per TCEQ, MG	Total Storage Surplus or Deficit per TCEQ Requirements, MG
2003	15400	5500	3.656	1.10	2.56
2005	17400	6214	3.656	1.24	2.41
2010	23900	8536	3.656	1.71	1.95
2015	32300	11536	3.656	2.31	1.35
2020	39000	13929	3.656	2.79	0.87
2025	43900	15679	3.656	3.14	0.52
2030	49400	17643	3.656	3.53	0.13
2035	55800	19929	3.656	3.99	-0.33

Population = 2.8 persons per connection
Required Total Storage = 200 gal/connection

Table 5-29 Existing and Projected Total Storage Requirements

	Population (Estimated or Projected)	Connections (Estimated or Projected)	Existing Elevated Storage Capacity, MG	Elevated Storage Required per TCEQ, MG	Elevated Storage Surplus or Deficit per TCEQ Requirements, MG
2003	15400	5500	1.975	0.55	1.43
2005	17400	6214	1.975	0.62	1.35
2010	23900	8536	1.975	0.85	1.12
2015	32300	11536	1.975	1.15	0.82
2020	39000	13929	1.975	1.39	0.58
2025	43900	15679	1.975	1.57	0.41
2030	49400	17643	1.975	1.76	0.21
2035	55800	19929	1.975	1.99	-0.02

Population = 2.8 persons per connection
Required Elevated Storage = 100 gal/connection

Table 5-30 Existing and Projected Elevated Storage Requirements

5.3 Future Source Water Options and Treatment Issues

Future water supply needs in the Study Area will be met utilizing ground water resources or surface water supplies or through a combination of the two.

5.3.1 Ground Water

5.3.1.1 Carrizo-Wilcox Aquifer

The Carrizo-Wilcox aquifer consists of the Wilcox Group and the overlying Carrizo Formation. The sands of the Calvert Bluff and Carrizo are hydrologically connected. In the Central Texas region the Carrizo and Simsboro Formations of the Carrizo-Wilcox aquifer produce the largest volume of water. The existing wells that serve Aqua Water are completed in the Simsboro Formation while the wells for BC WCID No. 2 are in either the Calvert Bluff or Simsboro Formation.

Because the geological composition of the Simsboro Formation makes it an excellent conduit for ground water and results in wells with high yields, other water providers in the state are exploring various means of tapping the aquifer and transporting the water to water poor regions of the state. While technical studies and modeling efforts indicate sufficient resources to meet the needs of the Bastrop area through the Year 2050, it is unclear as to the outcome of policy decisions which could affect water levels, pressures, and well production in the aquifer much sooner than 2050. Because of this uncertainty, development of a surface water source as an alternate source in the event that well production is affected should be considered.

5.3.1.2 Alluvium

The City of Bastrop does not tap Carrizo-Wilcox aquifer but has very shallow wells in the alluvium instead. As discussed previously, the alluvial wells will likely be considered to exist in a hydrogeologically sensitive aquifer under the proposed EPA Ground Water Rule

revision, perhaps as early as next year. Drilling ground water wells in such acquifers in the future brings the potential for advanced treatment requirements for wells that demonstrate an influence from surface water. However, such treatment may be actually enhanced by the provision of natural riverbank filtration (RBF). RBF has been shown to effectively reduce DBP precursors and some microorganisms (Weiss et al., 2003). Long-term plans should include alternatives that provide appropriate treatment for new and existing wells in the alluvium to assure a continued high quality product.

5.3.2 Surface Water

The Study area is adjacent to the Colorado River and water could be purchased from the Lower Colorado River Authority (LCRA). Data from the LCRA water quality sampling station at Loop 150 in Bastrop (TCEQ Station ID 12462) have been collected for various water quality parameters since 1982. The data are summarized in Table 5-31.

Many communities upstream of Bastrop utilize the Colorado River as source water for their surface water treatment plants, including the City of Austin which has intakes on Lake Austin and Town Lake. The LCRA also has several treatment plants on the Highland Lakes. As the Colorado River travels from Lakes Buchanan, Inks, LBJ, Marble Falls, Travis, Austin, and Town Lake, to Bastrop, the river changes in quality due to the effects of impoundments, tributaries, surface runoff, and wastewater discharges. The basic chemistry of the water including pH, hardness, and alkalinity does not change significantly, but the potential presence of pathogens is far greater since the plant is located downstream of City of Austin wastewater treatment facilities. A well-operated treatment plant utilizing available technologies for particle removal and disinfection and a multi-barrier approach to treatment would be able to consistently provide high quality safe drinking water meeting all state and federal regulations.

The experience of utilities currently treating Colorado River water can be utilized as a starting point for the selection of treatment processes and chemicals and assessing operations requirements. For example, pilot testing of Lake Austin water conducted by the City of Austin determined that disinfection with ozone is not an option due to the high bromide ion concentration in the source water and the resultant bromate formation. Experience has also shown that chlorine contact time must be limited in conventional treatment plants to prevent formation of trihalomethanes (THMs) when chlorine is used as a primary disinfectant. To assess disinfection requirements for the Colorado River at Bastrop, chlorine demand testing should be performed. Testing for THM and haloacetic acid formation may also be conducted to determine the time available for free chlorine to prevent excessive by-product formation.

	Average	Range	No. of Readings
Total Alkalinity, mg/L as CaCO3	167	114-225	148
Aluminum, ug/L	9		1
Arsenic, ug/L	2		1
Barium, ug/L	67.1		1
Cadmium, ug/L	1		1
Calcium, mg/L as Ca	53.1		1
Total Organic Carbon, mg/L	3.55	2.0-8.0	146
Chloride, mg/L	64	21-204	147
E. Coli, No./100mL	150	0-2380	43
Fecal Coliform, No./100 mL	99	0-2000	141
Total Hardness, mg/L as CaCO3	208	196-224	3
Lead, ug/L	1		1
Mercury, ug/L	0.2		1
Nickel, ug/L	20.6		1
Nitrate, mg/L	1.52	0.25-8.8	94
Ammonia Nitrogen, mg/L	0.05	0.01-0.32	145
Total Kjeldahl Nitrogen, mg/L	0.67	0.07-3.63	144
pH	8.08	7.14-9.0	161
Phosphorus, Dissolved mg/L	0.048	0.018-4.66	147
Total Phosphorus, mg/L	0.61	0.01-5.36	144
Total Dissolved Solids, mg/L	360	237-542	95
Selenium, ug/L	7.9		1
Silver, ug/L	1		1
Sulfate, mg/L	49.4	15-101	147
Temperature, C	21.1	4.3-31.5	161
Turbidity, NTU	22.7	0.81-164	39
Zinc, ug/L	4		1

Table 5-31 Water Quality Data for the Colorado River at Loop 150 in Bastrop

Some treatment differences will be required, however, based on the raw water data. The Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR) not only sets maximum contaminant levels for disinfection byproducts but requires a treatment technique for reduction of organic precursors for conventional treatment. For source water alkalinity greater than 120 mg/L as is found in the Colorado River, the percent reduction of Total Organic Carbon (TOC) is 15% for source water TOC of >2 to 4 mg/L and 25% for source water TOC of >4 but less than 8 mg/L. The source water TOC for upstream water treatment plant is consistently less than 4. For the Bastrop area, this is not the case. A conventional surface water treatment plant would be required to utilize enhanced coagulation (higher coagulant dosages than required for coagulation) to obtain greater removal of TOC. There are exceptions to this requirement depending on the ratio of dissolved organic carbon to the raw water specific ultraviolet absorbance (SUVA). Raw

water SUVA data should be collected to determine if enhanced coagulation would be required for conventional treatment processes.

The Long–Term 2 Enhanced Surface Water Treatment Rule will require additional removal or inactivation of *Cryptosporidium* in source waters with more than 0.075 oocysts per liter. The amount of *Cryptosporidium* in source water is based on the maximum running annual average of 24 months of monitoring, or the average of 48 samples. The requirements for new facilities have not been determined and TCEQ should be consulted to establish the potential requirements for a Bastrop plant. In the interim, monthly and storm water *Cryptosporidium* sampling is advised.

5.3.3 Combination of Surface Water and Ground Water

Use of both ground water and surface water supplies is another option for providing source water to the Study Area. The Colorado River could be used to augment or replace ground water either on an emergency or "as needed" basis or be routinely blended with the current ground water supply. There are treatment process implications and operations and maintenance considerations with both options.

5.3.3.1 Ground Water or Surface Water

Switching back and forth between ground water and surface water can cause serious problems in distribution system water quality. Probably the most widely known example of this is the experience of the City of Tucson when starting up a new surface water treatment plant in 1992. The City experienced widespread problems in their delivery system with rust-colored water, taste and odor complaints, and damage to household appliances, swimming pools, and aquariums. They ultimately solved the problem by blending the waters and, in fact, have not been permitted to distribute treated unblended surface water since 1995.

Measures must be taken to ensure the compatibility of the different waters throughout the distribution system with respect to water stability and disinfection. Consideration must also be given to the effects of any changes in the direction of flow in the water mains.

Ground water supplies in the Study Area are currently disinfected with chlorine. Depending on the selected treatment process, secondary disinfection with chloramines may be necessary to prevent the formation of disinfection by-products. Unfortunately, chlorinated water and chloraminated water are not compatible as loss of residual can occur when the two waters are mixed. For small distribution systems seeking to use a chloraminated supply for emergency use, procedures may be utilized in which the distribution system is flushed when the sources are switched. Public notification would be required prior to making the change to chloramines.

Larger systems are better advised to chloraminate both sources. For larger distribution systems chloramination also offers advantages in providing a more persistent residual to reach remote areas of the distribution system.

Water stability must be carefully evaluated through bench-scale jar testing and modeling or pipe loop testing so that treatment processes can be adopted that ensure that each of the

waters is non-aggressive to the distribution system piping. Since the ground water has been used for many years, the status of the distribution system should be carefully evaluated before any change in source water. A system-wide flushing program in which all water lines are flushed in an organized and sequential manner becomes especially important when more than one water source is used. Distribution system materials should be evaluated carefully with replacement of galvanized piping and lining of cast iron piping. Plastic piping should be used as much as possible.

5.3.3.2 Blending Ground Water and Surface Water

Routinely blending the two waters has some distinct advantages from a treatment and operations perspective. With blending the constituents in both waters are diluted, including disinfection by-products in the surface water and iron and manganese in the ground water. If the waters are routinely blended, the surface water treatment plant could be kept online at a base flow making operation and optimization of the plant easier for operators with startup problems minimized. Blended water also provides more consistent water to the distribution system minimizing distribution system water quality problems and customer taste and odor complaints associated with waters with distinctly different flavor profiles.

5.4 Water Supply Alternatives

5.4.1 ALTERNATIVE 1 – Independent Ground Water Usage

5.4.1.1 Alternative Description

The three entities that currently serve the customers in the Study Area would continue to do so and continue to operate independently. Emergency interconnections between the entities would permit TCEQ capacity requirements to be determined with all wells in service. Disinfection would be achieved with chlorine with additional treatment for hydrogen sulfide removal or sequestering or removal of iron or manganese at individual wells or pumps stations as required.

To meet the needs of its service area the City of Bastrop would need to construct an additional well with a minimum capacity of 335 gpm by 2020 or approximately two wells similar in capacity to Wells D and E, 700 to 750 gpm, to provide water to 2035. No additional storage facilities would be required by TCEQ, but an additional 0.75 MG total ground storage and 0.4 MGD elevated storage would be required to maintain the same excess storage presently available in the system.

To meet the needs of its service area BC WCID No. 2 would need to construct an additional well by 2015 of at least 410 gpm to meet needs through 2020. Projected population growth between 2020 and 2035 will require two more wells with a capacity of approximately 400 gpm each. Additional ground storage would be required by 2025 of approximately 0.2 MG to meet the needs through 2035. Three 100,000-gallon pressure tanks would be needed by 2020, 2030 and 2035, respectively. A larger elevated storage tank of 0.3 MG could replace the use of pressure tanks.

Aqua Water Supply Corporation well capacities in Zones 2 and 2A are approximately 300 gpm less than projected to be needed in 2005 to meet target maximum day demands. Two new wells would be needed by 2010, assuming the capacity of the new wells is similar to

the larger wells presently in service (1000 gpm). Approximately two, 1000 gpm wells would be needed every 5 years throughout the planning period for a total of 12 new wells. Note that this schedule assumes that the productivity of the existing wells is maintained. To meet TCEQ requirements approximately 0.33 MG more ground storage and 0.02 MG more elevated storage would be required by 2035. To maintain current excess storage capacities, approximately 3 MG total storage would be needed and approximately 1.5 MG in elevated storage would be required.

5.4.1.2 Pros and Cons

The primary advantage of this alternative is that a surface water treatment plant is not required and all entities remain on compatible supplies with the same chlorine disinfection.

The primary disadvantage is that this alternative depends on continued availability of water from the Carrizo-Wilcox aquifer under all conditions including drought. Should the productivity of the wells decrease due to overpumping, these systems could find themselves without sufficient water. This alternative also requires continued use by the City of Bastrop of wells in alluvium which will be classified as a sensitive formation under the upcoming Ground Water Rule. These wells will undergo monthly bacteriological monitoring which could at some point result in problems with the continued use of a particular well.

5.4.2 ALTERNATIVE 2A – Independent Ground Water Usage, Aqua Supplemented by Surface Water

5.4.2.1 Alternative Description

This alternative is identical to Alternative 1 for the City of Bastrop and BC WCID No. 2. Instead of drilling additional wells by 2010, Aqua Water would purchase water from the Lower Colorado River Authority and construct a surface water plant to augment ground water supplies. If ground water were available, the surface water plant would only operate as needed to ensure the plant was functional or the plant might only operate during the summer months to augment ground water supplies. The surface water plant would be constructed by 2010 and sized at 4.0 MGD to meet Aqua Waters' next expansion requirements.

If well water was not available such that development of new wells was not advised, the plant would be expanded to approximately 6.0 MGD by 2015; 10 MGD by 2020; 12 MGD by 2025; 14 MGD by 2030 and 16 MGD by 2035 depending on actual growth and demand in Zones 2 and 2A. If ground water supplies continued to be available, the surface water plant would be expanded more slowly and additional wells would be constructed. Storage capacity requirements would be the same as Alternative 1 except that more of the capacity would be situated at the plant site as clearwell capacity to maximize disinfection CT time.

Primary disinfection of the surface water would most likely be with chlorine with possible secondary disinfection with chloramines. With the use of membrane filtration instead of conventional treatment, chloramines are not expected to be required to prevent DBP formation. However, additional analysis is necessary during membrane pilot testing to determine if chloramines would be used as a secondary disinfectant. If chloramines have to

be used, disinfection of the ground water supplies would be converted from chlorine to chloramines to achieve compatibility with disinfection chemicals if the surface water and groundwater supplies are mixed. Mixing studies would need to be conducted to determine the compatibility and stability of the ground water and surface water in various proportions in the distribution systems.For the purposes of this analysis the major components of the surface water treatment plant are as follows:

- Combination intake structure and raw water pumping station
- Coagulation and preclarification
- Microfiltration / Ultrafiltration through membranes
- Primary disinfection with chlorine
- Possible secondary disinfection with chloramines (to be determined)
- Clearwell
- Finished water pump station
- New transmission mains

Trident or other package-type plants are not advised due to the wide variation in turbidity in the Colorado River at Bastrop based on the historical data. This surface water treatment plant would require a certified surface water treatment operator.

The Malcolm Pirnie July 1999 study for Aqua Water sited this facility at the Texas Hill Tank site. This allowed for the existing Texas Hill tank to serve as a clearwell and provided good elevation for feeding the rest of the system. Alternatively, siting the new plant near the river would have the advantage of minimizing the raw water pipeline distance.

5.4.2.2 Pros and Cons

The primary advantage of this alternative is that it provides an alternative source of water to the entire study area with existing interconnects. However, because the surface water treatment plant may receive treatment with chloramines, the water must be carefully managed so that chlorinated and chloraminated supplies are not mixed. In the event that the City of Bastrop or BC WCID No. 2 required water from Aqua Water they would need to flush their systems of the chlorinated water before distributing the chloraminated water and notify the public.

The potential exists for serious problems in the distribution system if the systems are not properly flushed and waters are unstable. Distribution system piping should be evaluated carefully to determine if replacement is required to prevent red-water problems. Mixing studies would be advisable as part of the predesign effort for the new plant.

Optimization of surface water treatment plants is important to achieve the highest water quality possible and ensure all elements of a multi-barrier approach to particle removal and

disinfection is functional. When surface water plants are not operated continuously, operations and maintenance personnel do not always get the experience they need to successfully operate the plants when they are needed. Treatment plants are susceptible to producing water of unacceptable quality during startup or sudden changes in flow or, in the case of membrane facilities, have problems maintaining desired production rates.

A public notification program would also need to be initiated to inform both the general public and special water users including kidney dialysis patients and fish owners in the event of a change to chloramine disinfection.

5.4.3 ALTERNATIVE 2B – Independent Ground Water Usage, Aqua Primarily Surface Water

5.4.3.1 Alternative Description

This alternative is identical to Alternative 2A except that the surface water treatment plant would be used to serve new customers and some existing customers as their primary supply. The surface water plant would be constructed by 2010 and sized at 4.0 MGD to meet Aqua Waters' next expansion requirements. Ground water supplies would be used to meet peak demands. As in Alternative 2A, Aqua Water's ground water supplies may need to convert to chloramines to safely mix with the surface water in the distribution system.

The plant would be expanded to approximately 6.0 MGD by 2015; 10 MGD by 2020; 12 MGD by 2025; 14 MGD by 2030 and 16 MGD by 2035 depending on actual growth and demand in Zones 2 and 2A. Storage capacity requirements would be the same as Alternative 1 except that more of the capacity would be situated at the plant site as clearwell capacity to maximize chloramines CT time and minimize free chlorine requirements.

5.4.3.2 Pros and Cons

The primary advantage of this alternative is that it provides an alternative source of water to the entire study area with existing interconnects while affording greater ease in operating the surface water treatment plant. Since the plant will be operated continuously, startups and shutdowns can be minimized and operators can strive to optimize treatment processes to produce the best quality water possible while maintaining desired membrane production efficiently.

As in Alternative 2A, chloramination is not expected to be required with the use of membranes in lieu of conventional treatment. However, if chloramination is used, ground water and surface waters must be carefully managed so that chlorinated and chloraminated supplies are not mixed. In the event that the City of Bastrop or BC WCID No. 2 required water from Aqua Water they would need to flush their systems of the chlorinated water before distributing the chloraminated water and notify the public.

Mixing studies would need to be conducted to determine the compatibility and stability of the ground water and surface water in various proportions in the distribution systems and to determine the potential impact of delivering ground water to the systems whose primary source is surface water.

A public notification program would also need to be initiated to inform both the general public and special water users including kidney dialysis patients and fish owners in the event of a change to chloramine disinfection.

5.4.4 ALTERNATIVE 3 – Regional Surface Water Treatment Plant for Portion of Study Area

5.4.4.1 Alternative Description

In this alternative the wells currently used by Bastrop would be phased out and a surface water plant brought online by 2010 in time to meet Aqua Water's expansion needs. No additional wells would be drilled to serve the Study Area for this Alternative 3. The size of the initial facility would be 6.0 MGD. The plant would need to be expanded to produce 8.7 MGD by 2015; 11 MGD by 2020; 12.6 MGD by 2025; 15 MGD by 3030 and 17.4 MGD by 2035 depending on actual growth experienced in the combined service areas. Aqua Water would utilize a base flow of surface water and provide a blended product of surface and ground water to its customers. BC WCID No. 2 would remain a ground water system with chlorine disinfection with emergency backup provided by Aqua Water or the Regional Plant.

The surface water treatment plant would have the same components listed for Alternative 2. The plant would operate continuously serving the current City of Bastrop area. Colorado River water could be purchased from the LCRA or treated water could be purchased from LCRA if LCRA were to own and operate the treatment facilities as a regional plant. Alternately, Aqua Water or another entity could own and operate the surface water treatment plant.

5.4.4.2 Pros and Cons

If LCRA owned and operated the plant, the costs of operations and maintenance personnel could be shared with other LCRA surface water treatment plants. By providing a base flow of 8.0 MGD of treated surface water to Aqua Water in 2010 and increasing that flow to augment ground water supplies as needed, the benefits of dilution are made available to reduce THMs in the surface water and lead and manganese in the ground water. Producing a blend of the ground and surface water results in a more consistent product in the distribution system and is less likely to cause distribution water quality problems than would potentially occur if the utility switched back and forth between the two sources. Blending studies and water stability investigations would be required in the predesign effort as in Alternatives 2(A and B) and 3.

Chlorine disinfection is expected to be acceptable with the proposed membrane facility. However, if chloramination is advised, conversion of the ground water disinfection scheme from chlorine to chloramines would ensure compatibility with the surface water disinfection and eliminate the concern of lost residual in the distribution system. A public notification program on conversion to chlormination would be required as in Alternatives 2(A and B) and 3.

Storage capacity requirements for City of Bastrop and Aqua Water could be combined in this Alternative into fewer and larger clearwells and elevated storage tanks. If conventional treatment processes are used instead of membranes, larger clearwells located at the plant

site could provide longer CTs for chloramines reducing the free chlorine time required and minimizing THM formation.

5.4.5 ALTERNATIVE 4 – Regional Surface Water Treatment Plant for Entire Study Area

5.4.5.1 Alternative Description

This alternative phases out the use of all ground water supplies. City of Bastrop, BC WCID No. 2, and Aqua Waters Zone 2 and 2A customers would be served by a Regional Water Treatment Plant facility. LCRA would sell raw or treated Colorado River water to the Study area or Aqua Water or another entity could own and operate the treatment plant. The plant would be sized to meet the total treatment capacity required of 16 MGD in 2010 and undergo expansions as needed and currently projected at 33 MGD in 2035.

5.4.5.2 Pros and Cons

The advantage of this alternative is that all entities would receive the same water and supply of that water could be secured in agreements with LCRA.

The disadvantage is the abandonment of the excellent and inexpensive groundwater afforded by the Carrizo-Wilcox aquifer.

5.4.6 Summary and Recommendation

A summary of the various options for ground water or surface water supply is shown in Table 5-32.

	Alternative				
	1	**2A**	**2B**	**3**	**4**
City of Bastrop Ground Water	●	●	●		
City of Bastrop Surface Water				●	●
Bastrop County WCID No. 2 – Ground Water	●	●	●	●	
Bastrop County WCID No. 2 – Surface Water					●
Aqua Water – Ground Water	●	●	●	●	
Aqua Water - Surface Water		●	●	●	●
Aqua Water – **Possible** Chloramination of Ground Water		●	●	●	
Emergency Surface Water Supply		●		●	
Emergency Ground Water Supply			●		
Continuously Operated Surface Water Treatment Plant			●	●	●
Regional Surface Water Treatment Facility				●	●

Table 5-32 Water Supply Alternatives Summary

Alternatives are compared on relative costs and benefits as well as operational complexities and the potential for distribution system water quality problems in Table 5-33.

Note that this table is looking at the issues from a relative perspective only.

	Alternative				
	1	**2A**	**2B**	**3**	**4**
Potential for Problems with Water Supply	High	Medium	Low	Low	Low
Relative Capital Cost	Low	Medium	Medium	Medium	High
Relative Operation and Maintenance Costs	Low	Medium	High	High	High
Potential Problems with Disinfection Compatibility	N/A	Medium	Medium	Medium	N/A
Potential Problems with Distribution System Quality	Low	High	Medium	Medium	Low
Potential Problems with Optimization of Treatment Plant	NA	Medium	Low	Low	Low
Complexity of System Operation	Low	High	Medium	Medium	Low

Table 5-33 Water Supply Alternatives Comparison

Section 6
Implementation Plan

This section describes the cost and schedule of improvements to the wastewater and water systems necessary to meet projected demands through 2035 in the area of Western Bastrop County study area defined previously in this report. Facility improvements plans presented in this section detail the regional wastewater and water plans selected by the Study Participants from those outlined in Sections 4 and 5 of this report. Presented first in this implementation plan are the capital improvements costs and schedule for the selected wastewater system plan (Alternative 2), followed by the selected water system plan (Alternative 2b). Finally, the costs associated with all proposed facilities improvements (water and wastewater) are grouped and scheduled.

6.1 Wastewater Facilities Installation Plan

The wastewater management strategy selected by the Study Participants effectively divides the study area into two sub regions with independent wastewater systems. The eastern region is served by the West Bastrop WWTP, accepting flows initially from the Bastrop West development areas, ultimately to include the Colony development. The western region is served by the Cedar Creek WWTP, accepting flows from the Carr development and taking over for the Elm Ridge WCID #3 WWTP (see Figure 4-5). Initially, development in the two regions will rely on existing and soon to be constructed package treatment facilities (Elm Ridge WCID #3 WWTP in the west and the Colony WWTP in the east) until the sub regional plants are established. Interim expansions to these plants, indicated schematically in Figure 6-1 and detailed in Table 6-3, will be adequate until 2020, when the Elm Ridge WCID #3 WWTP is decommissioned. The Colony WWTP is decommissioned shortly thereafter in 2025. Capital improvement plans already adopted before this study were incorporated into this implementation plan.

New treatment plants and expansions were sized according to TCEQ guidelines and engineering judgment. TCEQ WWTP permits frequently require expansion planning to commence when plants reach 75% capacity and construction at 90% capacity. Expansion targets were likewise set to keep capacity levels less than or equal to 75%, while minimizing the number of expansions. For plants bound for decommissioning, the TCEQ frequently permits operations at greater than 90% capacity. Regionalization of all or part of the wastewater service area, allows plants bound for decommissioning (e.g. Colony WWTP) to operate at a higher capacity provided there is a plan to decommission and transfer flow to the sub regional plant (e.g. West Bastrop WWTP), resulting in delayed capital costs and thus savings. This type of consolidation also limits staffing needs to fewer locations, reducing O & M costs.

Throughout this section, asterisks (*) are used to indicate information supplied by study participants that more accurately reflect the current state of facility improvement plans that are often beyond the basic requirements discussed in this

report. Therefore, the highlighted information pertaining to capacity upgrades, schedules, and costs are not the product of the same cost estimation procedure used throughout the remainder of the report, and account for the discrepancies found between costs listing in Section 6 and Section 4.

Interceptor sizes were determined using Manning's equation based on passing the specific service area flow rates through an 80% full pipe at slopes determined using USGS topographic maps. Details of the cost estimation assumptions for all facilities including the interceptors are available in the appendix.

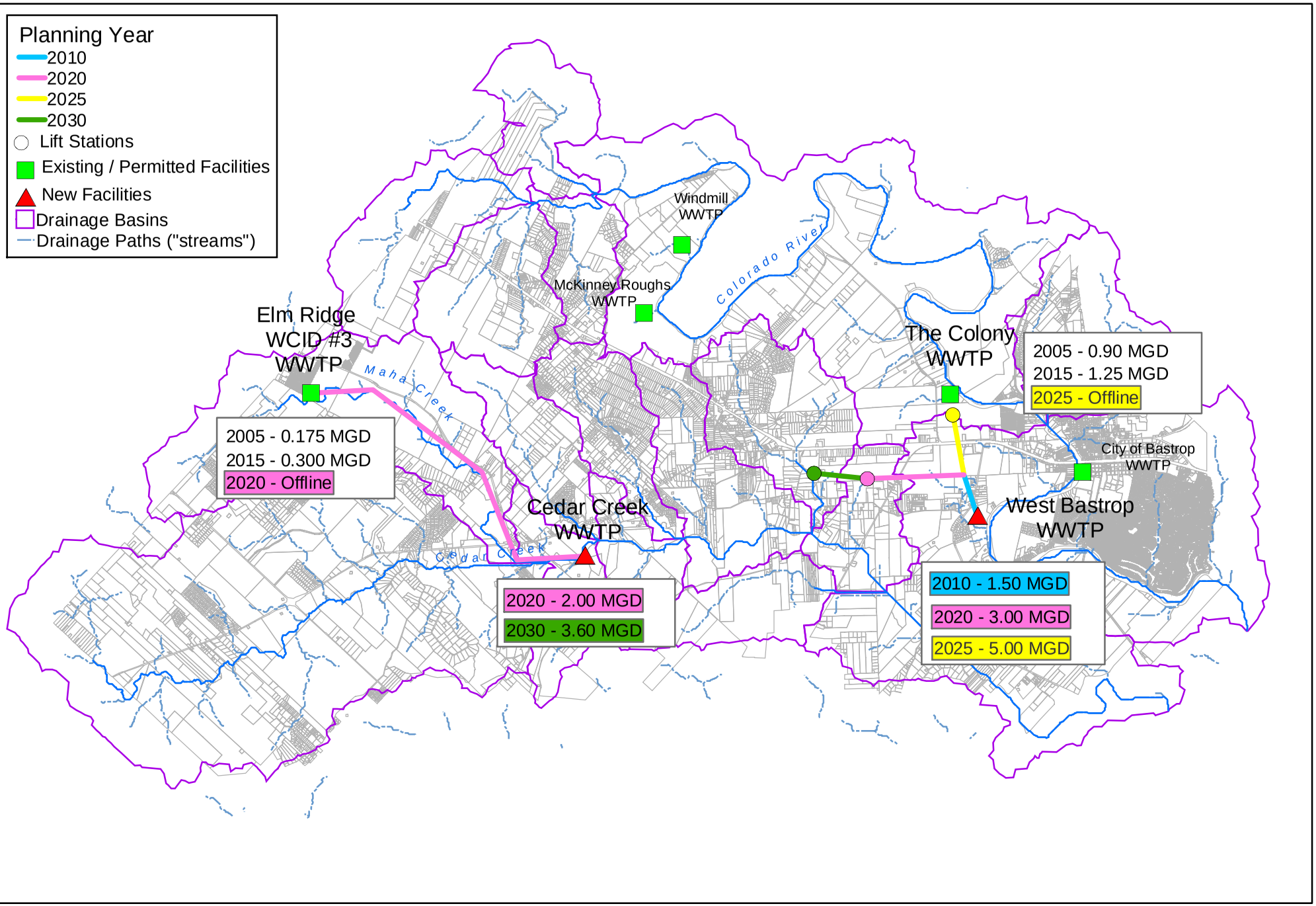


Figure 6-1
Implementation Plan

Eastern Sub-Region

Facilities improvements schedules for the east sub-regional wastewater system are presented in Figure 6-2. Planning initiatives by the City of Bastrop are already underway for the West Bastrop WWTP and forecast it to be operational at a capacity of 1.5 MGD by 2010. The associated collection system piping required to serve the Bastrop West development area in the Colorado River watershed for this installation is estimated to be 5280 feet of 21" gravity pipe (see Table 6-1). By 2020, service in the Bastrop West development will expand westward, warranting plant expansion to 3.0 MGD (see Figure 6-1). In 2025, the City of Bastrop plans to expand the treatment capacity to 5.0 MGD, accommodating growth in the Bastrop West development thru Year 2035 as well as a flow transfer from the decommissioning of the Colony WWTP.

2010	West Bastrop WWTP (1.5 MGD)	* $	5,500,000
	West Interceptor 1 to West Bastrop WWTP (5280 ft, 21")	$	771,000
2020	Expand West Bastrop WWTP (1.5 MGD)	*$	5,500,000
	West Interceptor 2 to West Bastrop WWTP (9240 ft, 21")	$	1,158,000
	West Lift Station 1 (1800 gpm)	$	480,000
2025	Expand West Bastrop WWTP (2.0 MGD)	*$	5,500,000
	Colony Interceptor to West Bastrop WWTP (7920 ft, 18")	$	993,000
	Colony Lift Station (2900 gpm)	$	529,000
2030	West Interceptor 3 to West Bastrop WWTP (5280 ft, 18")	$	444,000
	West Lift Station 2 (1000 gpm)	$	445,000
	TOTAL	$	21,320,000

Table 6-1 Eastern Sub Regional Wastewater Expansion Schedule in 2004 dollars

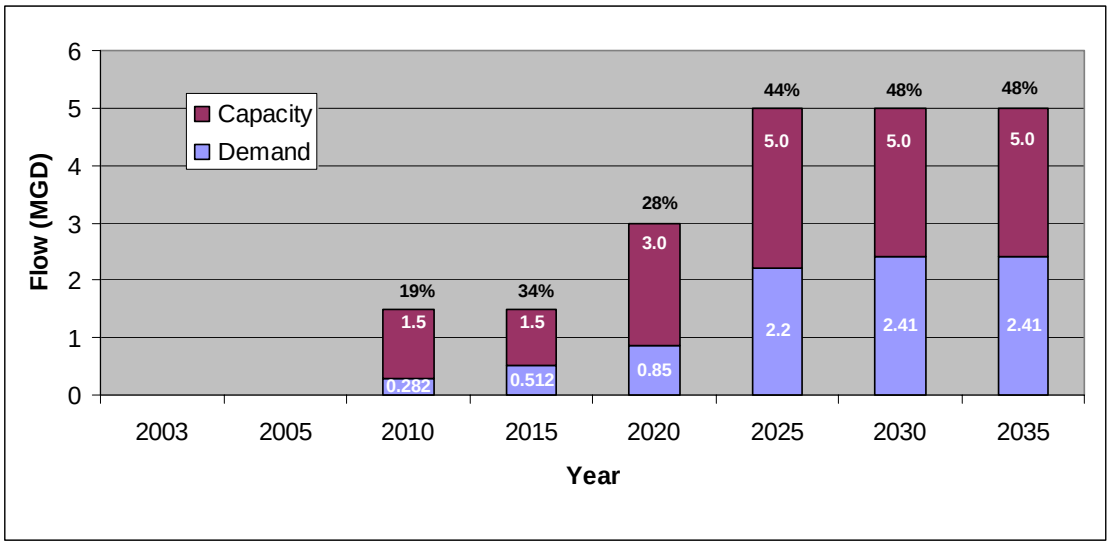


Figure 6-2 West Bastrop WWTP Capacity Projections
East Sub-Regional Wastewater System

Western Sub-Region

Facilities improvements scheduled for the west sub-regional wastewater system are presented in Figure 6-3. The Cedar Creek WWTP is located near the confluence of the Cedar and Hobbs Creeks, downstream of Maha Creek. This location was selected to maximize the area in the upstream watersheds that the plant could serve by gravity. The plant capacities in this study, however, are based on serving only the Carr and Elm Ridge developments (see Figure 4-5) beginning in year 2020. Growth in these service areas during the study period is expected to require a single plant expansion to 3.6 MGD in 2030.

2020	Cedar Creek WWTP (2.0 MGD)	$ 10,350,000
	Carr Interceptor 1 (9240 ft, 24")	$ 1,936,000
	Carr Interceptor 2 (21120 ft, 21")	$ 3,958,000
	Elm Ridge WCID#3 Interceptor (7920 ft,156")	$ 556,000
2030	Expand Cedar Creek WWTP (1.6 MGD)	$ 5,520,000
	TOTAL	$ 22,320,000

Table 6-2 Western Sub Regional Wastewater Expansion Schedule in 2004 dollars

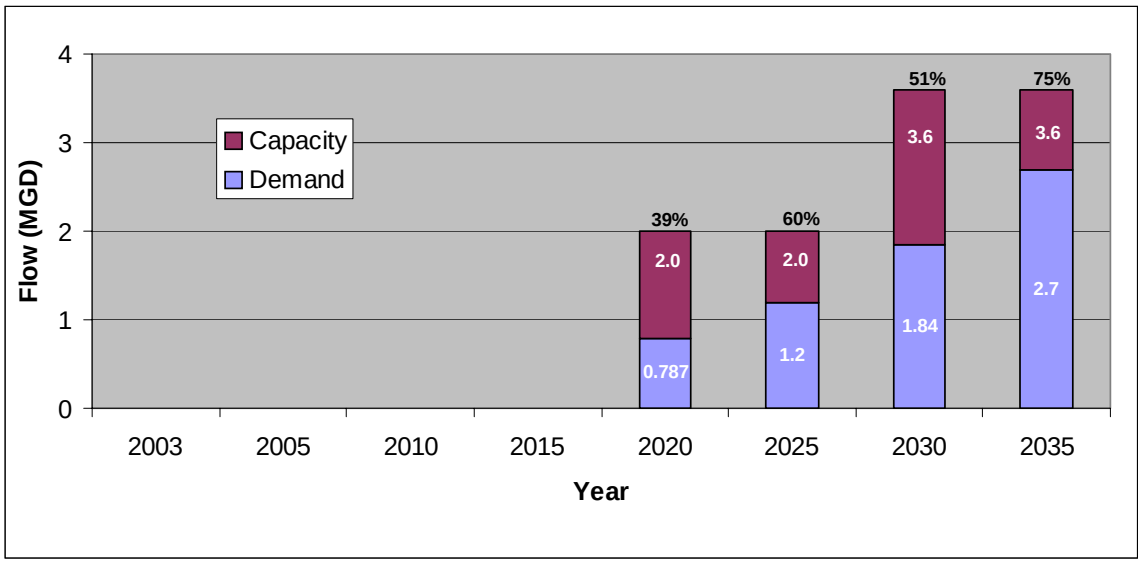


Figure 6-3 Cedar Creek WWTP Capacity Projections
West Sub Regional Wastewater System

Accomplishing the aforementioned strategy will require the construction of two new wastewater treatment plants with multiple expansions totaling 7.275 MGD of capacity; 66,000 linear feet of new pipe and 3 lift stations with a total firm pumping capacity of 5,700 gallons per minute. Table 6-3 summarizes the estimated costs associated with these improvements, which includes the cost associated with the expansion of the Colony WWTP and the Elm Ridge WWTP. These costs are not reflected in Table 6-1 or 6-2 because the plants will not be permanent parts of the sub regional wastewater systems.

2010	West Bastrop WWTP & West Interceptor 1	$	6,271,000
2015	Expand Colony & Elm Ridge WCID #3 WWTPs	$	1,640,000
2020	Cedar Creek WWTP & Interceptor, Expand West Bastrop WWTP & Interceptor with Lift Station, Decommission Elm Ridge WCID #3 WWTP	$	23,938,000
2025	Expand West Bastrop WWTP & Interceptor with Lift Station, Decommission Colony WWTP	$	7,022,000
2030	Expand Cedar Creek WWTP, Expand West Bastop Interceptor with Lift Station	$	6,409,000
	TOTAL	$	41,545,000

Table 6-3 Wastewater Facility Improvement Cost Schedule Summary in 2004 dollars

6.2 Water Facilities Installation Plan

The water system plan selected by the Study Participants (Alternative 2b in Section 5) calls for independent expansion within each water provider's service areas, with interdependence only through emergency provision agreements and system interconnection. The plan calls for Aqua WSC to begin introducing surface water into their system by 2010 when the planned membrane water treatment plant will be online. The City of Bastrop and Bastrop County WCID #2 (BC WCID #2) are both scheduled to expand their ground water facilities. The cost information that follows addresses solely water production and storage facilities, both of which have definitive facility requirements. Transmission infrastructure is not included due to its dependence on the subjective determination of source location and pipe routing.

Presented in Table 6-4 is a schedule indicating facility improvement requirements for the Aqua WSC during the study period, 2005 through 2035. The first major installation is the 1 MG composite elevated storage tank followed by the 4 MGD surface water treatment plant project, both of which have already been initiated by Aqua WSC. The cost estimate shown in Table 6-4 for the plant includes only raw water intake and treatment, not storage, pumping or connection to the existing system. Taking advantage of the ease of expansion associated with membrane water treatment technology, incremental expansions are scheduled to come online every 5 years throughout the course of the study period, resulting in an ultimate plant capacity of 16 MGD in 2035.

2005	Elevated Storage Tank (1.0 MG)	*$	800,000
2010	Surface WTP (4 MGD)	$	9,400,000
2015	Expand Surface WTP (2 MGD)	$	2,760,000
2020	Expand Surface WTP (4 MGD)	$	11,040,000
2025	Expand Surface WTP (2 MGD)	$	2,760,000
2030	Expand Surface WTP (2 MGD)	$	5,520,000
2035	Expand Surface WTP (2 MGD)	$	2,760,000
	TOTAL	$	35,040,000

Table 6-4 Aqua WSC Facility Improvements Schedule in 2004 dollars

The City of Bastrop facilities were deemed adequate through year 2020, however their own capital improvements schedule indicates Well "G" shall be online by year 2010 and Well "H" by 2015. These groundwater production plants are both planned to have 1000 gpm capacities (see Table 6-5). The City of Bastrop also plans to have a new elevated storage tank online by 2007.

2010	Well "G" and plant (1000 gpm)	*$	650,000
	Elevated Storage Tank (0.25 MG)	*$	650,000
2015	Well "H" and plant (1000 gpm)	*$	650,000
	TOTAL	$	1,950,000

Table 6-5 City of Bastrop Facility Improvements Schedule in 2004 dollars

Bastrop County WCID #2 will require additional wells for production as well as elevated and ground storage. The schedule for these improvements is shown in Table 6-6, with the majority of the work to be completed by 2020.

2010	Well 6 (410 gpm)	$	518,000
	Elevated Storage Tank (0.3 MG)	*$	600,000
2020	Wells 7 & 8 (2 x 400 gpm)	$	690,000
	Ground Storage Tank (0.2 MG)	$	359,000
	TOTAL	$	2,167,000

Table 6-6 Bastrop County WCID #2 Facility Improvements Schedule in 2004 dollars

Growth in the study area will require a number of capital improvements to the water systems in the region. Collectively, all three water providers considered in this study are expected to spend almost $40.1 million on wells, elevated and ground storage tanks, and a surface water treatment plant complete with expansions (see Table 6-7).

2005	Aqua Elevated Storage Tank	$	800,000
2010	Aqua Surface WTP; City of Bastrop Well "G"; City of Bastrop Elevated Storage Tank; BC WCID #2 Well 6, Elevated Storage Tank	$	11,818,000
2015	Exp Aqua Surface WTP; City of Bastrop Well "H"	$	3,410,000
2020	Exp Aqua Surface WTP; BC WCID #2 Wells 7 & 8, Ground Storage tank	$	12,089,000
2025	Exp Aqua Surface WTP	$	2,760,000
2030	Exp Aqua Surface WTP	$	5,520,000
2035	Exp Aqua Surface WTP	$	2,760,000
	Total	$	39,157,000

Table 6-7 Water Facility Improvement Cost Schedule Summary

6.3 Conclusion

The implementation of the water and wastewater system plans presented earlier in this report and chosen by the Study Participants will require an expenditure of $79.5 million dollars over 30 years to satisfy the projected growth in the region. A complete listing of the capital improvement costs and implementation schedule for both water and wastewater is provided in Table 6-8 in 2004 dollars.

2005	New Elevated Storage Tank	$	800,000
2010	New WWTP, 5280 ft Interceptor, New Surface WTP, 2 New Wells, New EST's	$	18,089,000
2015	2 Exp WWTPs, Exp Surface WTP, New Well	$	5,040,000
2020	1 New WWTP, 1 Exp WWTP, 47,520 ft Interceptor, New Lift Station; Exp Surface WTP, 2 New Wells, Ground Storage Tank	$	36,027,000
2025	Expand WWTP, 7920 ft Interceptor, New Lift Station; Exp Surface WTP	$	9,782,000
2030	Exp WWTP, 5280 ft Interceptor, New Lift Station; Exp Surface WTP	$	11,929,000
2035	Exp Surface WTP	$	2,760,000
	Total	$	84,427,000

Table 6-8 Water & Wastewater Facility Improvement Cost Schedule in 2004 dollars

Section 7
Natural and Cultural Resources Assessment

7.1 Natural Resources Assessment

The proposed Water and Wastewater Planning Study (Study) area is the western part of Bastrop County. It will include most of Bastrop County south of the Colorado River and west of the City of Bastrop, and will include the City of Bastrop and its ETJ.

7.1.1 Methods

LCRA staff performed a preliminary natural resources assessment for the study area included within the Western Bastrop County Regional Water and Wastewater Planning Study. The purpose of this assessment was to provide a general natural resources baseline for the project area based on available, in-house data. A site visit was not conducted for this phase of the natural resources evaluation.

The natural resources concerns that were addressed included: endangered and threatened species, waters of the United States, and any other special environmental features noted for the area.

As part of the evaluation, a review was made of the following documents:

- United States Geological Survey (USGS) 7.5-minute topographic quadrangles: Lake Bastrop, Bastrop, Bastrop SW, Webberville, Lytton Springs, and Creedmore, Texas
- Natural Resource Conservation Service (NRCS) Bastrop County Soil Survey (NRCS, 1979)
- Data from Texas Parks and Wildlife Department's (TPWD) Wildlife Diversity Program

7.1.2 Findings

The following information was researched using the above documents and includes Land Use, Hydrology/Topography, Soils/Geology, Vegetation, Species or Habitat of Concern, and Summary and Recommendations.

7.1.2.1 Land Use

Land use within the study area is primarily agricultural (with a mix of pastureland, hay land, and cropland) and secondarily urban (the City of Bastrop and surrounding subdivision development) (NRCS 1979).

7.1.2.2 Hydrology/Topography

The USGS Lake Bastrop, Bastrop, Bastrop SW, Webberville, Lytton Springs, and Creedmore, Texas quadrangles map the river and creek systems within the study area. The Lower Colorado River is the main waterway of the study area, meandering from northwest to southeast partially along the northern border and cutting down through the eastern portion of the study area, just west of the city of Bastrop. Named tributaries to the Colorado River in the northwest corner of the study area include Dry Creek, Cottonwood Creek, Moss Creek, and Red Gully Creek. There are over a dozen unnamed tributaries to the Colorado River within the study area.

The next largest waterway within the study area is Cedar Creek, which flows from the west to the southeastern edge, and is joined by Walnut Creek just before it flows into the Colorado River. Other named tributaries to Cedar Creek include Lytton Springs Creek, Maha Creek, Cottonwood Creek (separate from above), and Long Branch. There are 50+ unnamed tributaries that flow into Cedar Creek.

Waters of the United States are under the jurisdiction of the U.S. Army Corps of Engineers (USACE) and are protected by the States, U.S. Environmental Protection Agency and the USACE through the Federal Clean Water Act. Waters of the U.S. include, but are not limited to streams, creeks, ponds, rivers and wetlands. The Colorado River, Cedar Creek and their tributaries are considered waters of the US and may have wetland areas associated with them. Many stock ponds are scattered throughout the planning area and are considered water of the US if they were constructed on or within an existing water of the US.

The Texas Commission on Environmental Quality (TCEQ) has classified this portion of the Colorado River basin with uses that support exceptional aquatic life, contact recreation and public water supply. The TCEQ sets criteria to protect these uses such as numeric criteria for dissolved oxygen and nutrients[1] and establishes provisions, such as the Colorado River Watershed Rule, to protect the water quality downstream of Austin from pollutants.

The topography of the study area grades from approximately 400-ft elevation to approximately 600-ft elevation in the southwestern corner.

7.1.2.3 Soils/Geology

The Bastrop County General Soil Map indicates five major soil associations for the Study Area. The Patilo-Demona-Siltstid Association consists of gently sloping to strongly sloping soils on uplands. Soils have a sandy surface later and moderately slowly to moderately permeable lower layers. The Axtell-Tabor Association consists of nearly level to strongly sloping soils on stream terraces and uplands. Soils have a loamy surface layer and very slowly permeable lower layers. The Crockett-Wilson Association has nearly level to strongly sloping soils on uplands. Soils have a loamy surface layer and very slowly permeable lower layers. The Behring-Crockett-Heiden

[1] The TCEQ is currently developing numeric nutrient standards for all classified water bodies in Texas.

Association contains gently sloping soils on uplands. Soils have a loamy to clayey surface layer and slowly to very slowly permeable lower layers. The Bosque-Smithville-Norwood Association contains nearly level soils on low terraces and flood plains. Soils have a loamy surface layer and moderately permeable lower layers.

There are no hydric soils listed for Bastrop County. The presence or absence of Prime Farmland was not investigated for this planning area.

The underlying geology within the study area includes the Wilcox Formation, Midway Group, Navarro Group and Marlbrook Marl, Fluviatile Terrace Deposits, and Alluvium. The Wilcox group is the primary geologic feature in the study area, lying in the eastern half and portions of the southwestern corner of the study area. It is composed of mostly mudstone with various amounts of sandstone, lignite, ironstone concretions, and in uppermost and lowermost parts commonly glauconitic. Thickness of the formation is 1200-1300ft.

The Midway Group includes the Wills Point Formation, which consists of clay, silt and sand, and the Kincaid Formation comprised of poorly sorted sand and silty clay. This formation is located in the northwestern and western portion of the study area. The Navarro Group and Marlbrook Marl consist of mainly clay with a thickness of about 600ft, and is found on the northwestern and southwestern edge of the study area. Fluviatile Terrace Deposits are found on terraces along streams and include gravel, sand, silt, and clay. This formation is found along the Colorado River and Cedar Creek. Alluvium is mainly floodplain deposits of clay, silt, sand, gravel, and organic matter, including low terrace deposits 3-8 feet above floodplain subject to flooding. Alluvium is also found along the Colorado River and Cedar Creek within the study area.

7.1.2.4 Vegetation

The study area consists of Post Oak Woods, Forest, and Grassland Mosaic; Post Oak Woods/Forest; and crops. Post Oak Woods, Forest consists of (Post Oak Savannah): Blackjack oak, eastern redcedar, mesquite, black hickory, live oak, sandjack oak, cedar elm, hackberry, yaupon, poinson oak, American beautyberry, hawthorn, supplejack, trumpet creeper, dewberry, coral-berry, little bluestem, silver bluestem, sand lovegrass, beaked panicum, three-awn, sprangle-grass, tickclover. The distribution is most apparent on the sandy soils of the Post Oak Savannah.

There are wooded and/or shrubby riparian areas along many of the waterways in the Colorado River and Cedar Creek systems. Such riparian areas provide many ecological functions including habitat for wildlife.

7.1.2.5 Species or Habitat of Concern

According to lists maintained by the U.S. Fish and Wildlife Service (USFWS) and TPWD, three federally listed endangered or threatened, and ten state listed endangered or threatened species potentially occur within Bastrop County (see attached county list). The White Faced Ibis is not on the Bastrop county list but is

currently state threatened and should be considered for this study. It should be noted that inclusion on either list does not imply that a species is known to occur in the study area, but only acknowledges the potential for its occurrence. Only those species listed as endangered or threatened by the USFWS are afforded complete federal protection under the Endangered Species Act (ESA). State-listing of species protects only individual organisms, not their respective habitats. Although the endangered *Bufo houstonensis,* Houston Toad, is found in portions of Bastrop County, there is no concern of occurrence within the study area. The following is a description of species of particular concern for the project area.

The federally- and state-listed threatened bald eagle (*Haliaeetus leucocephalus*) is present in Texas year-round, and may be found breeding, wintering, and during migration. In Texas, bald eagles breed along the Gulf Coast and on major inland lakes and reservoirs. Additional numbers of migratory bald eagles winter in these habitats. Bald eagles prefer large bodies of water surrounded by tall trees or cliffs, which are used as nesting places. Potential habitat may exist in the vicinity of the Colorado River in the northeast corner of the study area.

The state-listed threatened timber/canebrake rattlesnake (*Crotalus horridus*) is found in swamps, floodplains, upland pine and deciduous woodlands, riparian zones and abandoned farmland. It prefers limestone bluffs, sandy soil or black clay with dense ground cover. Occurrences in the area are on the southwest border of the Tahitian Village wastewater area, and might be found in the eastern half of the study area.

7.1.3 Summary and Recommendations

Infrastructure development is not anticipated to directly negatively impact federally- or state-listed endangered or threatened species.

Riparian areas, wooded or vegetated banks of the Colorado River, are special areas of concern and should be avoided if at all possible. Any unavoidable impacts in riparian areas should minimize disturbance to vegetation and soils.

There is one federally-listed endangered species and one state-listed threatened species that are shown to potentially occur within the study area, all within the eastern half of the study area.

A more exhaustive Environmental Assessment should be performed prior to construction of any wastewater facilities in the Study Area. When preparing the Environmental Assessment and performing preliminary engineering, special attention should be paid to waters of the United States. Impacts to these features may require coordination with the U.S. Army Corps of Engineers.

7.2 Cultural Resources Assessment

7.2.1 Environmental Background

The planning area is situated within the Gulf Coastal Plains physiographic province and includes sections of both the Post Oak Savannah and the Blackland Prairie geographic provinces (Arbingast et al. 1976:12-13). The surface geology consists of a number of northeast-southwest trending formations. The westernmost of these is the Cretaceous-aged Upper Taylor Marl (Barnes 1974). This marl is a clay that is overlain by prairie topsoils such as the Houston Black clay and the Wilson gravelly clay loam (Baker 1979). Further eastward a succession of Eocene era geologic deposits consisting of the Midway Group, the Hooper, Simsboro, and Calvert Bluff formations are found. These are primarily sands, silts, mudstones, and sandstones that are overlain by sandy topsoils common to the Post Oak Savannah.

The Colorado River forms the northern boundary of most of the project area, and the river generally cross-cuts the above-described geological formations at a right angle. In addition to the Holocene alluvial deposits that the river has laid along its flanks, the river has deposited Pleistocene-aged fluviatile terrace deposits in the uplands in many areas. These high terrace deposits include a high volume of flint and quartzite cobbles that were heavily utilized by prehistoric peoples in the area for the production of chipped and ground stone tools.

Prior to the advent of historic clear landing and agricultural practices, the Blackland Prairie was primarily a grassland with little bluestem being predominant. Riparian zones were restricted to the flanks of stream channels where oak, pecan, ash, and hackberry were common. The Post Oak Savannah is a mix of oak woodlands and prairie pockets. Post oak is the predominant woodland species. Toward the eastern end of the project area, the western edge of a remnant hardwood pine forest pocket locally known as the Lost Pines is present.

7.2.2 Culture History

The project area lies within the Central Texas prehistoric cultural region (Prewitt 1981). The prehistory of Central Texas has recently been reviewed by several archeologists including Johnson (1994) and Collins (1995). These papers build upon the previous work of Weir (1976) and Prewitt (1981, 1985) that established a detailed cultural chronology and cultural history for the region. Importantly, Johnson's paper includes new data on past climates in Central Texas while Collins discusses past and present research theories and trends in prehistoric archeological research in Central Texas. The reader is referred to these works for in-depth discussions of Central Texas prehistory.

Prehistoric site types in Central Texas consist of camps, caches, isolated artifacts, interments, cemeteries, kill/butcher locales, quarry/workshops, lithic scatters, and rock art sites (Collins 1995:363). Central Texas is perhaps best known for the many burned rock midden sites that occur on the Edwards Plateau. Numerous excavations of major campsites have been conducted along the larger streams and rivers (cf. Peter

et al. 1982; Prewitt 1982). Such excavations have demonstrated that Central Texas was occupied for at least 11,500 years prior to the coming of Europeans. These also show that throughout these millennia, prehistoric peoples were nomadic hunter-gatherers who moved across the landscape exploiting seasonally available plant and animal resources.

Histories of several counties have been compiled by the LCRA staff for historic background information (LCRA files). According to these records, Bastrop County was settled as early as 1804, when a fort was established along the Nacadoches-San Antonio Road crossing of the Colorado River at the location of present-day City of Bastrop. In 1827 Stephen F. Austin received a grant from the Spanish governor, and by 1830 the town of Bastrop, named for the Baron de Bastrop, was settled. In 1837 the Republic of Texas established the County of Bastrop. Cotton and lumber were primary industries and by 1860 Black slaves formed about one-third of the population. Around 1870 industrial interests were expanding. By the turn of the century, railroads had helped to improve the economy, oil had been discovered, and a major brick manufacturing plant was in place near Elgin. Camp Swift was established as a military training center during World War II, and in time became a prisoner of war camp as well. By 1950, a diversified agricultural base was still the main economic strength of the county. Agriculture has been Bastrop County's mainstay until recently; as nearby Austin has continued to grow, so has Bastrop. Many residents of Bastrop now commute on a daily basis to the state's capital.

7.2.3 File Searches

7.2.3.1 General Background

A check of the cultural resource sites files at Texas Archeological Research Laboratory and the Texas Historical Commission's computerized Site Atlas showed that there are 90 previously recorded archeological sites within the planning area. These consist of 54 prehistoric sites (including one prehistoric burial remains), 11 historic period sites, 11 with both prehistoric and historic components, 1 historic cemetery, and 13 other sites lacking data on temporal components. Not surprisingly, the majority of the prehistoric sites are situated in the vicinity of the Colorado River. These include prehistoric campsites where nomadic Native American peoples camped intermittently through time. At some of these campsites, artifacts and features occur throughout topsoil deposits that are at least three feet in thickness. Most artifacts appear to be chipped stone tools manufactured from locally available chert (flint). Features mostly consist of burned rock clusters that served for heating and cooking. Lithic procurement/scatter sites are a second major type of prehistoric site found in the planning area. These frequently occur in upland areas farther distant from stream channels. Often, these sites occur at locations where lag gravel deposits that include chert are strewn across the ground surface. Artifacts typically found at these sites often reflect the early stages of chipped stone tool production.

Robinson's (1987) survey of the archeological and historical resources for the Bastrop County Historical Commission's sesquicentennial project is one of the most important

previous archeological investigations of land within and near the project area. Robinson recorded a total of 39 cultural resource sites including some that are situated within the project area. Among the noteworthy sites are a rare Middle to Late Archaic era prehistoric cemetery and three historic sites linked to historic personages important to Republic of Texas and Civil War periods. Additionally, he conducted test excavations at two prehistoric sites, the Appelt Site (41BP66) and the Wagner Site (41BP279) which are situated along the Colorado River east of the project area.

A second noteworthy previous archeological project is LCRA's inventory survey for the 1,100-acre McKinney Roughs Park and Preserve, which is situated within the northeast part of the planning area (Kotter et al. 1996). That survey identified 20 new archeological sites – 41BP444 through 41BP452, and 454 through 464. These sites consist of 3 that are historic in age, 16 that date to the prehistoric, and 1 that has both historic and prehistoric materials. The prehistoric sites are primarily upland lithic scatters that have flint chipping debris and cores present in shallow deposits. The historic period sites represent late nineteenth to early twentieth farmsteads. None of these previously recorded archeological sites are situated within the currently proposed road right-of-way.

Additionally, the McKinney Roughs Park and Preserve inventory survey area included a separate 250-acre that had been previously investigated by Robinson (1987). Two prehistoric sites, 41BP88 and 41BP286, and one historic site, 41BP287, had been found by Robinson (ibid.) in that tract. These three sites were originally thought to be similar in content to those recorded by Kotter et al. (ibid.). However, an emergency discovery investigation at 41BP88 by Prikryl and Malof (1999:209-224) showed that the northwest portion of this site is an important prehistoric campsite with features contained within an 80 cm thick topsoil. Diagnostics found at 41BP88 indicate that the site was occupied during the Middle and Late Archaic periods.

More recently the LCRA Archeology Services staff completed survey investigations for proposed multiple improvements on the Windmill Ranch portion of the McKinney Roughs tract (Prikryl and Malof 2002). Two new cultural resource sites, 41BP659 and 41BP660, were found and assessed. Site 41BP659 is of particular note as it is a multi-component prehistoric site with stratified campsite remains in an alluvial setting. It was assessed as potentially eligible for inclusion in the National Register of Historic Places (NRHP) and potentially meriting formal designation as a State Archeological Landmark (SAL).

North of the current project area, archeological investigations have been undertaken at Camp Swift where 43 prehistoric and 44 historic sites were discovered during intensive survey efforts (Skelton and Freeman 1979). Eight the prehistoric sites were later test excavated. Closer to the north boundary of the planning area, Kenmotsu (1982) recorded 30 prehistoric and 22 historic sites during survey of the LCRA's Powell Bend Lignite Prospect. Subsequent excavation of one of the these prehistoric sites, 41BP191, led to the documentation of 25 burned rock features used for cooking

and heating activities by prehistoric peoples who intermittently camped at this locale over a 5,000 year period (Bement 1984).

7.2.3.2 Potential Treatment Plant Sites Background

A more detailed file search was conducted for two general treatment plant locations that have been identified. One of these two areas is situated on the west bank of the Colorado River just southwest of the City of Bastrop at the east end of the planning area. Four previously recorded prehistoric sites are located in this general area. Review of data on these sites found in the Texas Historical Commission computerized *Site Atlas* indicates that all four of these sites are prehistoric campsites of potential significance. Cultural materials include flint tools and chipping debris, burned rocks from hearth features, and animal bones. Dark midden soil was also noted at several of these sites. Available data suggests that this area has a high potential for significant prehistoric sites, including many other unrecorded ones, that would require avoidance or mitigation if ground-disturbing activities related to water or wastewater treatment construction were pursued in this area.

The second potential treatment plant site is located on the Maha Creek drainage at the west end of the planning area. Review of the THC's computerized *Site Atlas* showed that there has been very little in way of professional archeological investigations in this vicinity. Available data from nearby areas suggests that prehistoric lithic scatter/procurement sites could be present in upland areas along this creek drainage. Most such sites would be considered insignificant and would not require avoidance/mitigation. On the lower terraces adjacent to the Maha Creek channel, some unrecorded prehistoric campsites could be present, but these would occur less frequently in comparison to those on the larger stream drainages. Such campsites could be potentially significant, however, and may require avoidance/mitigation.

7.2.4 Cultural Resources Summary

A cultural resource files search for the planning of the West Bastrop County Water and Wastewater Planning Project was undertaken by the LCRA Archeology Services staff in January 2004. The file search indicated that there are 90 previously recorded archeological and historical sites within the planning area. The file search also showed that the vast majority of the project area has not ever been surveyed for cultural resource sites by professional archeologists. Thus, it is certain that only a small percentage of the archeological sites within the project area have been recorded and assessed by archeologists.

Not surprisingly, the majority of the prehistoric sites are situated in the vicinity the Colorado River. Prehistoric sites that appear to represent actual campsites occur adjacent to stream channels and springs. Other prehistoric sites that represent more temporary activity areas are found in upland areas where lag gravel deposits could be exploited for the production of stone tools. Although Bastrop County has a long, rich history, few historic period archeological sites have been recorded. As indicated in the discussion of the historic background, Bastrop County was settled quite early. Known early historic period sites predating the Civil War mostly cluster around the

City of Bastrop. Previous survey work, such as the intensive survey of the LCRA's McKinney Roughs tract, has mostly led to the recording of late 19th to early 20th century historic period archeological sites. Any pre-Civil War historic period archeological sites that are present within the planning could be potentially significant and might require avoidance/mitigation.

By utilizing existing data, adverse effects to known cultural resource sites can be avoided and/or minimized. The available data suggests that intensive cultural resource surveys will be needed prior to the construction of various elements of the proposed wastewater system to search for unrecorded cultural resource sites. Any water and wastewater treatment plants and associated pipeline systems constructed on the Colorado River or one of its tributaries have the potential to affect prehistoric archeological sites. Further, any pipelines constructed adjacent to rural road ROWs have the potential to affect archeological remains related to unrecorded historic rural farmsteads.

Section 8
Funding Options

This section presents a summary and evaluation of financing sources and alternatives that could be utilized for implementation of the regional projects described in Section 6. Prior to a discussion on funding alternatives, it is important to note the jurisdictional challenges of implementing a regional facility in a study area containing the following utility providers:

Aqua Water Supply Corporation,

Lower Colorado River Authority,

City of Bastrop,

Bastrop County Water and Improvement District #2

Municipal Utility Districts (MUDs), private developers

Considering the options available for participation of any of the utility providers listed above in a regional project, the discussion of financing alternatives will be limited to existing funding alternatives currently available. All of the options cited herein are to be considered preliminary and could change once the process of negotiating participation by the existing utility providers in any regional project is completed.

Within the many options for funding regional projects, there are three primary legal funding options that could be utilized for implementation of a regional utility project. The three methods are:

- Revenue Bonds (issued on the open market or through the Texas Water Development Board's Clean Water State Revolving Fund);
- Contract Revenue Bonds supported solely by project revenues;
- Individual participant issued debt;
- General Obligation Debt.

Each of these options should be able to attain an investment grade bond rating and should additionally be qualified for triple-A rated bond insurance, if necessary. Each of these options should provide for the debt to be tax-exempt and should meet all qualifications for the Clean Water State Revolving Fund lending program offered by the Texas Water Development Board (TWDB). If bonds were to be issued to the Texas Water Development Board through its Clean Water State Revolving Fund (CWSRF), such funds would be subject to the availability of funding from the State, the completion of a pre-application, the rating and ranking of the project by the TWDB,

and other application requirements and approval procedures. The CWSRF program provides for funding for the planning, design and construction of, among other things, wastewater treatment facilities and collection systems. The CWSRF funding is provided at interest rates lower than the market offers to political subdivisions and can be advantageous in certain instances involving economically distressed areas.

Revenue bonds would most likely be the highest credit rated of the three options. The Brushy Creek Regional Wastewater System located in Williamson County is an example of a project funded through revenue bonds. LCRA sells its revenue bonds for the existing Brushy Creek system and internally bills the Brushy Creek customers for its share of LCRA debt after adding costs for coverage and other contractually agreed upon expenses. This option could be used for developing a regional wastewater facility and/or the building of new regional collection facilities as well.

Contract Revenue Bonds are similar in that they are issued by the LCRA. However, the holders of these bonds would not be able to look to all LCRA revenues for payment; only to those revenues that LCRA receives from the contract with the new participants. The ratings would be determined by the credit of the participants rather than the credit of LCRA. Contract revenue bonds are very common in Texas. Most river authorities issue contract revenue bonds rather than system revenue bonds. The Texas Water Development Board has purchased numerous contract revenue bond issues over the years.

Individual member revenue bonds can also be used to fund the project. Under this scenario, a utility provider would contract to own and construct the project, but would not issue any bonds for the capital costs. The bonds would be issued by individual members, who would then pay cash for the project. The credit ratings would be determined on an individual issuer basis.

General Obligation Bonds could not be issued by the LCRA, but could be issued by some of the public utilities. Only municipalities and some districts can issue these types of bonds, which are supported by property tax revenue. This scenario would be the least likely utilized funding for this project. The Texas Water Development Board will purchase these types of bonds, if the entity can make this sort of obligation.

The chart below summarizes the options above.

	Revenue Bonds	**Contract Revenue Bonds**	**Participant Revenue Bonds**	**General Obligation Bonds**
Likely Rating	AA category	A category	Multiple	Multiple
TWDB as Option	Yes	Yes	Yes	Yes
Available for Treatment and Collection	Yes	Yes	Yes	Yes
Issuer	LCRA	LCRA	Participants	City of Bastrop
Pledge for repayment	LCRA revenues	Participant Contract Revenues	Individual Participant revenues and/or taxes	Individual Participant revenues and/or taxes

In summary, there are many options for funding a regional water and/or wastewater solution for the Western Bastrop County region in a cost-effective manner. The actual method chosen depends upon the needs, constraints, timing, interest rates, other costs and political situation of the participants at the time of the contract negotiations. The three methods mentioned above are commonly used for regional projects, are accepted by rating agencies, bond insurance companies and the Texas Water Development Board and should be considered as a starting point.

Further information regarding Texas Water Development Board programs can be found in the appendix.

Section 9
Drought Contingency Plan Considerations

This section provides an assessment of the existing Drought Contingency Plans that currently serve to control and regulate water usage during times of drought, water shortage, and emergency demand within the Lower Colorado River Authority (LCRA) planning area located in western Bastrop County, Texas. The three retail public water providers that operate within this study area include:

- Aqua Water Supply Corporation (Aqua WSC)
- Bastrop County Water Control & Improvement District No. 2 (BC WCID No. 2)
- City of Bastrop

Besides these three entities, the LCRA also serves as a potential retail and wholesale public water provider within the western Bastrop County service area.

Currently, wells are the primary source of drinking water within the study area withdrawn primarily from groundwater resources supplied by the Carrizo Aquifer. In the future, reliance might extend to surface water, particularly the Colorado River. The LCRA has the means to sell raw water to entities interested in surface water treatment and one entity, Aqua WSC, is considering the construction of a membrane, surface water treatment plant to supplement its extensive, rural water supply and transmission system.

9.1 Existing Drought Contingency Plan Assessment

Each of the three entities identified above provided copies of their respective Drought Contingency Plans (DCP) for review and appraisal. All three plans have been declared administratively complete by the Texas Commission on Environmental Quality (TCEQ), Water Supply Division, Water Conservation and Drought Management Section. Each entity's current DCP is presented in the appendix.

The existing Aqua WSC DCP was prepared by Turner Collie & Braden Inc. and the final adopted version was dated September 13, 1999. The Aqua WSC submitted their final DCP to the TCEQ in compliance with the regulatory deadline of August 30, 1999.

The current BC WCID No. 2 DCP was prepared in 1999 with the final adopted version dated June 15, 2000. The BC WCID No. 2 implemented their DCP plan and submitted it to the TCEQ in substantial compliance with the TCEQ requirements in June 2000.

The existing City of Bastrop DCP was prepared in 1999 with the final adopted version dated April 25, 2000. The City of Bastrop implemented their DCP plan and submitted it to the TCEQ in substantial compliance with the TCEQ requirements in April 2000.

All three DCPs were declared administratively complete by the TCEQ Water Conservation and Drought Management Section. The TCEQ judged that the DCPs are

in accordance with the minimum requirements specified by Title 30 of the Texas Administrative Code (30 TAC) Chapter 288 that regulates Water Conservation Plans, Drought Contingency Plans, Guidelines and Requirements.

The three DCPs have functioned adequately since their adoption and implementation in 1999-2000. The plans meet all current applicable TCEQ requirements and are not recommended for any immediate update, especially with regard to future regulatory changes that are being developed for rollout in 2004 as is explained below.

Besides the Aqua WSC, Bastrop County WCID No. 2, and the City of Bastrop DCPs, the LCRA also has its wholesale/retail public water provider Conservation and Drought Contingency Plan for its basin-wide utilities and customers. A copy of the most recently updated LCRA Utility Plan (Conservation and Drought Contingency Plan) is provided in the appendix for reference.

9.2 Future Regulatory Considerations

The TCEQ Water Supply Division, Water Conservation and Drought Management Section are currently working to develop revisions to 30 TAC Chapter 288 that regulates Water Conservation Plans, Drought Contingency Plans, Guidelines and Requirements. The rule revisions to 30 TAC §288 were directives from the 2003 Texas Legislature that passed the following bills (House Bills 2660 and 2663) into law.

House Bill 2660 requires water rights holders to develop 5- and 10-year target water use restriction goals for their water conservation plans by May 1, 2005. The water use restriction targets must include goals for unaccounted water loss and goals for municipal gallons per capita per day use reduction. The TCEQ and the Texas Water Development Board (TWDB) will develop suggested best management practices (BMPs) for water suppliers to implement for meeting these goals.

House Bill 2663 requires the development of quantifiable goals to be specified for all state-required wholesale, retail, and irrigation district drought contingency plans (DCPs) by May 1, 2005. The TCEQ and the TWDB will jointly develop suggested BMPs for achieving the highest practicable level of water use reductions. As of March 2004, the TWDB-led Water Conservation Implementation Task Force has set a goal of April 2004 to post the selected municipal BMPs recommended for the updated30 TAC §288 rule for public review and comment.

TCEQ Water Conservation and Drought Management Section - Team Leader, Mr. Bill Billingsley reported in November 2003 (at the Texas AWWA Water Conservation and Reuse Division meeting) that the regulatory timeline is scheduled as follows:

- 30 TAC §288 Rule Revision that specifies new requirements for Water Conservation Plans and Drought Contingency Plans is due for adoption by May 1, 2004.
- Updated Water Conservation Plans and Drought Contingency Plans that meet the new 30 TAC §288 rules are due from public water suppliers by May 1, 2005.

- Implementation of updated Water Conservation Plans and Drought Contingency Plans by the public water suppliers is due by May 1, 2006.

Because the 30 TAC §288 rule revision process was enacted through the work of the 2003 Texas Legislature, its requirements remain undefined as to what the actual requirements of the new rule will contain. Most wholesale, retail, and irrigation district public water suppliers should be prepared to re-develop their Water Conservation Plans and Drought Contingency Plans for submittal to TCEQ by May 2005 with program implementation of the plans by May 2006. The TWDB-led Water Conservation Implementation Task Force, a multi-disciplinary collection of water industry professionals, convened in October 2003 and has worked to develop recommended rule revisions to 30 TAC §288 that will soon be available for public review and comment.

This 30 TAC §288 rule update process continues the Regional Water Planning Group effort that originated from Senate Bill 1 (75th Texas Legislature) and established 16 regional water planning groups in conjunction with the 1997 State Water Plan. The western Bastrop County study area is designated as Region K (the Austin region). As during the development of the 1999-2000 drought contingency plans, all future water conservation plans and drought contingency plans developed to comply with the new 30 TAC §288 rule will need to coordinate their plans with Region K planning group.

9.3 Conclusions and Recommendations

As this assessment of the existing Drought Contingency Plans that operate within the western Bastrop County study area has previously discussed, the current plans are considered administratively complete and have been accepted by the TCEQ. The current Aqua WSC, the Bastrop County WCID No.2, and the City of Bastrop DCPs all satisfy the applicable 30 TAC §288 rules and have apparently not caused water use complications within their respective service areas since their adoption.

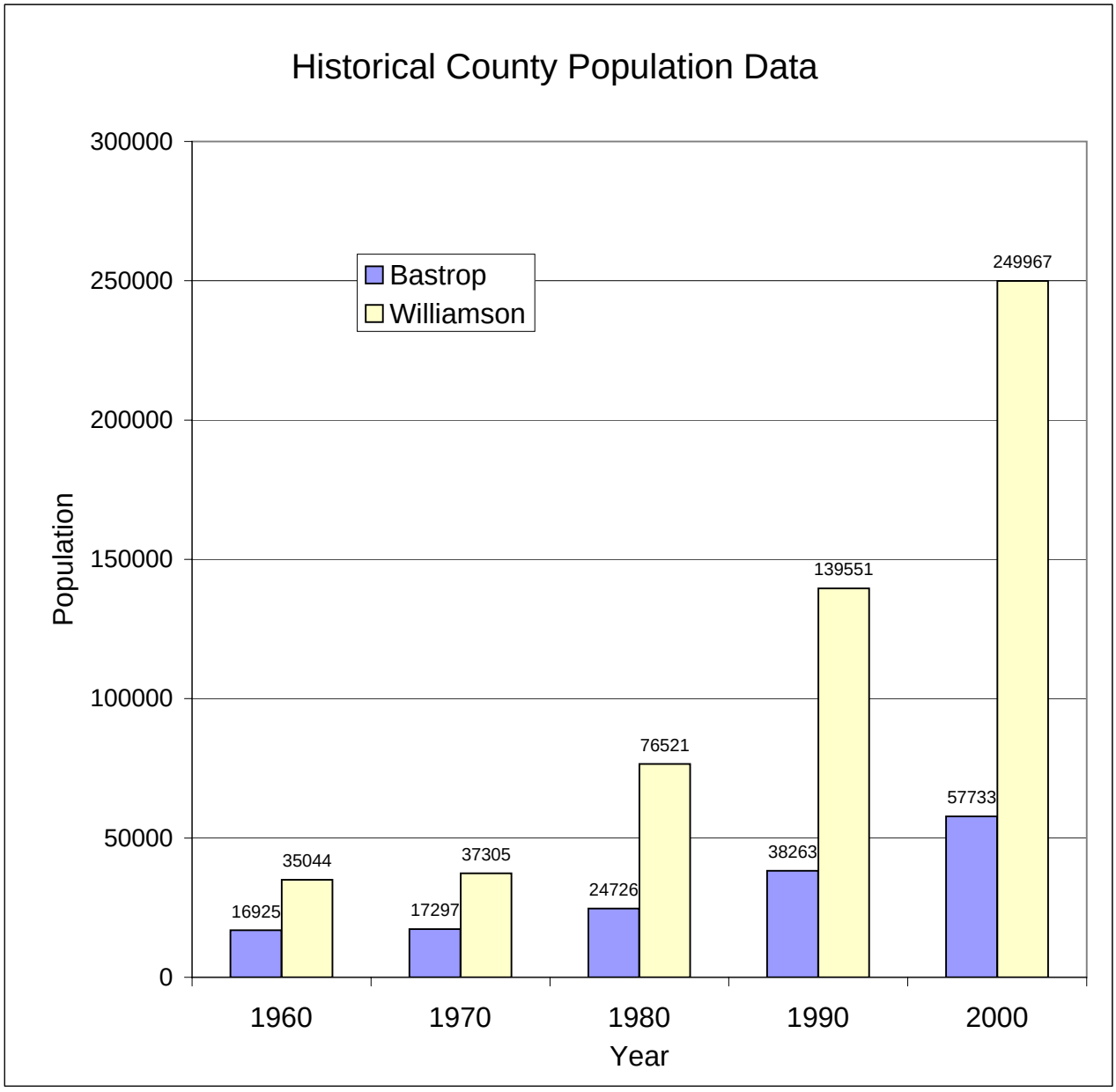
For these reasons, CDM recommends that these entities continue to abide by the provisions set forth by their current Drought Contingency Plans while they monitor the rule revision process that the TCEQ and TWDB develops for rule adoption by the scheduled date of May 1, 2004. Each entity may then initiate the revision of their Drought Contingency Plan (and also their Water Conservation Plan) allowing sufficient time to meet the scheduled TCEQ submittal date of May 1, 2005. Plan implementation would then be required to initiate by May 1, 2006, according the schedule that the TCEQ plans to follow. Because the future regulatory changes appear imminent, Aqua WSC, Bastrop County WCID No. 2, and the City of Bastrop all have clear reason to wait for the new requirements to be adopted before committing any effort to modify their Drought Contingency Plans at the present time.

Section 2
Appendix

Bastrop and Williamson County

Historic Population Projections

CDM



*Data received from Carol Weide of Texas State Data Center on 9/22/03

Section 3
Appendix

Memorandum of Understanding

LCRA, Aqua WSC, City of Bastrop

CDM

COPY

**LOWER COLORADO RIVER AUTHORITY, CITY OF BASTROP AND AQUA WATER SUPPLY CORPORATION,
MEMORANDUM OF UNDERSTANDING REGARDING RETAIL AND WHOLESALE WASTEWATER SERVICE IN BASTROP COUNTY**

WHEREAS, the Lower Colorado River Authority ("LCRA"), is a Texas conservation and reclamation district, established under authority provided by Title 6, Chapter 222 of the Texas Water Code.

WHEREAS, the City of Bastrop, Texas, ("City") is a Home Rule Municipality, established and operating under the laws of the State of Texas.

WHEREAS, the Aqua Water Supply Corporation ("Aqua"), is a water supply corporation, established pursuant to Chapter 67 of the Texas Water Code, as amended.

WHEREAS, the Board of the LCRA has adopted the following mission statement:

> The mission of the Lower Colorado River Authority (LCRA) is to provide reliable, low-cost utility and public services in partnership with our customers and communities and to use our leadership and environmental authority to ensure the protection and constructive use of the area's natural resources.

WHEREAS, the City Council has determined that by adhering to the City's Comprehensive Plan growth policies, citizens of Bastrop are striving to preserve the identity of their community, including its historical, small-town flavor, and the natural beauty and livability of the surrounding area. In this regard, the City's Comprehensive Plan embraces growth policies to help shape the future of the City which include:

- Managing growth and development quality beyond the current city limits in Bastrop's extraterritorial jurisdiction
- Setting high standards for future development and redevelopment;
- Maximizing "green space" amid a growing city;
- Ensuring a "pedestrian friendly" community;
- Promoting attractive roadway corridors and "gateways" into the city;
- Preserving the area's environmental resources.

WHEREAS, the Board of Aqua has adopted the following mission statement:

> Aqua will provide continuous and adequate retail water and wastewater service to its members in the most cost effective way possible while continuing to meet all applicable federal and state standards.

WHEREAS, the Parties agree that it is consistent with their plans and missions to enter into this Memorandum of Understanding ("MOU") so that they may work together to accomplish the mutual goals and objectives noted herein. Further, the Parties

acknowledge that the City's Comprehensive Plan is currently, and shall remain, the core planning guide relied upon by the City, LCRA and Aqua, with reference to planning of development and growth in the City's ETJ.

WHEREAS, this MOU sets forth the mutual understanding and agreements of the LCRA, the City and Aqua, regarding the provision of retail and wholesale wastewater service in Bastrop and Travis Counties.

WHEREAS, the Parties agree to carry out ongoing joint planning of retail and wholesale wastewater and utility systems, treatment infrastructure, locations and capacities in conjunction with current and future plans.

WHEREAS, by executing this MOU, the Parties represent and agree that they shall abide by the terms and conditions set forth herein, and that they shall each negotiate in good faith the terms of a wholesale wastewater service agreement, agreements for shared resources, and a billing and collection agreement consistent with the terms hereof.

NOW THEREFORE, THE LCRA, THE CITY, AND AQUA, AS PART OF THE MASTER PLAN, HEREBY CONSENT AND AGREE AS FOLLOWS:

SECTION 1.0. DEFINITIONS

1. ETJ and/or Extraterritorial Jurisdiction means those unincorporated areas of the Bastrop municipality as defined by the Local Government Code, Chapter 42, and/or other pertinent and controlling State law, including areas known as 'statutory ETJ' and/or 'voluntary ETJ.'

2. Service Areas means the agreed upon retail sewer service areas as provided in the attached Exhibit A.

3. Certificate of Convenience and Necessity [CCN] means the retail sewer service certificate issued by the Texas Commission on Environmental Quality, or its successor agency, pursuant to the Texas Water Code, Chapter 13, et seq.

4. Study means the Western Bastrop County Regional Water and Wastewater Study developed pursuant to a planning grant from the Texas Water Development Board.

5. Regional Area means the Parties' agreed upon retail sewer service areas in Bastrop and eastern Travis Counties as shown on Exhibit A.

6. Texas Commission on Environmental Quality [TCEQ] means that regulatory agency empowered by the State to implement the environmental laws and regulations of the State, specifically those related to the provision of retail sewer services, and includes its successor agencies, if any.

SECTION 2.0. RESPONSIBILITIES OF THE PARTIES.

The Parties agree to the following:

1. **Sewer CCN Applications.**

   A. The Parties agree that the attached map (Exhibit "A") reflects the Parties' agreed upon retail sewer service areas in Bastrop and eastern Travis Counties.

   B. The Parties acknowledge that each has filed applications for retail sewer service areas reflecting the agreed upon sewer service areas.

   C. Each Party agrees to not actively pursue a hearing and/or protest against any other Party's application for a sewer CCN in the Regional Area, provided the application seeks certification for only those lands identified as the respective applicant's retail sewer service area on Exhibit A. The Parties agree that within ten (10) days of the execution of this MOU each Party shall notify the TCEQ that it does not object to and supports the issuance of retail sewer CCNs to the other Parties for the areas set out in Exhibit A above.

   D. The Parties agree that they will not amend their respective sewer CCN applications to include any additional areas within the Regional Area without sixty (60) days prior notice to the other Parties and, during that sixty day period, the Parties will negotiate in good faith to agree upon a revised Exhibit A.

2. **Service Requests Along the Boundaries of the Parties' Retail Wastewater Service Areas.**

   A. The Party holding the CCN for any specific retail sewer service area may, at its sole option, elect to allow another Party to serve a customer who is requesting service and is located along the boundary of the CCN, if the CCN holder determines that, based upon its evaluation, such service by another Party would be more feasible and cost-effective, and the other Party agrees to provide the service requested.

   B. If the Party holding the sewer CCN determines that another Party may provide more feasible and cost-effective sewer service to the requestor, the Parties may either:

      1) execute an agreement whereby one Party consents to the other Party's provision of retail sewer service to the requestor until such time as the Party holding the sewer CCN where the requestor is

located extends its sewer system to serve the requestor and file such an agreement with the TCEQ; or

2) execute an agreement whereby the Parties agree to amend their respective sewer CCN service areas to reflect which Party may provide more feasible and cost-effective service to the requestor's location.

3. **Regional Wastewater Plants and Wastewater Package Treatment Plants.**

A. The Parties agree that temporary wastewater plants (wastewater package treatment plants) are an interim solution to provide service to a development and that regional wastewater systems are the ultimate goal and solution for the Regional Area.

B. The Parties agree to adopt policies and provisions in their respective rate schedules or tariffs to promote the most feasible and cost-effective regionalization of wastewater systems.

C. The Parties agree to work together in the development of:

1) a Floodplain/Watershed Management Program, related to rivers and streams located in Bastrop County; and
2) a coordinated Water Quality Improvements Program for Bastrop County.

4. **Study and Wholesale Wastewater Treatment Service.**

A. The Parties acknowledge that each of them has participated in the study titled "Western Bastrop County Regional Water and Wastewater Study (the "Study"), for which one of the primary goals is the establishment of a regionalized wastewater treatment system to serve the western portion of Bastrop County. The Parties agree to complete the Study in accordance with the terms of the contract.

B. The Parties agree that the Study will be the framework of a regional wastewater plan for the Study area. As the Parties receive wastewater service requests within their respective retail sewer service areas, the Parties will identify regional wastewater treatment plants and subregional wastewater treatment plants. The Parties will designate representatives to meet upon a quarterly basis, unless otherwise agreed, to discuss plans for capital expenditures in wastewater facilities, designs of additional facilities, and other planning issues to update the Study as appropriate. The Parties will develop a process to determine the timing and the cost-effectiveness of the construction of regional wastewater treatment

facilities. The City shall participate and provide information to Aqua and LCRA concerning the City's growth patterns and planning goals, as they relate to the City's Comprehensive Plan, and may discuss with Aqua and LCRA how those City patterns and the City's Comprehensive Plan may be considered and incorporated by the Parties into the Study.

C. With the exception of the City of Austin in the Travis/Bastrop County Dry Creek watershed, LCRA will provide exclusive wholesale wastewater treatment and disposal for the regional wastewater plants serving Aqua's retail sewer service area, constructing and operating all regional wastewater treatment facilities necessary to treat and dispose of wastewater from Aqua's retail wastewater collection system. The above is conditioned upon the LCRA providing the most feasible and cost-effective regional wastewater system as between Aqua and the LCRA. LCRA is not precluded in this agreement from providing wholesale wastewater services for subregional wastewater treatment plants within Aqua's retail sewer service area, if Aqua and LCRA agree. Nothing contained in this Agreement shall be construed to prohibit the City from entering into an agreement with Aqua for the City to provide wholesale wastewater service within the City's Retail Wastewater CCN.

5. **Common Standards for Wastewater Collection and Treatment Facilities within the City's Corporate Limits and the City's ETJ.**

A. Within the City's corporate limits and the City's ETJ, the Parties will construct and install wastewater collection and treatment facilities in compliance with the retail and/or wholesale wastewater service provider's standard specifications for wastewater facilities; however, the retail and/or wholesale wastewater service provider and the City will determine and agree upon any additional standards, specific to the City's corporate limits or City's ETJ.

B. The Parties agree that each shall comply with the City's subdivision requirements and standards related to water and wastewater standards in effect at the time development occurs as evidenced by the filing of a final plat within the City's corporate limits or the City's ETJ. Further, the LCRA and Aqua have agreed to work jointly with the City to assist in the subdivision development review and approval process. To the extent it may legally do so, each Party agrees it will not sign a final plat for any subdivision located within the City's corporate limits or the City's ETJ stating retail wastewater service is available from that Party unless the City has also approved the final subdivision plat.

C. The Parties agree that the City of Bastrop's design standards for water and wastewater infrastructure contained within the City's subdivision standards

and construction standards shall not apply to water and wastewater infrastructure built within the City's ETJ if the infrastructure is installed and used for the sole purpose of extending water or wastewater service to: (1) a single residential, or (2) an agricultural connection, on tracts sized two (2) acres or larger.

D. Nothing in this MOU shall require the Parties to retrofit: (a) any water or wastewater infrastructure that is installed and operating on the Effective Date of this Agreement to the City of Bastrop's construction standards; or (b) to accommodate changes in the City's construction standards that occur after the Parties' administratively complete construction plans for such infrastructure have been submitted and receipt acknowledged by the City. If such existing infrastructure is substantially replaced or improved, it shall meet the City's construction standards, then applicable.

E. The Parties agree to provide the City with written notice of any wastewater service requests received for subdivisions within the City's corporate limits or the City's ETJ within thirty (30) days of the receipt of the service request and prior to approving any request for wastewater service.

F. To the extent each can legally do so under the laws of the State of Texas, the Parties agree to comply with the City's ordinances applicable to the provision of wastewater services so that upon written notice by the City, the Parties agree that they will not install a water meter, or will disconnect/lock an existing construction water meter within the City's corporate limits or where the City has and exercises statutory jurisdiction to any structure that has been "red-tagged" by the City as a result of City inspections of the structure during the inspection or building process. For the purposes of this agreement, "red-tagged" means the City has identified the structure as not conforming to the City's building codes and has further prohibited or denied occupancy of the structure. If any of the Parties are brought into an administrative or judicial procedure as a result of disconnection or refusal to install a meter to a structure as a result of the structure being "red-tagged", the City agrees to intervene in the administrative or judicial procedure in support of the action.

6. **Shared Resources**.

The Parties will use their best efforts to negotiate written agreements, when appropriate, to share resources for the purposes of construction inspections, operations, laboratories, equipment, maintenance of wastewater facilities. The Parties agree to develop coordinated inspection of water and wastewater improvements to insure that public improvements conform to standards that are jointly developed and adopted for the Service Areas.

7. **Billing and Collection Agreement.**

The Parties will use their best efforts to negotiate or amend agreements, if existing, for the calculation, preparation, and mailing of monthly wastewater bills, in addition to the collection of charges for wastewater services, for the retail wastewater customers of a Party if another Party is the retail water provider in the retail sewer service area.

SECTION 3.0. CONCLUSIONS AND ENDORSEMENTS

Except to the extent of a conflict, this MOU is not intended to, nor shall it be construed to, modify the terms of any written agreements between the LCRA, the City and/or Aqua entered prior to the date of execution of this MOU.

Nothing in this Agreement is to be construed as conflicting with existing laws, regulations, or existing contractual agreements between the Parties. This Agreement may be amended or extended in scope and purpose by written agreement and approval of the Parties. Further, the Parties specifically agree that other entities operating within Bastrop County may become additional parties to this Agreement, by adoption of resolutions or similar acts by their governing body, should they elect to consent and concur to the goals, objectives responsibilities and plans set forth herein.

The Parties agree that they shall enter into good faith negotiations within a reasonable time to finalize the terms of: (1) any required agreements for shared resources, (2) any agreements related to terms of billing and collection, (3) any required wholesale wastewater service agreements,, and (4) any agreements required to effectuate all other terms of this MOU consistent with the provisions noted herein.

This Agreement may be terminated by any Party hereto upon thirty (30) days written notice to the other Parties. This Agreement is intended to maximize the communication, increase mutual cooperation, and enhance the effectiveness of procedures utilized for the mutual benefit of the Parties and water and wastewater customers within Bastrop County, and to further the process of orderly development within the County.

The Parties agree to amend and defend their respective retail wastewater rate schedules and/or tariffs to comport with and reflect the terms of this MOU made by and agreed upon between the Parties.

This MOU shall be effective from and after the date of due execution by the Lower Colorado River Authority, the City of Bastrop and the Aqua Water Supply Corporation.

EXECUTED by the Parties on the dates indicated below:

LOWER COLORADO RIVER AUTHORITY

By: _____

Printed Name: Joseph J. Beal

Title: General Manager

Date: 15 March 04

CITY OF BASTROP, TEXAS

By: Tom Scott

Printed Name: TOM SCOTT

Title: MAYOR

Date: MARCH 15, 2004

AQUA WATER SUPPLY CORPORATION

By: _____

Printed Name: John E. Burke

Title: General Manager

Date: March 15, 2004

THE STATE OF TEXAS §
§
COUNTY OF Travis §

This instrument was acknowledged before me on the 16th day of March 2004, by Joseph J. Beal, P.E, General Manager of the Lower Colorado River Authority, a Texas conservation and reclamation district, on behalf of said district.

RENEE F. POTEET
MY COMMISSION EXPIRES
October 28, 2007

Renee F. Poteet
Notary Public in and for
the State of Texas

THE STATE OF TEXAS §
§
COUNTY OF BASTROP §

This instrument was acknowledged before me on the 15th day of March 2004, by Tom Scott, Mayor of the City of Bastrop, a Texas home rule municipal corporation, on behalf of said City.

TERESA MIERTSCHIN
MY COMMISSION EXPIRES
DECEMBER 11, 2006

Teresa Miertschin
Notary Public in and for
the State of Texas

THE STATE OF TEXAS §
§
COUNTY OF BASTROP §

This instrument was acknowledged before me on the 15th day of March 2004, by John E. Burke, General Manager of the Aqua Water Supply Corporation, a water supply corporation on behalf of said corporation.

Debra Ikenberry
Notary Public in and for
the State of Texas

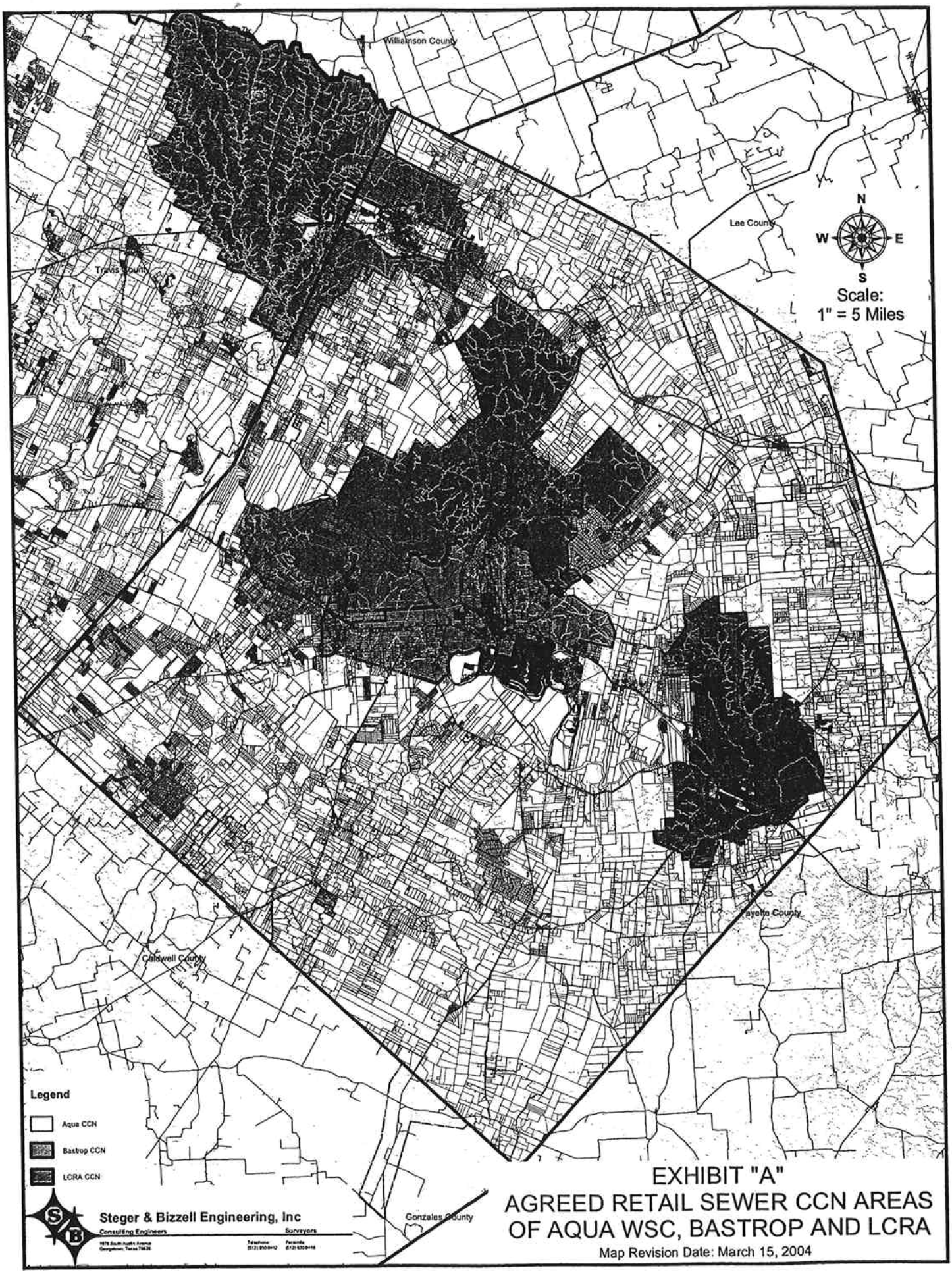


EXHIBIT "A"
AGREED RETAIL SEWER CCN AREAS OF AQUA WSC, BASTROP AND LCRA

Map Revision Date: March 15, 2004

Section 5
Appendix

Aqua WSC

Water Quality Data

CDM

Aqua Water Supply Corporation Well Data

Drilling Log Data

Owner ID		S-2	S-3	S-4	S-5	S-6	S-7
State ID		5862114	5862115	5862116	5862409		
Date Drilled		6/1/1978	7/25/1982	10/26/1985	12/9/1985		
Land Surface Elev.	ft	352	370	372	401		
Well Depth	ft	497	496	529	615		
Static Level	ft	43	45	42	71		
Pumping Level	ft	246	220	112	190		
Yield	gpm	457	703	1000	1200		
Drawdown	ft	50	175	70	119		
Capacity	gpm/ft	9.1	4	14.2	10.1		
Aquifer		Simsboro Sand Member of the Rockdale Formation					

Raw Water Quality Data S-2

Date		5/24/1978	5/25/1978	2/19/1987	2/9/1988
Temperature	C				20.5
Calcium	mg/L	7.2	8	7	5
Magnesium	mg/L	3.9	4	2	2
Sodium	mg/L	237	226	256	167
Potassium	mg/L		10		
Carbonate	mg/L	11.4	7.2	10.8	0
Bicarbonate	mg/L	424	422	464	307
Sulfate	mg/L	108	124	103	89
Chloride	mg/L	50	44	58	29
Fluoride	mg/L	0.4	0.3	0.4	0.2
Nitrate	mg/L	0	<.4	<.04	<0.04
pH		8.4	8.5	8.6	8.41
TDS	mg/L	841	631	665	605
Total Alkalinity	mg/L	366	358	398	252
Total Hardness	mg/L	34	36	25	22
Specific Cond.	umhos/cm	975	1116	1215	810
Total Iron	mg/L as Fe	0.09			0.1
Silica	mg/L				11
Total Manganese	mg/L				0.01
Color	CU				0
Turbidity	NTU				0.15

Raw Water Quality Data S-3

Date		9/9/1982	2/19/1987	2/9/1988	7/19/1989	5/19/1998	7/24/2002
Temperature	**C**			20		25.5	25.4
Silica	**mg/L**	14		11	14	15.6	15.14
Calcium	**mg/L**	6.8	7	9	5.9	6.18	6.52
Magnesium	**mg/L**	3.6	3	2.6	3.6	3.75	3.87
Sodium	**mg/L**	261	254	241	279	242	239
Potassium	**mg/L**				3.4	2.4	1.88
Strontium	**mg/L**					0.56	0.62
Carbonate	**mg/L**	0	10.8		2.4	2.4	5.42
Bicarbonate	**mg/L**	530	510	488	521	493	483
Sulfate	**mg/L**	100	82	92	82	83	75
Chloride	**mg/L**	44	54	44	54	60	50
Fluoride	**mg/L**	0.3	0.4	0.2	0.3	0.3	0.27
Nitrate	**mg/L**	<0.1	<0.04	<0.04	<0.04	<0.18	0.12
pH	**mg/L**	8.2	8.6	8.44	8.24	8.15	8.2
TDS	**mg/L**	960	662	883	700	658	635
Total Alkalinity	**mg/L**	434	436	400	431	48	405
Total Hardness	**mg/L**	31	29	33	29	31	32
Specific Cond.	**umhos/cm**	1100	1215	1100	1100	959	1074
Color	**CU**	0		0			
Turbidity	**NTU**	4.5		0.05			
Bromide	**mg/L**					0.2	0.18
Nitrogen, Kjeldahl	**mg/L**					0.88	
Nitrogen, Ammonia	**mg/L**					0.9	
Phosphorus, Total	**mg/L**					<0.1	
Boron	**ug/L**					517	537
Cobalt	**ug/L**					<0.1	ND
Iron	**ug/L**					62	ND
Lithium	**ug/L**					58.9	64.3
Molybdenum	**ug/L**					<1.0	ND
Vanadium	**ug/L**					2	1.24
Aluminum	**ug/L**					<4	ND
Arsenic	**ug/L**					<2	ND
Barium	**ug/L**					74.9	77.2
Cadmium	**ug/L**					<1	ND
Chromium	**ug/L**					6.8	4.46
Copper	**ug/L**					4.6	ND
Lead	**ug/L**					<1	ND
Manganese	**ug/L**					5.5	5.49
Nickel	**ug/L**					<1	ND
Selenium	**ug/L**					<4	ND
Antimony	**ug/L**					<1	ND
Beryllium	**ug/L**					<1	
Thallium	**ug/L**					<1	ND
Zinc	**ug/L**					<4	ND
Total Manganese	**mg/L**	<0.05		0.1			
Total Iron	**mg/L**	<0.18		0.06			

Raw Water Quality Data S-4

Date		11/22/1985	7/24/1986	2/9/1988	2/29/1987	11/8/1993
Temperature	**C**	22.5				25.6
Silica	**mg/L**	14		11		14
Calcium	**mg/L**	5.6	5	5.6	5	3.9
Magnesium	**mg/L**	1.9	2	1.6	2	2
Sodium	**mg/L**	361	367	349	360	340
Potassium	**mg/L**					3.7
Strontium	**mg/L**					0.36
Carbonate	**mg/L**	0	25.2	0	14.4	12
Bicarbonate	**mg/L**	683	630	705	658	649
Sulfate	**mg/L**	52	64	42	56	36
Chloride	**mg/L**	138	146	112	133	107
Fluoride	**mg/L**	1.4	1.5	1.3	1.5	1.24
Nitrate	**mg/L**	<0.04	<0.04	<0.04	<0.04	<0.04
pH	**mg/L**	8.18	8.7	8.5	8.6	8.48
TDS	**mg/L**	1259	920	1229	895	840
Total Alkalinity	**mg/L**	560	558	578	563	552
Total Hardness	**mg/L**	22	20	21	20	18
Specific Cond.	**umhos/cm**	1275	1694	1500	1672	1223
Color	**CU**	10		0		
Turbidity	**NTU**	0.4		0.08		
Bromide	**mg/L**					0.35
Nitrogen, Kjeldahl	**mg/L**					0.8
Nitrogen, Ammonia	**mg/L**					0.57
Phosphorus, Total	**mg/L**					
Boron	**ug/L**					1.24
Cobalt	**ug/L**					
Iron	**ug/L**					<4
Lithium	**ug/L**					
Molybdenum	**ug/L**					
Vanadium	**ug/L**					
Aluminum	**ug/L**					
Arsenic	**ug/L**					<1.0
Barium	**ug/L**					69.8
Cadmium	**ug/L**					<2
Chromium	**ug/L**					<4
Copper	**ug/L**					<2
Lead	**ug/L**					<5
Manganese	**ug/L**					2.1
Nickel	**ug/L**					
Selenium	**ug/L**					<2
Antimony	**ug/L**					
Beryllium	**ug/L**					
Thallium	**ug/L**					
Zinc	**ug/L**					<5
Mercury	**ug/L**					<0.13
Silver	**ug/L**					<10
Alpha	**pCi/L**					<4
Beta	**pCi/L**					<6
Total Manganese	**mg/L**	0.01		0.02		
Total Iron	**mg/L**	0.06		0.04		
Carbon Dioxide	**mg/L**	6.2				

Raw Water Quality Data S-5

Date		1/20/1986	7/24/1986	2/19/1987	2/9/1988
Temperature	**C**	23			21
Silica	**mg/L**	14			11
Calcium	**mg/L**	5.2	4	4	5.6
Magnesium	**mg/L**	1.5	2	2	1.7
Sodium	**mg/L**	310	324	325	345
Potassium	**mg/L**				
Strontium	**mg/L**				
Carbonate	**mg/L**	0	16.8	13.2	0
Bicarbonate	**mg/L**	666	639	655	678
Sulfate	**mg/L**	67	71	56	65
Chloride	**mg/L**	55	77	81	78
Fluoride	**mg/L**	1.3	1.4	1.4	1.4
Nitrate	**mg/L**	<.4	0.04	<0.04	<.4
pH	**mg/L**	8.24	8.6	9.1	8.46
TDS	**mg/L**	1125	810	804	1180
Total Alkalinity	**mg/L**	546	552	559	556
Total Hardness	**mg/L**	19	18	18	21
Specific Cond.	**umhos/cm**	1080	1460	1485	1400
Color	**CU**	5			0
Turbidity	**NTU**	0.27			0.1
Bromide	**mg/L**				
Nitrogen, Kjeldahl	**mg/L**				
Nitrogen, Ammonia	**mg/L**				
Phosphorus, Total	**mg/L**				
Boron	**ug/L**				
Cobalt	**ug/L**				
Iron	**ug/L**				
Lithium	**ug/L**	20			
Molybdenum	**ug/L**				
Vanadium	**ug/L**				
Aluminum	**ug/L**				
Arsenic	**ug/L**				
Barium	**ug/L**				
Cadmium	**ug/L**				
Chromium	**ug/L**				
Copper	**ug/L**				
Lead	**ug/L**				
Manganese	**ug/L**				
Nickel	**ug/L**	10			
Selenium	**ug/L**				
Antimony	**ug/L**				
Beryllium	**ug/L**				
Thallium	**ug/L**				
Zinc	**ug/L**				
Mercury	**ug/L**				
Silver	**ug/L**				
Alpha	**pCi/L**				
Beta	**pCi/L**				
Total Manganese	**mg/L**	<0.01			0.01
Total Iron	**mg/L**	0.02			0.1
Carbon Dioxide	**mg/L**	5			

Raw Water Quality Data S-6

Report Date		9/21/1998
Temperature	**C**	
Silica	**mg/L**	
Calcium	**mg/L**	16.8
Magnesium	**mg/L**	6.32
Sodium	**mg/L**	129.2
Potassium	**mg/L**	2.33
Strontium	**mg/L**	
Carbonate	**mg/L**	0
Bicarbonate	**mg/L**	267.2
Sulfate	**mg/L**	80.2
Chloride	**mg/L**	35
Fluoride	**mg/L**	0.5
pH	**mg/L**	7.09
TDS	**mg/L**	429
Total Alkalinity	**mg/L**	219
Total Hardness	**mg/L**	68
Specific Cond.	**umhos/cm**	727
Color	**CU**	<10.0
Turbidity	**NTU**	0.81
Bromide	**mg/L**	
Nitrates	**mg/L**	0.2
Nitrites	**mg/L**	0.1
Phosphorus, Total	**mg/L**	
Boron	**mg/L**	
Cobalt	**mg/L**	
Iron	**mg/L**	0.191
Lithium	**mg/L**	
Molybdenum	**mg/L**	
Vanadium	**mg/L**	
Aluminum	**mg/L**	0.647
Arsenic	**mg/L**	<0.005
Barium	**mg/L**	0.112
Cadmium	**mg/L**	<0.001
Chromium	**mg/L**	<0.004
Copper	**mg/L**	<0.005
Lead	**mg/L**	<0.005
Manganese	**mg/L**	0.04
Nickel	**mg/L**	<0.01
Selenium	**mg/L**	<0.005
Antimony	**mg/L**	
Beryllium	**mg/L**	<0.001
Thallium	**mg/L**	
Zinc	**mg/L**	<0.005
Mercury	**mg/L**	
Silver	**mg/L**	<0.0002
Alpha	**pCi/L**	
Beta	**pCi/L**	
Total Manganese	**mg/L**	
Total Iron	**mg/L**	0.251
Carbon Dioxide	**mg/L**	

Raw Water Quality Data S-7

Date		6/21/1999
Temperature	**C**	
Silica	**mg/L**	
Calcium	**mg/L**	5.6
Magnesium	**mg/L**	0.486
Sodium	**mg/L**	154.6
Potassium	**mg/L**	2.51
Strontium	**mg/L**	
Carbonate	**mg/L**	
Bicarbonate	**mg/L**	261
Sulfate	**mg/L**	88.2
Chloride	**mg/L**	35
Fluoride	**mg/L**	<0.1
pH	**mg/L**	8.28
TDS	**mg/L**	568
Total Alkalinity	**mg/L**	214
Total Hardness	**mg/L**	16
Specific Cond.	**umhos/cm**	773
Color	**CU**	30
Turbidity	**NTU**	37
Bromide	**mg/L**	
Nitrates	**mg/L**	0.77
Nitrites	**mg/L**	<0.1
Phosphorus, Total	**mg/L**	
Boron	**mg/L**	
Cobalt	**mg/L**	
Iron	**mg/L**	<0.05
Lithium	**mg/L**	
Molybdenum	**mg/L**	
Vanadium	**mg/L**	
Aluminum	**mg/L**	1.67
Arsenic	**mg/L**	<0.005
Barium	**mg/L**	0.0276
Cadmium	**mg/L**	<0.001
Chromium	**mg/L**	<0.004
Copper	**mg/L**	<0.005
Lead	**mg/L**	<0.005
Manganese	**mg/L**	<0.01
Nickel	**mg/L**	<0.01
Selenium	**mg/L**	<0.005
Antimony	**mg/L**	
Beryllium	**mg/L**	<0.001
Thallium	**mg/L**	
Zinc	**mg/L**	0.027
Mercury	**mg/L**	
Silver	**mg/L**	<0.0002
Alpha	**pCi/L**	
Beta	**pCi/L**	
Total Manganese	**mg/L**	
Total Iron	**mg/L**	0.904
Carbon Dioxide	**mg/L**	

City of Bastrop

Water Quality Data

CDM

City of Bastrop

Drilling Log Data

Owner ID		A (#3)	B (#4)	C	D	E	F
State ID			5862206		5862213	5862214	
Date Drilled		1943	7/7/1950		5/15/1991	5/31/1991	
Land Surface Elev.	ft	330	330		520	520	
Well Depth	ft	54	52		52	34	
Static Level	ft	22	22		10	14.2	
Pumping Level	ft		31		15.9	19.8	
Yield	gpm		500		704	704	
Drawdown	ft		9		5.9	5.5	
Capacity	gpm/ft		56		119	128	
Aquifer		Alluvium	Alluvium	Alluvium	Alluvium	Alluvium	Alluvium

Water Quality Data A (#3)

Date		4/24/1958
Calcium	mg/L	91
Magnesium	mg/L	21
Iron	mg/L	0.04
Total Iron	mg/L	
Manganese	mg/L	
Sodium	mg/L	20
Carbonate	mg/L	
Bicarbonate	mg/L	329
Sulphate	mg/L	51
Chloride	mg/L	33
Fluoride	mg/L	0.2
Nitrate	mg/L	5.8
pH		7.4
Total Dissolved Solids	mg/L	378
Total Alkalinity	mg/L	
Total Hardness	mg/L	
Specific Conductivity	umhos/cm	630

Water Quality Data B (#4)

Date		1/2/1957
Calcium	mg/L	67
Magnesium	mg/L	13
Iron	mg/L	0.02
Total Iron	mg/L	
Manganese	mg/L	
Sodium	mg/L	25
Carbonate	mg/L	
Bicarbonate	mg/L	248
Sulphate	mg/L	24
Chloride	mg/L	40
Fluoride	mg/L	0.3
Nitrate	mg/L	<0.4
pH		7.4
Total Dissolved Solids	mg/L	329
Total Alkalinity	mg/L	
Total Hardness	mg/L	224
Specific Conductivity	umhos/cm	549

Water Quality Data D

Date		5/1/1991*	5/31/1991
Calcium	**mg/L**	116.1	112.1
Magnesium	**mg/L**	21.5	26.3
Iron	**mg/L**	0.09	0.01
Total Iron	**mg/L**	0.25	
Manganese	**mg/L**	0.01	0.02
Sodium	**mg/L**	67.8	75.3
Carbonate	**mg/L**	0	0
Bicarbonate	**mg/L**	317.2	327
Sulphate	**mg/L**	135.8	150
Chloride	**mg/L**	88.3	90
Fluoride	**mg/L**	0.3	0.4
Nitrate	**mg/L**	5	5
pH		7.2	7.4
Total Dissolved Solids	**mg/L**	752	787
Total Alkalinity	**mg/L**	260	268
Total Hardness	**mg/L**	378	388
Specific Conductivity	**umhos/cm**	900	1000

* Pilot Hole

Water Quality Data E

Date		5/31/1991
Calcium	**mg/L**	112.1
Magnesium	**mg/L**	26.3
Iron	**mg/L**	0.01
Total Iron	**mg/L**	0.04
Manganese	**mg/L**	0.02
Sodium	**mg/L**	79.8
Carbonate	**mg/L**	0
Bicarbonate	**mg/L**	329.4
Sulfate	**mg/L**	155.2
Chloride	**mg/L**	92.2
Fluoride	**mg/L**	0.5
Nitrate	**mg/L**	5
pH		7.2
Total Dissolved Solids	**mg/L**	800.5
Total Alkalinity	**mg/L**	270
Total Hardness	**mg/L**	388
Specific Conductivity	**umhos/cm**	1000

City of Bastrop
TCEQ Water Quality Data

Date			3/23/1999		4/24/2002
Sample Location					
Calcium	mg/L		104		80
Chloride	mg/L		57		47.9
Fluoride	mg/L		0.3		0.389
Magnesium	mg/L		20		20.9
Sodium	mg/L		37		30.1
Sulfate	mg/L		86		62.3
Total Hardness	mg/L		343		286
pH			7.3		7.98
Conductivity	umhos/cm		902		729
Total Alkalinity	mg/L		247		241
Bicarbonate	mg/L		301		241
Carbonate	mg/L		0	<	2
Dissolved solids	mg/L		458		420
Nitrate	mg/L		2.10		1.83
Nitrite	mg/L	<	0.01		
Arsenic	mg/L	<	0.0020	<	0.002
Barium	mg/L		0.140		0.136
Cadmium	mg/L	<	0.0012	<	0.001
Chromium	mg/L	<	0.01		0.00177
Copper	mg/L		0.007		0.00566
Iron	mg/L		0.045	<	0.05
Lead	mg/L		0.0010	<	0.001
Manganese	mg/L		0.042		0.0594
Mercury	mg/L	<	0.00036	<	0.0002
Selenium	mg/L		0.0047		<.004
Silver	mg/L	<	0.01	<	0.001
Zinc	mg/L		0.05		0.0146
Aluminum	mg/L	<	0.04	<	0.004
Nickel	mg/L	<	0.02		0.00216
Antimony	mg/L	<	0.0020	<	0.001
Beryllium	mg/L	<	0.001	<	0.001
Thallium	mg/L	<	0.0010	<	0.001
Sodium	mg/L		36.00		30.1
Gross Alpha	pCi/L		2.80		2.8
Gross Beta	pCi/L		4.40		

Trihalomethanes

Date		4/24/2002	4/24/2002	8/26/2002	8/26/2002
Sample Location		POE 001	POE 002	POE 001	POE 002
Bromodichloromethane	ug/L	7.45	4.64	9.59	5.84
Bromoform	ug/L	8.86	5.37	5.69	4.12
Dibromochloromethane	ug/L	17.13	9.97	16.23	10.56
Chloroform	ug/L	1.74	1.19		1.79

BC WCID # 2

Water Quality Data

CDM

WCID No. 2

Drilling Log Data

Owner ID		#1	#2	#3	#4	#5
State ID		582302	582304	582305	582307	
Date Drilled		5/16/1973		1986?	10/26/1990	
Land Surface Elev.	ft	528		510	510	
Well Depth	ft	515			460	
Static Level	ft	197		1020	188	
Pumping Level	ft					
Yield	gpm	60			150	
Drawdown	ft				142	
Capacity	gpm/ft			310	1.1	
Aquifer		124CABF		124SMBR	124SMBR	

124CABF= Calvert Bluff Formation

124SMBR = Wilcox Aquifer - Simsboro Sand Member of the Rockdale Formation

Water Data #1

Date		9/15/1974	8/25/1980
Temperature	C		27
Silica	mg/L		18
Calcium	mg/L	52	39
Magnesium	mg/L	8	9
Sodium	mg/L	125	120
Potassium	mg/L		5
Carbonate	mg/L	0	0
Bicarbonate	mg/L	247	253
Sulfate	mg/L	160	145
Chloride	mg/L	38	36
Fluoride	mg/L	1.3	<0.1
Nitrate	mg/L	4.5	<0.1
pH		7.7	8
TDS	mg/L	509	496
Total Alkalinity	mg/L	202	207
Total Hardness	mg/L	162	134
Specific Conductivity	umhos/cm	906	900
Total Iron	ug/L as Fe	360	850
Total Manganese	ug/L as Mn	<50	

Water Data #3

Date		5/1/1986	7/14/1986	7/28/1986	10/2/1986	3/12/2003
Water Level	**ft**					-241
Calcium	**mg/L**	9.6	4	48	3.2	
Magnesium	**mg/L**	5.6	1.8	10.4	1.4	
Iron	**mg/L**	0.02	0.03	0.02	0.06	
Manganese	**mg/L**	0.01	0	0.04	0	
Sodium	**mg/L**	686	429	53.7	432	
Potassium	**mg/L**					
Carbonate	**mg/L**	4.8	16.8		14.4	
Bicarbonate	**mg/L**	1086	628	219	657	
Sulfate	**mg/L**	8	12	63	4	
Chloride	**mg/L**	448	285	24	279	
Fluoride	**mg/L**	0.5	1.5	0.1	2.3	
Nitrate	**mg/L**	0	0		0	
pH		8	8.3	7.7	8.3	
Total Dissolved Solids	**mg/L**	2250	1378		1383	
Total Alkalinity	**mg/L**	899	543	180	555	
Total Hardness	**mg/L**	47	17.5	163	13.7	
Specific Conductivity	**umhos/cm**	2900	1800	600	1800	
Total Iron	**mg/L**	0.38		0.25	0.18	
Total Arsenic	**ug/L as As**				<20	
Total Barium	**ug/L as Ba**				<100	
Total Cadmium	**ug/L**				<2	
Total Cobalt	**ug/L as Co**				<10	
Total Copper	**ug/L as Cu**				10	
Total Lead	**ug/L as Pb**				180	
Total Manganese	**ug/L as Mn**				<10	
Total Silver	**ug/L as Ag**				<2	
Total Zinc	**ug/L as Zn**				20	
Total Selenium	**ug/L**				<10	
Alpha	**pCi/L**				<2	
Beta	**pCi/L**				<4	
Total Mercury	**ug/L as Hg**				<2	

Water Data #4

	11/21/1990	2/25/2000	9/11/2000	1/31/2001	2/8/2002
Water Level, ft	-188	-207	-225	-222	-214

WCID No. 2
TCEQ Water Quality Data

Date			2/7/1997		2/7/1997		9/30/1998		5/8/2000
Sample Location			**POE 001**		**POE 002**		**POE 001,002**		
Calcium	**mg/L**		12		27				
Chloride	**mg/L**		42		158				
Fluoride	**mg/L**		0.2		1.2				
Magnesium	**mg/L**		4		6				
Nitrate (as N)	**mg/L**		0.02		0.16				
Sodium	**mg/L**		193		273				
Sulfate	**mg/L**		147		29				
Total Hardness	**mg/L**		46		92				
pH			8.3		8.1				
Conductivity	**umhos/cm**		1001		1440				
Total Alkalinity	**mg/L**		246		418				
Bicarbonate	**mg/L**		300		510				
Carbonate	**mg/L**		0		0				
Dissolved solids	**mg/L**		549		751				
Arsenic	**mg/L**	<	0.0020	<	0.0020			<	0.0020
Barium	**mg/L**		0.022		0.070				0.044
Cadmium	**mg/L**	<	0.0002		0.0003			<	0.0012
Chromium	**mg/L**	<	0.010	<	0.010			<	0.01
Copper	**mg/L**	<	0.006		0.014				0.007
Iron	**mg/L**		0.04		0.08				0.061
Lead	**mg/L**	<	0.0010		0.0131			<	0.0011
Manganese	**mg/L**		0.012		0.024				0.012
Mercury	**mg/L**	<	0.00027	<	0.00027			<	0.00043
Selenium	**mg/L**	<	0.0020	<	0.0020				0.0040
Silver	**mg/L**	<	0.010	<	0.010			<	0.01
Zinc	**mg/L**	<	0.02		0.07			<	0.02
Aluminum	**mg/L**	<	0.04	<	0.04			<	0.06
Nickel	**mg/L**	<	0.02	<	0.02			<	0.02
Antimony	**mg/L**	<	0.0020	<	0.0020			<	0.0040
Beryllium	**mg/L**	<	0.001	<	0.001			<	0.001
Thallium	**mg/L**	<	0.001	<	0.001			<	0.0010
Sodium	**mg/L**		173.00		169.00				224.00
Gross Alpha	**pCi/L**					<	2.00	<	2.0
Gross Beta	**pCi/L**					<	4.00	<	4.0
4-Methyl-2-Pentanone	**ug/L**						4.12		
Total Zylenes	**ug/L**						4.21,4.85		
Ethylbenzene	**ug/L**						1.6		

WCID No. 2
TCEQ Water Quality Data

Date		5/13/2002	8/26/2002
Sample Location			
Calcium	mg/L		
Chloride	mg/L	95.2	
Fluoride	mg/L	0.813	
Magnesium	mg/L		
Nitrate (as N)	mg/L	0.0752	
Sodium	mg/L	230	
Sulfate	mg/L	79.5	
Total Hardness	mg/L	53.6	
pH		8.3	
Conductivity	umhos/cm	1140	
Total Alkalinity	mg/L	343	
Bicarbonate	mg/L		
Carbonate	mg/L		
Dissolved solids	mg/L	707	
Arsenic	mg/L		
Barium	mg/L		
Cadmium	mg/L		
Chromium	mg/L		
Copper	mg/L		
Iron	mg/L		
Lead	mg/L		
Manganese	mg/L		
Mercury	mg/L		
Selenium	mg/L	0.004	
Silver	mg/L	0..1	
Zinc	mg/L		
Aluminum	mg/L		
Nickel	mg/L	0.001	
Antimony	mg/L		
Beryllium	mg/L		
Thallium	mg/L		
Sodium	mg/L		
Gross Alpha	pCi/L		
Gross Beta	pCi/L		
Bromodichloromethane	ug/L	4.43	2.22
Bromoform	ug/L	44.96	1.81
Dibromochloromethane	ug/L	15.73	3.29
Chloroform	ug/L	1.96	1.24
m,p-Xylene	ug/L		1.5
o-Xylene	ug/L		0.53

Ground Water Rule Memorandum

CDM

MEMORANDUM

Western Bastrop County Master Plan

To: Mitt Tidwell/CDM

From: Susan Booth/SKB

Date: November 24, 2003

Re: Ground Water Rule

A draft of Technical Memorandum No. 5 Planning Area Water Treatment Facility Alternatives was presented last week at the November 18th progress meeting. The draft briefly discusses the proposed Ground Water Rule (GWR) and the potential impacts of the rule on each of the three existing water providers in the Study Area: Bastrop County WCID No. 2, City of Bastrop, and Aqua Water Supply Corporation.

Mike Fisher of the City of Bastrop requested additional information on the Rule. The purpose of this memorandum is to provide the requested information. Note that the Ground Water Rule applies only to wells and it does not apply to Public Water Systems (PWS) that are designated ground water under the direct influence of surface water; such systems are subject to the Surface Water Treatment Rule and the Interim Enhanced Surface Water Treatment Rule.

The proposed rule dated May 10, 2000 is posted on the internet at www.epa.gov/safewater/gwr/gwrprop.pdf. The rule is expected to be finalized next summer. The purpose of the rule is stated as follows:

> "EPA is proposing to require a targeted risk-based regulatory strategy for all ground water systems. The proposed requirements provide a meaningful opportunity to reduce public health risk associated with the consumption of waterborne pathogens from fecal contamination for a substantial number of people served by ground water sources. The proposed strategy addresses risks through a multiple-barrier approach that relies on five major components: periodic sanitary surveys of ground water systems requiring the evaluation of eight elements and the identification of significant deficiencies; hydrogeologic assessments to identify wells sensitive to fecal contamination; source water monitoring for systems drawing from sensitive wells without treatment or with other indications of risk; a requirement for correction of significant deficiencies and fecal contamination (by eliminating the source of contamination, correcting the significant deficiency, providing an alternative source water, or providing a treatment which achieves at least 99.99 percent (4-log) inactivation or removal of viruses), and compliance monitoring to insure disinfection treatment is reliably operated where it is used."

The Proposed GWR Requirements for Hydrogeologic Sensitivity Assessment are discussed in Section III B and excerpted below:

> "…the challenge of the hydrogeologic sensitivity assessment is to identify ground water wells sensitive to fecal contamination. The assessment supplements the sanitary survey by evaluating the risk factors associated with the hydrogeologic setting of the system."
>
> "The hydrogeologic sensitivity assessment is a simple, low burden, cost-effective approach that will allow States to screen for high priority systems. Systems that are situated in certain hydrogeologic settings are more likely to become contaminated. EPA believes that a well obtaining water from a karst, fractured bedrock or gravel hydrogeologic setting is sensitive to fecal contamination unless the well is protected by a hydrogeologic barrier. A State may add additional sensitive hydrogeologic settings (*e.g.*, volcanic aquifers) if it believes that it is necessary to do so to protect public health."

It is the intention of the Texas Commission on Environmental Quality (TCEQ) to include volcanic rock and alluvial formations on the list of sensitive hydrogeologic settings (John Meyer, Source Water Assessment Team, 239-6199 and Alicia Diehl, Drinking Water Quality, 239-1626). PWS that have wells in hydrogeologically sensitive formations will be required to collect monthly raw water samples for bacteriological testing for each well and report the results to TCEQ. They will also be required to demonstrate 4 log viral CT on a daily basis.

Also included in Section III B is a discussion of Alternative Approaches to Hydrogeologic Sensitivity Assessment and a discussion of Setback Distance and Well and Water Table Depth as risk factors associated with the hydrogeologic setting. The EPA concluded that specific setback distances and well depths could not be dictated for all wells on a national scale. States may, however, choose to use these factors when assessing wells. TCEQ is also considering a combination of criteria including setbacks and well depth in evaluating individual wells. Therefore, the City of Bastrop wells can expect to receive additional scrutiny due to their proximity to the Colorado River and the shallowness of the wells.

Water Treatment Assessment References

References

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Section 6
Appendix

Facilities Cost Basis

CDM

Gravity Wastewater Interceptor	$ 5/in-ft
New Wastewater Treatment Plant	$ 4.5 per gal-day
Expanded Wastewater Treatment Plant	$ 3 per gal-day
Permanent Easement Acquisition	50% appraised value
Temporary Easement Acquisition	10% appraised value
Appraised Value	$ 4000 per acre
Lift Station - 800 gpm	$380,000
Lift Station - above 800 gpm	$ 37.50 per gpm
Contingency	20%
Professional Services	15%

* DENOTES COST PROVIDED BY STUDY PARTICIPANTS

Facilities Cost Estimation Basis

Section 7
Appendix

Cultural Resources

References and Site List

CULTURAL RESOURCES - References Cited

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Prehistoric

41BP48
41BP49
41BP50
41BP51
41BP62
41BP67
41BP76
41BP83
41BP85
41BP88
41BP197
41BP285
41BP286
41BP290
41BP291
41BP292
41BP293
41BP305
41BP306
41BP307
41BP308
41BP309
41BP310
41BP311
41BP312
41BP342
41BP374
41BP427
41BP445
41BP447
41BP450
41BP454
41BP455
41BP456
41BP457
41BP458
41BP459
41BP460
41BP461
41BP462
41BP463
41BP464
41BP535
41BP536
41BP607
41BP617
41BP622
41BP623
41BP624
41BP625
41BP626
41BP645
41BP659

Historic

41BP81
41BP82
41BP266
41BP267
41BP314
41BP339
41BP340
41BP372
41BP375
41BP451
41BP643

Prehistoric/Historic

41BP52
41BP61
41BP86
41BP89
41BP270
41BP287
41BP302
41BP376
41BP373
41BP448
41BP660

Historic Cemetery

41BP446

Prehistoric Burial

41BP84

Unknown Temporal Affiliation

41BP27
41BP28
41BP37
41BP38
41BP39
41BP217
41BP269
41BP437
41BP637
41BP638
41BP640
41BP641
41BP642

Section 8
Appendix

Texas Water Development Board

Financial Programs Descriptions

CDM

TEXAS WATER DEVELOPMENT BOARD

P.O. Box 13231,
Capitol Station
Austin, TX
78711-3231

Phone: 512.463.7847
FAX: 512.475.2053

URL Address:
http://www.twdb.state.tx.us

Email Address:
info@twdb.state.tx.us

Texas Natural Resources Information System (TNRIS)
http://www.tnris.state.tx.us

StratMap
http://www.stratmap.org

Borderlands Information Center (BIC)
http://www.bic.state.tx.us

Water Information Integration and Dissemination (TWDB WIID System)
http://wiiddev.twdb.state.tx.us/

Texas Water Information Network (TxWIN)
http://www.txwin.net

Water Smart
http://www.watersmart.org

STATE PARTICIPATION

WHAT IS STATE PARTICIPATION?

Generally, the State Participation Program enables the Texas Water Development Board (TWDB) to assume a temporary ownership interest in a regional project when the local sponsors are unable to assume debt for the optimally sized facility. The TWDB may acquire ownership interest in the water rights or a co-ownership interest of the property and treatment works. The loan repayments that would have been required, if the assistance had been from a loan, are deferred. Ultimately, however, the cost of the funding is repaid to the TWDB based upon purchase payments, which allow the TWDB to recover its principal and interest costs and issuance expenses, etc., but on a deferred timetable.

The intent of this program is to allow for optimization of regional projects through limited State participation where the benefits can be documented, and such development is unaffordable without State participation. The goal is to allow for the "Right Sizing" of projects in consideration of future growth. On new water supply projects the TWDB can fund up to 80% of costs, provided the applicant will finance at least 20% of the total project cost from sources other than the State Participation Account, and at least 20% of the total capacity of the proposed project will serve existing needs. On other State Participation projects the TWDB can fund up to 50% of costs, provided the applicant will finance at least 50% of the total project cost from sources other than the State Participation Account, and at least 50% of the total capacity of the proposed project will serve existing needs.

WHO CAN APPLY FOR THE FUNDS?

Any political subdivision of the State and water supply corporations which may sponsor construction of a regional water, or wastewater project can apply to the TWDB for participation in the project. Although it is not required, the applicant usually acquires a loan from the TWDB for the community's immediate needs.

HOW DO I APPLY FOR STATE PARTICIPATION FUNDING?

The applicant is encouraged to meet with TWDB staff for assistance in the preparation of the application and to discuss the terms of the loan. The applicant must submit an engineering feasibility report and environmental information, as well as general, fiscal and legal application information to the appropriate TWDB regional project manager for staff review.

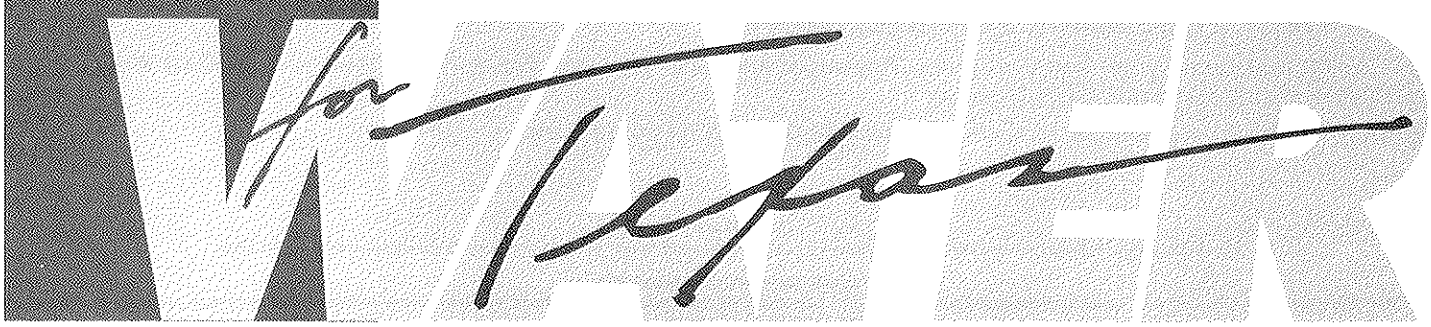
Provided funds are available to finance state participation projects, the TWDB will normally consider applications for financial assistance from the State Participation Account at its March and October meetings each year. It will apply a priority rating to the project if there is more than one project competing for the funds. The applications must be submitted by the first of February or first of September to be considered at the March and October TWDB meetings, respectively.

HOW DOES TWDB GET FUNDS FOR THE PROGRAM?

The State Legislature, recognizing the value in optimizing and "Right Sizing" systems, has appropriated funds to assist local governments in regional optimization projects. To offset some of the initial cost of processing these projects, the TWDB charges an administrative cost recovery fee of 0.77%. As the earlier projects repurchase the TWDB's interest, there will be additional funds available for future projects.

WHAT SAVINGS DOES STATE PARTICIPATION PROVIDE?

The benefits to the participant are threefold. First, payments are deferred until the customer base grows into the added capacity facilitated, which will augment the applicant's ability to make the payments to the TWDB. Second, the TWDB does not accrue interest on the deferred interest



portion thereby reducing the overall carrying cost of the facility for the applicant. Third, optimizing regional projects reduces the necessity and added expense to local governments of building new structures or replacing undersized structures in the future.

These funds are limited in availability both as to the total amount approved by the Legislature each biennium and by limitations to participation in individual projects. The TWDB's participation from this program is limited to a maximum of 80% of costs for projects creating a new water supply, and to 50% of costs for other types of projects. The remaining costs of the project may be funded through other TWDB programs.

There is also a requirement that the project cannot be reasonably financed without state participation assistance, and that the optimum regional development of the project cannot be reasonably financed without the State participation. Other findings must also be made.

WHAT ARE THE TERMS OF FINANCIAL ASSISTANCE?

Security Instrument: A Master Agreement will be developed to establish responsibilities, duties and liabilities of each party, and to govern the funding arrangements, including provisions for a defined source of revenue which will be used to purchase the State's portion of the facility.

Pledge: System revenues and/or tax pledges are typically required. Contract revenue pledges for river authorities and others are possible. The TWDB may subordinate this obligation relative to debt issuance.

Length of TWDB Participation and Repurchase Payments: Period of useful life of the project facilities being constructed with a maximum financing life of 34 years. Contracts between the TWDB and the applicant include a repurchase payment schedule which approximates the following:

- 1st & 2nd Years $0 interest payable/$0 principal (interest accrues but deferred as to payment)
- 3rd & 4th Years @ 20% of accrued interest/$0 principal (80% of accrued interest deferred)
- 5th Year @ 30% of accrued interest/$0 principal (70% of accrued interest deferred)
- 6th Year @ 40% of accrued interest/$0 principal (60% of accrued interest deferred)
- 7th Year @ 55% of accrued interest/$0 principal (45% of accrued interest deferred)
- 8th Year @ 70% of accrued interest/$0 principal (30% of accrued interest deferred)
- 9th Year @ 85% of accrued interest/$0 principal (15% of accrued interest deferred)
- 10th through 12th Years @ 100% of accrued interest/$0 principal (No accrued interest deferred)
- 13th through 19th Years @ all annual accruing interest plus recovery of equal portions of the previously deferred interest each year
- 20th through 34th Years @ all annual accruing interest plus principal.

A portion of the TWDB's ownership is transferred only when the principal portion of the payment begins.

THE INTENT IN THE SCHEDULE IS TO PRODUCE APPROXIMATELY LEVEL DEBT SERVICE BEGINNING IN THE 13TH YEAR, BUT THE DEFERRED INTEREST COMPONENT IS RECOVERED PRIOR TO THE APPLICATION OF PAYMENTS TO PRINCIPAL.

Interest Rates: While the assistance is not a loan, the purchase requirement is certain as to terms of payment and does include a component of the repurchase cost that includes the interest costs of the TWDB's funds in financing the project. These rates are based upon the TWDB's cost of the funds for loans at such time as the TWDB's acquisition payment is made to establish its participation in the project. Rates are established by maturity date for each installment closed. The rates are set approximately 45 days prior to installment closing, and are based upon the TWDB's TIC composite lending rate scale for State Participation bonds. The rate is set in accordance with the TWDB Rules in 31 TAC 363.33(a).

Fees: Please be aware that there is an Administrative cost recovery fee relating to State Participation Commitments. This is for commitments made for State Participation after 9/01/1999 only. As of 8/8/00, the fee will be $0.77 per $100 of Participation funds provided.

The fee will be paid at closing in full, or a minimum of 1/3 of the fee may be paid at closing. If the applicant chooses to pay 1/3 of the fee at closing, the remaining 2/3 of the fee may be arranged in two subsequent installments in the first, second or third years based upon terms agreed upon in the individual contracts.

Conditions to Close: Environmental Review and Water Conservation Plans in addition to financial conditions. Upon TWDB commitment, a letter is provided detailing all special conditions.

Applicable Rules: 31 TAC 363 Subchapter A and F.

WHERE MAY I GET MORE INFORMATION?

For further information on the State Participation Program, please contact your area's Region Project Manager of the Texas Water Development Board or visit the TWDB web site at

http://www.twdb.state.tx.us/assistance/financial/fin_infrastructure/StateParticipation.asp

11/02 -SP

TEXAS WATER DEVELOPMENT BOARD

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Texas Natural Resources Information System (TNRIS)
http://www.tnris.state.tx.us

StratMap
http://www.stratmap.org

Borderlands Information Center (BIC)
http://www.bic.state.tx.us

Water Information Integration and Dissemination (TWDB WIID System)
http://wiiddev.twdb.state.tx.us/

Texas Water Information Network (TxWIN)
http://www.txwin.net

Water Smart
http://www.watersmart.org

STATE FINANCING FOR WATER SUPPLY, WASTEWATER AND FLOOD CONTROL PROJECTS

WHAT STATE FINANCIAL ASSISTANCE CAN THE BOARD PROVIDE FOR WATER SUPPLY, WASTEWATER AND FLOOD CONTROL PROJECTS AND WHO CAN APPLY?

Loans for the planning, design and construction of water supply, wastewater and flood control projects may be obtained from the Texas Water Development Fund (TWDF).

To apply for state financial assistance for water supply, water and wastewater treatment, and flood control projects, the applicant must be a political subdivision of the state or a nonprofit water supply corporation. Political subdivisions include cities, counties, districts and river authorities. Water supply projects must be consistent with the 2002 State Water Plan.

HOW CAN TWDF LOANS BE USED?

The TWDF provides financing for the acquisition, improvement or construction of such water-related projects as water wells, retail distribution and wholesale transmission lines, pumping facilities, storage reservoirs and tanks, and water treatment plants. It also provides financing for the purchase of water rights. The TWDF also provides financing for wastewater collection and treatment projects and flood control projects.

WHAT LOAN TERMS ARE OFFERED THROUGH THE TWDF?

The interest rate on a TWDF loan varies depending on market conditions. The lending rate scales are set 0.35 percent above the Texas Water Development Board's (TWDB) borrowing cost. The lending rates are intended to provide reasonable rates for its customers while covering the TWDB's cost of funds and risk exposures. A typical tax-exempt loan would have an average rate of 5 to 6 percent using the current rate scales; and typical loans subject to taxation, i.e., loans made to water supply corporations, would have an average rate of 6.5 to 7 percent.

The final interest rates for individual loans will be set five days before the borrowing entity plans to adopt the ordinance or resolution for the debt. The loan must close within 45 days of that adoption. If the Delphis Hanover Index rates at the "A" scale move higher than the TWDB's adopted scale rates, the rates assigned to borrowers will be adjusted accordingly.

Repayment periods generally range from 20 to 25 years. ➢

DOES THE TWDB LOAN MONEY TO COMPLETE PLANNING, PRELIMINARY DESIGN AND OTHER PRE-CONSTRUCTION COSTS?

Using the TWDB's pre-design funding option, an eligible applicant may receive a loan commitment based on preliminary engineering, environmental, economic and social information. Funds for completing detailed planning, including environmental studies, are provided at closing, while funds for design, preparation of final plans and specifications, and construction are placed in escrow until needed. The interest rate is locked in at closing.

The pre-design funding option is available for most water supply and treatment, and wastewater projects. As with other TWDB loan programs, the applicant's ability to repay the loan is the major determining factor in the approval for using the pre-design funding option.

If the pre-design funding option is not used, the applicant must develop plans and specifications and have them approved, obtain all necessary permits and open bids prior to closing the loan.

WHAT REVENUE SOURCE(S) CAN A BORROWER USE TO REPAY A TWDB LOAN?

The TWDB accepts general obligation bonds, revenue bonds and tax and revenue certificates of obligation.

WHAT IS THE APPLICATION AND APPROVAL PROCESS?

(1) Schedule a pre-application conference to discuss the project's eligibility. For tax-exempt borrowers, the applicant, the applicant's financial advisor and the applicant's consulting engineer must attend this conference.

(2) Submit an application to the appropriate regional project manager for staff review. An application consists of general, fiscal, legal, engineering and environmental information; a water conservation and drought contingency plan will be required for financial assistance greater than $500,000 (a statutory requirement). A complete application is due on the first business day of the month preceding the month during which the application is to be considered by the Board.

(3) The Board usually meets in Austin on the third Wednesday of each month to consider applications for financial assistance. If the application is approved, the TWDB will extend a two-year loan commitment unless the project schedule indicates otherwise.

(4) After commitment where the applicant does not need loan funding until the start of construction, the following activities will occur:

- the applicant's engineer prepares and submits project plans and specifications for review and approval by TWDB engineers;
- after approval of plans and specifications, the applicant advertises for bids and submits bids with a recommendation for award to the TWDB for approval;
- after bids are accepted, the applicant's engineer provides the TWDB with a sufficiency of funds letter;
- after bids are awarded, executed contracts are submitted for review and approval by the TWDB;
- prior to adoption by the applicant's governing body, a bond ordinance or resolution must be submitted to the TWDB for approval;
- applicant's bond counsel arranges for the approval of the debt by the Attorney General's office, and arranges for printing and registration of the debt instruments;
- the financial advisor schedules the closing date for the exchange of debt for loan money; and
- all project pre-construction costs are reimbursable at the time the loan is closed.

(5) TWDB staff monitors the project during the construction process.

(6) Loans are monitored by TWDB staff for the life of the outstanding debt to ensure compliance with the bond indenture requirements and the maintenance of a sound financial condition.

WHERE MAY I GET MORE INFORMATION?

For more information, contact the Texas Water Development Board at 512/463-7853.

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DRINKING WATER STATE REVOLVING FUND

WHAT IS THE DWSRF PROGRAM AND WHO CAN APPLY?

The Drinking Water State Revolving Fund (DWSRF) provides loans at interest rates lower than the market offers to finance projects for public drinking water systems that facilitate compliance with primary drinking water regulations or otherwise significantly further the health protection objectives of the federal Safe Drinking Water Act (SDWA). Projects must also be consistent with the 2002 State Water Plan. Applicants may be political subdivisions of the state, nonprofit water supply corporations, privately-owned water systems and state agencies.

HOW CAN DWSRF LOANS BE USED?

Loans can be used for the planning, design and construction of projects to upgrade or replace water supply infrastructure, to correct exceedances of SDWA health standards, to consolidate water supplies and to purchase capacity in water systems. DWSRF loan proceeds can also be used to purchase land integral to the project.

Under the Source Water Protection Program, an applicant may apply for a loan to purchase land or conservation easements, if the purpose of the purchase is to protect the source water of a public water system from contamination and to ensure compliance with national primary drinking water regulations.

WHAT LOAN TERMS WILL BE OFFERED THROUGH THE DWSRF?

The DWSRF offers a net long-term interest lending rate of 1.2 percent below the rate the borrower would receive on the open market at the time of loan closing. The maximum repayment period for most DWSRF loans is 20 years from the completion of construction. A limited amount of funding is available each year at even greater subsidies to applicants which qualify as "disadvantaged communities." Disadvantaged communities may also receive a 30-year loan term.

A cost-recovery loan origination charge is imposed to cover the administrative costs of operating the DWSRF, but an additional interest rate subsidy is offered to offset the charge.

WHAT IS THE APPLICATION AND APPROVAL PROCESS?

Pre-application:

Prospective loan applicants are asked to submit a brief DWSRF Information Form to the Texas Water Development Board (TWDB) each year for inclusion in an Intended Use Plan (IUP) developed for that year. The Information Form describes the applicant's existing water facilities, additional facility needs and the nature of projects being considered for meeting those needs and project cost estimates. It also provides information to establish "disadvantaged community" ➢

status. The Texas Commission on Environmental Quality (TCEQ) prioritizes potential DWSRF loan applicants' projects using information contained in their files. Loan funds are distributed based upon the priority rating and an applicant's readiness to proceed.

TWDB staff will notify prospective applicants of their priority rating and will encourage them to schedule a pre-planning conference for guidance in preparing the engineering, planning, environmental, financial and water conservation portions of the DWSRF application.

Application and Commitment:

The applicant must submit an engineering feasibility report and environmental information, as well as general, fiscal and legal application information to the appropriate TWDB regional project manager for staff review. These application materials must be submitted by the first business day of the month preceding the month during which the applicant desires Board consideration. The applicant is encouraged to meet with TWDB staff for assistance in the preparation of the application and to discuss the terms of the loan.

Completed applications for DWSRF loans are considered by the Board at its monthly public meeting usually held in Austin on the third Wednesday of each month.

Loan Closing Options:

Using the TWDB's pre-design funding option, an eligible applicant receives a loan commitment based on preliminary engineering, environmental, economic and social information. Because the DWSRF program is a reimbursement program due to U.S. Environmental Protection Agency requirements, DWSRF loans are closed in installments. The interest rate is locked in at the first installment loan closing. Approved applications typically receive a two-year commitment. The applicant's ability to repay the loan is the major determining factor in the approval for using the pre-design funding option.

If the pre-design funding option is not used, the applicant must develop plans and specifications and have them approved, obtain all necessary permits and open bids prior to closing the first installment of the loan.

FUNDING AND MONITORING:

Prior to loan closing, the applicant submits a final bond ordinance or resolution to the TWDB for review and approval. The applicant's bond counsel arranges for the approval of the debt by the Attorney General's office and the financial adviser schedules a closing date for the exchange of debt for loan money. The applicant and TWDB staff monitor the project during the construction process. Loans are monitored by TWDB staff for the life of the outstanding debt to ensure compliance with the bond indenture requirements and the maintenance of a sound financial condition.

ARE THERE ANY SPECIAL CONSIDERATIONS?

- Applicants for loans greater than $500,000 must adopt a water conservation and drought contingency plan (a statutory requirement).
- A National Environmental Policy Act type environmental review is required by the SDWA. TWDB staff is available to assist applicants in determining the scope of investigation required, preparing reports and coordinating with environmental regulatory agencies. TWDB archeologists may also assist applicants by conducting necessary archeological surveys, when appropriate, and securing regulatory agency approval.
- Applicants will need to make good faith efforts to obtain Minority and Women Business Enterprises participation through its procurement for construction, materials and service, including contracts for professional services.

WHERE MAY I GET MORE INFORMATION?

For more information, contact the Texas Water Development Board at 512/463-7853. Additional information on the DWSRF and other programs is also available on the TWDB web site at www.twdb.state.tx.us/assistance/financial/financial_main.asp

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CLEAN WATER STATE REVOLVING FUND

WHAT IS THE CWSRF PROGRAM AND WHO CAN APPLY?

The Clean Water State Revolving Fund (CWSRF) provides loans at interest rates lower than the market to political subdivisions with the authority to own and operate a wastewater system. The CWSRF also includes Federal (Tier III) and Disadvantaged Communities funds that provide even lower interest rates for those meeting the respective criteria.

Although nonprofit water supply corporations are considered political subdivisions for various other TWDB programs, they are not eligible to receive assistance from the CWSRF.

HOW CAN CWSRF LOANS BE USED?

Loans can be used for the planning, design and construction of wastewater treatment facilities, wastewater recycling and reuse facilities, collection systems, stormwater pollution control projects and nonpoint source pollution control projects.

WHAT LOAN TERMS ARE OFFERED THROUGH THE CWSRF?

The CWSRF offers fixed and variable rate loans at subsidized interest rates. The maximum repayment period for a CWSRF loan is 20 years from the completion of project construction. A cost-recovery loan origination charge of 1.85% is imposed to cover administrative costs of operating the CWSRF. Applicants have the option to finance the origination charge in their loan or to pay it at closing. An additional interest rate subsidy is offered to those financing the origination charge. Total loan amounts are limited to $75,000,000 for the first nine months of the fiscal year.

Interest rates vary according to the type of financing selected and are locked in at closing:

- Fixed rate loans offer net long-term interest rates at **0.95% below market rates** for those applicants financing the origination charge. For applicants who pays for the origination charge from other sources, the interest rate is **0.70% below market rates.**
- Short-term, variable rate loans are also available. Variable rates are available during the construction period but must convert to a long-term, fixed rate loan within 90 days of the completion of project construction. The variable interest rates are generally about 2% below the above-described fixed rates, or up to **2.95% below market rates.** Borrowers have the option to convert to long-term, fixed rate financing at any time prior to project completion.
- Federal funds offer an additional subsidy of 1.0%. Interest rates are up to **1.95% below market rates.**
- Disadvantaged Communities funds offer loans to eligible communities with populations under 25,000 at **interest rates of 0% and 1%.**

What is the Application and Approval Process?

Pre-application:

Each year the TWDB notifies all potential entities of the availability of funding and timelines for the upcoming cycle. Prospective loan applicants are asked to submit a CWSRF Intended Use Plan (IUP) Worksheet for inclusion in the IUP. The Worksheet describes the applicant's existing wastewater facilities, facility needs, the nature of the project being considered and project cost estimates. This information is used to rate each proposed project and place them in priority order on the IUP. Projects are ranked in priority order in one of seven different categories: six population groups and one nonpoint source/bays and estuaries group. Available funds are distributed among these categories and funding lines are drawn. Applicants above the funding lines are invited to submit applications. All applicants are encouraged to schedule a pre-application conference that will guide them through the CWSRF application process. Funding lines are redrawn as necessary and subsequent invitations are sent to prospective applicants.

Application and Commitment:

Applications consist of an engineering feasibility report and environmental information, as well as general, fiscal and legal information. The timeframe for submittal of an application is the first business day of the month preceding the month during which the applicant desires TWDB Board consideration. Applications for loans are considered for approval by the TWDB Board at its monthly public meetings that are generally held on the third Wednesday of each month.

Loan Closing Options:

The CWSRF offers a pre-design funding option, whereby, an eligible applicant may receive a loan commitment based on preliminary engineering, environmental, economic and social information. Pre-design funding allows for the release of funds for completion of detailed planning and environmental studies at closing. Funds for design, preparation of final plans and specifications, and construction are placed in escrow at closing to be released when applicable.

If the pre-design option is not used, prior to closing the applicant must develop plans and specifications, obtain all necessary permits and bid the project in order to determine the exact amount needed for funding.

Applicants generally received a two year loan commitment. All TWDB loans are monitored for the life of the outstanding debt to ensure compliance with all requirements and the maintenance of a sound financial condition.

Are There Any Special Requirements?

- Applicants for loans greater than $500,000 must adopt a water conservation and drought contingency plan (a statutory requirement).
- Loans from the Federal funds (Tier III) portion require compliance with various federal cross-cutter requirements. Included in these requirements are: good faith efforts to obtain Minority and Women Business Enterprises participation through its procurement for construction, materials and service, including contracts for professional services, and a National Environmental Policy Act type environmental review. TWDB staff is available to assist applicants in determining the scope of investigation required, preparing reports and coordinating with environmental regulatory agencies. TWDB archeologists may also assist applicants by conducting necessary archeological surveys, when appropriate, and securing regulatory agency approval.

Where May I Get More Information?

For more information, contact the Texas Water Development Board at 512/463-7853. Additional information on the CWSRF and other agency programs is also available on the TWDB web site: www.twdb.state.tx.us under Assistance.

10/30/03
CWSRF

Section 9
Appendix

Aqua Water Supply Corporation

Drought Contingency Plan

CDM

Aqua
Water Supply Corporation

Aqua Water Supply Corporation
Drought Contingency Plan

September 13, 1999

TCB Job No. 37-02400-001

Turner Collie & Braden Inc.

DROUGHT CONTINGENCY PLAN
FOR THE
AQUA WATER SUPPLY CORPORATION

September 13, 1999

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the Aqua Water Supply Corporation (Aqua WSC) hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section X of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by Aqua WSC through the August 1999 issue of *Aqua News*, an insert included in Aqua WSC utility bills. This insert described the reasons and methodology for the development of the drought contingency plan, directions to obtain a copy of the draft plan, the period for public comment and input on plan development, and contact information to deliver comments and request additional information.

Section III: Public Education

Aqua WSC will periodically provide the public with information about the Plan. This will include an annual issue of *Aqua News* (the Aqua WSC utility bill insert) that describes the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. Additional information concerning the Plan may be provided by press releases in the following newspapers:

- Bastrop Advertiser
- Elgin Courier
- Smithville Times
- The Giddings Times and News

Section IV: Coordination with Regional Water Planning Groups

The service area of Aqua WSC is located predominately within the Lower Colorado Regional Water Planning Area with small portions of service area extending into the South Central Texas Water Planning Area and the Brazos Water Planning Area. Aqua WSC has provided a copy of this Plan to each of these three regional water planning groups.

Section V: Authorization

The general manager of Aqua WSC or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The general manager or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by Aqua WSC. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

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

Customer: any person, company, or organization using water supplied by Aqua WSC.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any purpose other than fire fighting.

Section VIII: Triggering Criteria for Initiation and Termination of Drought Response Stages

The general manager, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Water supply and/or demand conditions will be monitored through Aqua WSC's SCADA system. This system provides real-time information about each critical component in Aqua's water production, storage, and distribution system.

Reasonable notice, including, by way of example and without limitation, notice published in local newspaper, radio and television announcements, and by posting notice in public buildings, of the proposed implementation of a drought response stage shall be provided 24 hours before Aqua WSC officially initiates the response stage. Published notice may be followed by a mailed notice included in the next regular bill. Any notice shall contain the following information:

- the date implementation of the drought response stage shall begin;
- an explanation of the measures to be implemented during the response stage; and
- an explanation of penalties for violations.

The triggering criteria for each stage of drought response are described below. These criteria were developed based largely on the experience and professional judgement of the general manager, employees, and consulting engineers who are responsible for the operation of the Aqua WSC supply and distribution system. At present, the groundwater supplies available to the Aqua WSC

are adequate to satisfy all customer water demands during extreme drought conditions. However, in some portions of the water service area, water storage and/or distribution facilities experience stress during peak water demand periods, often resulting in low water pressure and increased risk of service interruption. Consequently, this drought contingency plan is oriented toward alleviating stress on water storage and distribution facilities during peak demand periods. Provision is also made for response to emergency conditions resulting from the failure of key water system facilities and water supply contamination. Triggering criteria will be revisited and possibly revised as historical operational information from the recently installed SCADA system becomes available.

(a) Stage 1 - Mild Water Shortage Conditions

Requirements for initiation - Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII – Definitions, when any of the following triggering conditions are met.

Critical Tank	STAGE I - Triggering Conditions	
Blue Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 8 feet less than the maximum level.*
Rocky Hill Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 10 feet less than the maximum level.*
HT Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 10 feet less than the maximum level.*
Butler Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 4 feet less than the maximum level.*
Delhi Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 9 feet less than the maximum level.*
County Line Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 10 feet less than the maximum level.*
Bohls Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 7 feet less than the maximum level.*
Watts Tank	1. Declining tank level is observed for 2 consecutive days.*	2. Tank water level is more than 8 feet less than the maximum level.*

* Tank levels will be measured 2 hours after peak in order to represent tank recovery.

Requirements for termination - Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of seven (7) consecutive days.

(b) Stage II - Moderate Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage II of this Plan when any of the following triggering conditions are met.

Critical Tank	STAGE II - Triggering Conditions	
Blue Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 16 feet less than the maximum level.*
Rocky Hill Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 20 feet less than the maximum level.*
HT Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 20 feet less than the maximum level.*
Butler Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 8 feet less than the maximum level.*
Delhi Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 18 feet less than the maximum level.*
County Line Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 20 feet less than the maximum level.*
Bohls Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 14 feet less than the maximum level.*
Watts Tank	1. Declining tank level is observed for 3 consecutive days.*	2. Tank water level is more than 16 feet less than the maximum level.*

* Tank levels will be measured 2 hours after peak in order to represent tank recovery.

Requirements for termination - Stage II of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of seven (7) consecutive days. Upon termination of Stage II, Stage I becomes operative.

(c) Stage III - Emergency Water Shortage Conditions

Requirements for initiation - Customers shall be required to comply with the requirements and restrictions for Stage III of this Plan when the general manager, or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; **or**

2. Natural or man-made contamination of the water supply source(s).

Requirements for termination – Stage III of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of seven (7) consecutive days.

Section IX: Drought Response Stages

The general manager, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of the Plan, shall determine that a mild, moderate, or emergency condition exists and shall implement the following actions upon the notice procedures described in Section VIII.

Because of large service area served by Aqua WSC and the large number of pressure zones within the water distribution system, the general manager may, at his discretion, initiate drought response stages in designated sub-areas of the water service area. This is intended to allow for the targeted implementation of drought response measures in areas where such measures are necessary, thereby minimizing the number of Aqua WSC customers impacted.

Stage I - Mild Water Shortage Conditions

Goal: Achieve a voluntary reduction in daily water demand sufficient to stabilize water levels in key water storage tanks at safe operating levels.

Supply Management Measures:

(a) Aqua WSC will shut off all fire hydrant meters that are for non-essential use.

(b) Aqua WSC will discontinue flushing of water mains.

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to once every five days use. Aqua will provide a calendar noting the respective outdoor watering days and the order will remain consecutive as each new month begins. For customers having rural delivery numbers, the last numerical digit of the rural delivery number, whether route or box number, shall be used to determine the watering days.

(b) It is requested that outdoor watering be limited to before 10:00 a.m. and after 8:00 p.m. on designated watering days.

(c) Water customers are requested to apply no more than 1 inch of water to landscaped areas on designated watering days.

Stage II - Moderate Water Shortage Conditions

Goal: Achieve a reduction in daily water demand sufficient to stabilize water levels in key water storage tanks at safe operating levels.

Water Use Restrictions. Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from Aqua WSC.

(f) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by Aqua WSC.

(g) All restaurants are prohibited from serving water to its patrons except when requested.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage III - Emergency Water Shortage Conditions

Goal: Achieve a reduction in daily water demand sufficient to meet basic water needs to for public health and safety.

Water Use Restrictions. All requirements of Stage II shall remain in effect during Stage III except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane, or other vehicle is absolutely prohibited.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is absolutely prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is absolutely prohibited except where necessary to support aquatic life or where such fountains are equipped with a recirculation system.

(e) No applications for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be allowed or approved.

Section X: Enforcement

No person shall knowingly or intentionally allow the use of water from the Aqua WSC for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the general manager, or his/her designee, in accordance with provisions of this Plan. Violations to this plan will be treated as follows.

(a) First violation - Aqua WSC may install a flow restricter in the line to limit the amount of water which will pass through the meter in a 24-hour period. The cost to be charged to the member's account shall be the actual installation cost to Aqua WSC.

(b) Subsequent violations - Aqua WSC may terminate service at the meter for a period of seven (7) days, or until the end of the calender month, whichever is less. The normal reconnect fee of Aqua WSC shall apply for restoration of service.

Section XI: Variances

The general manager, or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the Aqua WSC within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the general manager, or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.

(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by Aqua WSC shall be subject to the following conditions, unless waived or modified by the general manager or his/her designee:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section XII: Severability

It is hereby declared to be the intention of the Board of Directors of the Aqua Water Supply Corporation that the sections, paragraphs, sentences, clauses, and phrases of this Ordinance are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the Board of Directors of the Aqua Water Supply Corporation without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

City of Bastrop

Drought Contingency Plan

CDM

CITY OF BASTROP

DROUGHT CONTINGENCY PLAN

Developed to Meet Senate Bill 1 Regulatory Requirements

April, 2000

Department of Water and Wastewater
Michael C. Fisher, Director

P. O. Box 427 - Bastrop, TX 78602
512- 321-2124 - fax 512-332-0279

ORDINANCE NO. 2000-14

AN ORDINANCE OF THE CITY OF BASTROP, TEXAS, ADOPTING A DROUGHT CONTINGENCY PLAN; ESTABLISHING CRITERIA FOR THE INITIATION AND TERMINATION OF DROUGHT RESPONSE STAGES; ESTABLISHING RESTRICTIONS ON CERTAIN WATER USES; ESTABLISHING PENALTIES FOR THE VIOLATION OF AND PROVISIONS FOR ENFORCEMENT OF THESE RESTRICTIONS; ESTABLISHING PROCEDURES FOR GRANTING VARIANCES; AND PROVIDING SEVERABILITY AND AN EFFECTIVE DATE.

WHEREAS, the City of Bastrop, Texas recognizes that the amount of water available to the City and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the City recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Natural Resource Conservation Commission require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the citizens of Bastrop, Texas, the City Council deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT ORDAINED BY THE CITY OF BASTROP TEXAS:

SECTION 1.
That the City of Bastrop, Texas Drought Contingency Plan attached hereto as Exhibit "A" and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the City.

SECTION 2.
That all ordinances that are in conflict with the provisions of this ordinance be, and the same are hereby, repealed and all other ordinances of the City not in conflict with the provisions of this ordinance shall remain in full force and effect.

SECTION 3.
Should any paragraph, sentence, subdivision, clause, phrase, or section of this ordinance be adjudged or held to be unconstitutional, illegal or invalid, the same shall not affect the validity of this ordinance as a whole or any part or provision thereof, other than the part so declared to be invalid, illegal or unconstitutional.

SECTION 4.
This ordinance shall take effect immediately.

DULY PASSED BY THE CITY OF BASTROP TEXAS, on the 25th day of April, 2000.

APPROVED

Tom Scott

TOM SCOTT, MAYOR

ATTESTED TO:

Teresa Miertschin

TERESA MIERTSCHIN, CITY SECRETARY

APPROVED AS TO FORM:

CITY ATTORNEY

DROUGHT CONTINGENCY PLAN
FOR THE
CITY OF BASTROP, TEXAS

Exhibit "A" to City of Bastrop
Ordinance No. 2000-14

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the City of Bastrop hereby adopts the following regulations and restrictions on the delivery and consumption of water.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential uses; continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section X of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the City of Bastrop by means of Public Hearings and meetings.

Section III: Public Education

The City of Bastrop will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of paid advertisements, public notices, press releases and/or utility bill inserts.

Section IV: Coordination with Regional Water Planning Groups

The service area of the City of Bastrop is located within the Lower Colorado Region and City of Bastrop has provided a copy of this Plan to the Region K Water Planning Group.

Section V: Authorization

The Mayor or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The Mayor or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan. This Plan shall also be referenced in, and become an Appendix to, the City of Bastrop Emergency Management Plan, Annex L; Utilities.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the City of Bastrop. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

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

Customer: any person, company, or organization using water supplied by the City of Bastrop.

Daily Water Demand: the total amount of water pumped or otherwise released into distribution system(s) for customer use. Expressed in gallons, which are metered in a given 24-hour period (gallons per day).

Declaration of Disaster: that action taken by the Mayor, as authorized by the City of Bastrop Emergency Management Basic Plan and the Texas Disaster Act of 1975, when the Mayor determines that the public health, safety, and welfare may be threatened by a disastrous event, or the imminent threat of such an event.

Director: the Director of Water and Wastewater, City of Bastrop, Texas.

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;

(g) use of water in a fountain or pond for aesthetic water use or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Total Production Capability: the total net aggregate amount of water that can be produced from all water wells capable of supplying water to the system in any given 24-hour period.

Trigger: a threshold level to be used as an initiation or termination point for actions based on certain mathematical criteria.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The Director of Water and Wastewater shall monitor water supply and/or demand conditions on a daily basis and shall determine when conditions require initiation or termination of each stage of the Plan, that is, when the specified "triggers" are reached.

The triggering criteria described below are based on a statistical analysis of the vulnerability of the water source under drought of record condition, and on known system capacity limits.

Stage 1 Trigger – MILD Water Shortage Conditions

Requirements for initiation

Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, provided in Section IX of this Plan, when daily water demand exceeds 85% of Total Production Capability for five (5) consecutive days, and the Director determines that no circumstances exist that will decrease the demand except conservation by customers.

Requirements for termination

Stage 1 of the Plan may be rescinded when water demand is 85% or less of Total Production Capability for a period of 3 consecutive days, and the Director determines that circumstances exist to indicate that demand will continue at less than the trigger level without conservation by customers.

Stage 2 Trigger – MODERATE Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when daily water demand exceeds 90% of Total Production Capability for five (5) consecutive days, and that response measures required by Stage 1 Trigger – MILD Water Shortage Conditions have been implemented, and the Director determines that no circumstances exist that will decrease the demand below the Stage 2 Trigger except conservation by customers.

Requirements for termination

Stage 2 of the Plan will be rescinded when daily water demand reduces to 90% or less of Total Production Capability for a period of 3 consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Trigger -- CRITICAL Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when daily water demand exceeds 95% of Total Production Capability for a period of five (5) consecutive days, and that response measures required by Stage 2 Trigger – MODERATE Water Shortage Conditions have implemented, and the Director determines that no circumstances exist that will decrease the demand below the Stage 3 Trigger except conservation by customers.

Requirements for termination

Stage 3 of the Plan will be rescinded when daily water demand reduces to 95% or less of Total Production Capability for a period of 3 consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Trigger -- EMERGENCY Water Shortage Conditions

Requirements for initiation

Customers shall be required to comply with the requirements and restrictions for Stage 4 of this Plan when the Director determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or
2. Natural or man-made contamination of the water supply source(s); or
3. Daily water demand equals 100% of the Total Production Capability for 3 consecutive days.

Requirements for termination

Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist and the Director determines that no circumstances exist which require further conservation. Upon rescinding Stage 4 of the Plan, the Director may impose response requirements of Stages 1, 2, or 3 of the Plan if circumstances exist that require continued abatement to the effects of the emergency water shortage condition.

Section IX: Drought Response Stages

The Director or his/her designee shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, critical, or emergency water shortage condition exists and shall implement the following notification procedures:

Notification

Notification of the Public:
The Director or his/ here designee shall notify the public by means of:

publication in a newspaper of general circulation, and/or
direct mail to customers, or
public service announcements, or
signs posted in public places.

Additional Notification:
The Director or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

City Manager
Mayor / Members of the City Council
Fire Chief
City and/or County Emergency Management Coordinator(s)
County Judge
State Disaster District / Department of Public Safety
TNRCC (required when mandatory restrictions are imposed)
Major water users
Critical water users, i.e. hospitals, clinics and nursing homes
City of Bastrop Department Heads

Stage 1 Response -- MILD Water Shortage Conditions

Goal: Achieve a voluntary reduction in daily water demand to 85% or less of Total Production Capability.

Supply Management Measures:

The City of Bastrop shall implement supply management measures that include reduction in flushing of water mains and conservation of incidental water usage at water and wastewater plants. Activities shall be implemented, which include increased monitoring of meters, gauges, water levels in tanks, and water well production data.

Voluntary Water Use Restrictions:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 8:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All general operations of the City of Bastrop shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response -- MODERATE Water Shortage Conditions

Goal: Achieve reduction in daily water demand to 90% or less of Total Production Capability.

Supply Management Measures:

The City of Bastrop shall implement supply management measures that discontinue flushing of water mains, irrigation of public landscaped areas, and all water usage at water and wastewater plants not required for direct operations of the facilities.

Water Use Restrictions. Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 8:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 8:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a re-circulation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the Director.

(f) Use of water for the irrigation of athletic fields or golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 8:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the athletic field or golf course utilizes a water source other than that provided by the City of Bastrop, the facility shall not be subject to these regulations.

(g) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response -- CRITICAL Water Shortage Conditions

Goal: Achieve a reduction in daily water demand to 95% or less of the Total Production Capability.

Supply Management Measures:

The City of Bastrop shall implement supply management measures that discontinue flushing of water mains, irrigation of public landscaped areas, and all water usage at water and wastewater plants not required for direct operations of the facilities. Water usage at all City buildings shall be restricted to health, sanitation, cleanliness or firefighting purposes.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 4:00 a.m. and 8:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 6:00 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a re-circulation system.

(e) No new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved or installed for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 4 Response -- EMERGENCY Water Shortage Conditions

Goal: Achieve a reduction in daily water demand sufficient to assure the water system for the protection of public health, safety, and welfare until the Stage 4 Trigger criteria(s) can be abated.

Supply Management Measures:

The City of Bastrop shall implement supply management measures that discontinue flushing of water mains, irrigation of public landscaped areas, and all water usage at water and wastewater plants not required for direct operations of the facilities. Water usage at all City buildings shall be restricted to health, sanitation, cleanliness or firefighting purposes.

Water Use Restrictions. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

(c) Curtailment of service to persons shown to be violation of prohibited uses of water may be ordered by the Director, if the Director determines that such curtailment would not be detrimental to the public health, safety, and welfare, and determines that such curtailment would benefit the mitigation of Stage 4 conditions.

Stage 5 Response -- WATER ALLOCATION

In the event that water shortage conditions threaten public health, safety, and welfare due to the duration, type, effect or magnitude of such conditions, and a Declaration of Disaster has been issued relating to such conditions, the Mayor is hereby authorized to allocate water according to the following plan. In addition to other restrictions required in Stage 2, 3, or 4 Response, a monthly water allocation may be established by the Mayor for single family residential water customers.

Single-Family Residential Customers

The allocation to residential water customers residing in a single-family dwelling shall be as follows:

Persons per Household	Gallons per Month
1 or 2	4,500
3 or 4	5,500
5 or 6	6,500
7 or 8	7,500
9 or 10	8,500
11 or more	10,000

"Household" means the residential premises served by the customer's meter. "Persons per household" includes only those persons currently physically residing at the premises and expected to reside there for the entire billing period. It shall be assumed that a particular customer's household is comprised of two (2) persons unless the customer notifies the City of Bastrop of a greater number of persons per household on a form prescribed by the Mayor. It shall be the customer's responsibility to go to the City of Bastrop offices to complete and sign the form claiming more than two (2) persons per household. When the number of persons per household increases so as to place the customer in a different allocation category, the customer may notify the City of Bastrop on such form and the change will be implemented in the next practicable billing period. If the number of persons in a household is reduced, the customer shall notify the City of Bastrop in writing. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of persons in a household or fails to timely notify the City of Bastrop of a reduction in the number of person in a household shall be subject to penalties set forth in Section X of this Plan.

Residential water customers shall pay the following surcharge:

125% of the normal and routine charge for water billed above allocation.

Master-Metered Multi-Family Residential Customers

In addition to other restrictions required in Stage 2, 3, or 4 Responses, a monthly water allocation may be established by the Mayor for master-metered multifamily water customers. The allocation to a customer billed from a master meter which jointly measures water to multiple permanent residential dwelling units (e.g., apartments, mobile homes) shall be allocated 6,000 gallons per month for each dwelling unit. A dwelling unit may be claimed under this provision whether it is occupied or not. Any person who knowingly, recklessly, or with criminal negligence falsely reports the number of dwelling units served by a master meter shall be subject to penalties set forth in Section X. Customers billed from a master meter under this provision shall pay the following monthly surcharge:

125% of the normal and routine charges for water billed above allocation.

Commercial Customers

In addition to other restrictions required in Stage 2, 3, or 4 Responses, a monthly water allocation may be established by the Mayor for each commercial customer. The commercial customer's allocation shall be no less than 75 percent of the customer's usage for corresponding month's billing period for the previous 12 months. If the customer's billing history is shorter than 12 months, the monthly average for the period for which there is a record shall be used for any monthly period for which no history exists. Provided, however, a customer, 75 percent of whose monthly usage is less than 6,000 gallons, shall be allocated 6,000 gallons. Upon request of a customer or at the initiative of the Mayor, the allocation may be reduced or increased if, (1) the designated period does not accurately reflect the customer's normal water usage or (2) other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the Bastrop City Council. Nonresidential commercial customers shall pay the following surcharges:

150% of normal and routine charges for water billed in excess of allocation.

Industrial Customers

In addition to other restrictions required in Stage 2, 3, or 4 Responses, a monthly allocation may be established by the Mayor for each industrial customer, which uses water for processing purposes. The industrial customer's allocation shall be no less than 85 percent of customer's water usage baseline. Provided, however, a customer, 85 percent of whose monthly usage is less than 6,000 gallons, shall be allocated 6,000 gallons. The industrial customer's water use baseline will be computed on the average water use for the three month period ending prior to the date of implementation of Stage 2 of the Plan. If the industrial water customer's billing history is shorter than three months, the monthly average for the period for which there is a record shall be used. Upon request of the customer or at the initiative of the Mayor, the allocation may be reduced or increased, (1) if the designated period for baseline calculation does not accurately reflect the customer's normal water use, (2) the customer has added or is in the process of adding significant additional processing capacity, (3) the customer has shutdown or significantly reduced the production of a major processing unit, (4) the customer has previously implemented significant permanent water conservation measures such that the ability to further reduce water use is limited, or (5) if other objective evidence demonstrates that the designated allocation is inaccurate under present conditions. A customer may appeal an allocation established hereunder to the Bastrop City Council. Industrial customers shall pay the following surcharge:

150% of normal and routine charges for water billed in excess of allocation.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the City of Bastrop for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a Class C misdemeanor and, upon conviction shall be punished by a fine of not less than FIFTY DOLLARS ($50.00) and not more than FIVE HUNDRED DOLLARS ($500.00). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of two or more distinct violations of this Plan, the Director shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $25.00, and any other costs incurred by the City of Bastrop in discontinuing service. In addition, suitable assurance must be given to the Director that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the City of Bastrop, in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she

proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any police officer, or other City of Bastrop employee, designated by the Mayor, may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the municipal court on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in municipal court to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in municipal court, a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in municipal court before all other cases.

Section XI: Variances

The Bastrop City Council may grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the City of Bastrop within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the Director and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.
(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

Variances granted by the City of Bastrop shall be subject to the following conditions, unless waived or modified by the City Council:

(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

A variance, if so approved by City Council, may be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

BASTROP

Where Preservation of the Past Combined with Progress for the Future Encourages Opportunities to Grow

City of Bastrop
904 Main Street
P.O. Box 427
Bastrop, Texas 78602

512-321-3941 Main
512-303-7305 Metro
512-321-6684 Fax

cityhall@bastrop.com

May 2, 2000

Lower Colorado River Regional Planning Group
Region K
c/o John Burke, General Manager
Aqua Water Supply Corp.
P. O. Drawer P
Bastrop, TX 78602

Dear Mr. Burke:

Please find enclosed the City of Bastrop Drought Contingency Plan and Ordinance 2000-14 for your files. Please contact me if questions arise regarding this plan.

Very truly yours,

MIKE

Michael C. Fisher, Director
Water and Wastewater Department

mcf:bjs

Enclosure

cc: Mayor Tom Scott
City Manager Randy Holly

C:\Dept. - Water-Wastewater\Drought Contingency Plan\Memo-Region K-Burke 5-2-00.doc

Bastrop County WCID No. 2

Water Conservation and Emergency Water Demand Management Plan

CDM

STATE OF TEXAS
COUNTY OF BASTROP

CERTIFICATE FOR
ORDER

We, the undersigned officers of the Board of Directors of BASTROP COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 2, hereby certify as follows:

1. The Board of Directors of BASTROP COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 2 convened in REGULAR session on the 15 day of JUNE, 2000, at the regular meeting place thereof, and the roll was called of the duly constituted officers and members of the Board, to wit:

Angelo Schena	President
Dale Olson	Vice-President
Andrew McMullen	Treasurer
Stanley Wellso	Secretary
R.W. Fender	Director

and all of said persons were present except ANGELO SCHENA & STANLEY WELLSO constituting a quorum. Whereupon among other business, the following was transacted at the meeting; an

ORDER ADOPTING DROUGHT CONTINGENCY PLAN

was introduced for the consideration of the Board. It was then duly moved and seconded that the ORDER be adopted; and, after due discussion, the motion, carrying with it the adoption of the ORDER, prevailed and carried unanimously.

2. That a true, full and correct copy of the aforesaid ORDER adopted at the meeting described in the above and foregoing paragraph is attached to and follows this certificate; and that the ORDER has been duly recorded in the Board's minutes of the meeting; that the persons named in the above and foregoing paragraph are the duly chosen, qualified and acting officers and members of the Board as indicated therein; that each of the officers and members consented, in advance, to the holding of the meeting for such purpose; that the meeting was open to the public as required by law; and that public notice of the time, place and subject of the meeting was given as required by Chapter 551, Texas Government Code and the Texas Water Code.

SIGNED AND SEALED the 15 day of JUNE, 2000.

R.W. Fender
ACTING SECRETARY OF THE BOARD

Dale Olson
DALE OLSON
VICE PRESIDENT OF THE BOARD

District Seal

WATER CONSERVATION AND EMERGENCY WATER DEMAND MANAGEMENT PLAN BASTROP COUNTY WCID NO. 2 WATER SYSTEM

Table of Contents

I. Introduction

A. Description of Bastrop County WCID No. 2 and Its Water System

Bastrop County WCID No. 2 is a water improvement district located South of the city of Bastrop in Bastrop County on State Highway 71. The water district currently has 722 connections, but also serves water utility customers outside the water district. Texas Water Development Board (TWDB) records indicate during the period 1993 to 1997, average per capita water use in Bastrop County WCID was 361 gallons per connection per day (gpcd) and ranged from a high of 405 gpcd to a low of 318 gpcd. The TWDB and the Capitol Area Planning Council have also predicted that the population of the WCID will continue to grow significantly within the foreseeable future.

The Bastrop County WCID No. 2 presently has a water system composed of two (2) water plants. The WCID's water system has sufficient capacity to serve all of its constituents. Water Plant # 1 currently has two (2) water wells (No. 1 - 60 gpm and No. 2 - 172 gpm), 2-100,000 gallon ground storage tanks, hydropneumatic tanks, and booster pumps. Water Plant # 2 has two water wells (No. 3 - 349gpm and No. 4 - 144 gpm), 100,000 gallon ground storage tank, hydropneumatic tank, and booster pumps. All items are in operation. The WCID's Water System experienced minimal problems during the drought of 1996.

The Bastrop County WCID No.2 has adopted a Water Conservation and Emergency Water Demand Management Plan so that the residents of Bastrop County WCID No. 2 will continue to have an adequate and reliable source of drinking water.

B. Goals of the Plan

The Bastrop County WCID No. 2 has adopted a Water Conservation and Emergency Water Demand Management Plan. They propose to have a successful plan through education and water system analysis.

The goals of the Water Conservation Plan are to:

1. Provide public information to water customers to encourage non-wasteful water use.
2. Utilize a conservative-orientated water rate structure.
3. Safeguard the water supply by comparing the amount of water supplied versus water consumption.
4. Reduce high peak water demand during the summer months by 10%.
5. Reduce the average annual per capita water use to below 300 gallons per capita per day (gpcd) by the year 2008.
6. Reduce unaccounted for water to less than 15% by the year 2000.

C. Plan Obligations

The WCID will keep adequate records of the obligations of the Plan. In addition, the WCID will annually submit all records associated with the Plan.

II. Water Conservation Plan

A. Plan Elements

The Plan has nine (9) elements that can be enacted by the Bastrop County WCID No. 2. In addition, the Directors shall review and revise these policies if any changes are required.

1. Information Programs: The water conservation plan will promote saving practices to the public. The WCID will provide these tips through the local newspaper and educational literature from the TWDB. The educational program will be an on-going annual program that addresses residential, commercial, and industrial customers.

The WCID will develop a New Customer Packet which will be distributed to new customers that apply for service. This packet will include conservation information materials, an Emergency Rationing Program "Fact Sheet", and other various water conservation literature. In addition, these packets will be available at WCID's Office for those who wish to pick up a packet.

Many educational brochures, pertaining to residential, commercial, and industrial customers, can be obtained from the TWDB Municipal Water Conservation Unit at (512) 445-1498. Examples of these brochures are enclosed in this plan for review and selection by the Directors.

2. Water Conservation-Orientated Rate Structure: The WCID encourages conservation. The rate structure is summarized below (Rates effective September 1997):

Residential and Commercial

Gallons	Usage Rate
First 3,000 gallons	$ 18.00/Minimum
Next 12,000 gallons	$ 3.00/1,000 gallons
Over 15,001 gallons	$ 3.75/1,000 gallons

3. Universal Metering and Water Loss: The WCID has a policy to meter all customers on the water system. It is recommended that all customers be metered individually and that "master meters" for multi-family dwellings, apartment complexes, trailer parks, etcetera not be allowed.

   A regularly scheduled meter maintenance and replacement program shall be established. The program shall be as follows:

Meter Maintenance Program

Master Meters (at Pumping Stations)	Test each year and recalibrate as necessary Replace if necessary
Meters Larger Than 1-1/2"	Test every five years, replace if necessary
Meters 1-1/2" Or Smaller	Test every ten years, replace if necessary

The WCID will also test a customer's meter at their request. The "Meter Test Authorization and Test Report" is included in the APPENDIX.

Accurate metering can help to reduce unaccounted water in the system. Water loss can also be reduced with good record keeping. It is important to record unmetered uses such as water used to flush water or sewer lines, fight fires, etcetera to calculate unaccounted-for water. Water loss should not exceed fifteen (15) percent. Water loss reduction is an important goal in efficient water system operation. An accounting of the amount of water pumped from the water wells versus the amount of water billed to the customers shall be kept on a monthly basis and submitted to the TNRCC annually.

4. Leak Detection and Repair: The WCID will perform inspections on water meters, hydrants, abandoned services, etcetera as part of a leak detection and repair program. The WCID may also have LCRA perform leak monitoring on an occasional basis. The TWDB can be contacted to assist and train WCID personnel on the use of leak detection equipment.

5. Plumbing Codes: The WCID has a plumbing code which includes the use of water-efficient fixtures. The plumbing codes shall meet the following standards:

- Shower head flow rates less than 2.75 gallons per minute (gpm) at 80 pounds per square inch (psi) of pressure.

- Lavatory and Sinks, Faucets, and Aerators shall have flowrates less than 2.2 gpm at 60 psi. In addition, all public lavatory faucets shall have self-closing valves.

- Wall-Mounted Flushometer Toilets with maximum flowrate per flush of 2.0 gallons.

- Conventional Toilets shall have a flowrate of less than 1.6 gallons per flush (gpf).

- Urinals shall not exceed a flowrate of 1.0 gpf

- All drinking water fountains shall have self-closing valves.

- Pressure in residential customer systems shall not exceed 80 psi (Pressure reducing valves may be used at the residence).

- All hot water piping shall be insulated.

- All swimming pools and spas shall have recirculating/filtration systems.

The WCID inspector will not approve the permits of new construction that fail to meet the plumbing codes described above.

6. Pressure Reduction: Currently, the Bastrop County WCID No. 2 is served by a single pressure plane. The Directors do not have a policy of installing pressure reducing valves or services where static water pressure is over 80 psi as part of their plumbing code. A pressure reduction will provide better customer service through leak prevention and a reduction in water consumption. Presently, there are numerous areas in the WCID that have a water pressure greater than 80 psi.

7. Controls on Commercial Customers: All businesses such as car washes, commercial laundries, etcetera shall monitor water usage during drought conditions. If drought conditions reach a critical point, the WCID has the jurisdiction to monitor or eliminate water usage in these types of businesses. Additionally, economic incentives could be implemented for commercial and industrial water reduction and reuse programs.

8. Water Conservation Landscaping: The Bastrop County WCID No. 2 should encourage local customers and construction companies to promote water saving ideas during installation of landscaping, gardens and stock watering facilities for residential and commercial establishments. The following methods are recommended by the TWDB and encouraged by educational and informational programs:

- Encourage drought-resistant grasses and plants that require less water and efficient irrigation systems.

- Initiate a program to advocate xeriscaping.

- Promote drip irrigation systems, when possible, and to design all irrigation systems with conservation features such as sprinklers that emit large drops rather than a fine mist and a sprinkler layout that uses prevailing wind patterns.

- Practice outdoor conservation programs such as covering pools and spas to prevent evaporation.

- Recommend stock ponds for stock watering facilities. If a stock pond is impractical, then the stock owner should utilize a trough with a float.

9. Other Water Conservation Methods: The Directors can investigate other various types of conservation practices. Resources available for demonstration of these practices include the TWDB, LCRA, or TNRCC. In addition, these agencies can make a recommendation to the WCID on which practices would benefit the WCID most.

B. Plan Implementation and Enforcement

The Directors have passed an ordinance adopting this Water Conservation and Emergency Water Demand Management Plan. If a rationing period is initiated, the WCID has the authority to enforce the measures outlined in the Plan. Additionally, other plan elements which cannot be enforced by the WCID can be promoted and encouraged by educational means. The ordinance gives the WCID authority to perform periodic evaluations and modifications to ensure that the programs and regulations are kept current with changing conditions.

C. Annual Reporting and Future Planning

The WCID is obligated to the TWDB to prepare an annual report describing the implementation, status and effectiveness of the plan and its programs. This report is due within 60 days of the anniversary of the loan closing date.

A Conservation Committee will perform this task which will monitor water usage patterns, public education efforts and make recommendations to the Directors on future water conservations efforts. In addition, the committee shall also perform an evaluation every five (5) years (more frequently if required) to ensure that the programs associated with the plan are kept current with changing conditions.

III. Emergency Water Demand Management Plan

A. Introduction

The goal of Emergency Water Demand Management Plan is to outline water reduction measures required to preserve water availability during water emergency periods. These measures usually involve voluntary water use reductions, but may also include the restriction or elimination of certain types of water use, water rationing, or temporary water use from sources other than established supplies. The plan will contain four (4) stages of rationing which can be imposed by the Directors. The next section will explain the situations which can trigger these stages of rationing.

B. Trigger Conditions

Stage 1: Mild Conditions

a. Average daily water consumption reaches 90% of production capacity (939,600 gpd) for three (3) consecutive days.
b. Loss of production in one (1) well.
c. Consider weather predictions of long, dry periods regarding impact analysis.

Stage 2: Moderate Conditions

a. Average daily water consumption reaches 100% of production capacity (1,044,000 gpd) for three (3) consecutive days.
b. Storage capacity (300,000 gallons) is not being maintained during period of 100% rated production period.
c. One ground storage tank or one well is taken out of service during mild condition period.
d. Weather predictions indicate mild conditions will exist for five (5) or more consectutive days.

Stage 3: Severe Conditions

a. Average daily water consumption reaches 110% of production capacity (1,148,400 gpd).
b. Average daily water consumption will not enable storage levels to be maintained.
c. System demand exceeds available high service pump capacity
d. Any two (2) conditions listed in moderate condition classification occur at the same time for a 24-hour period.

Stage 4: Critical Conditions

a. Any two (2) conditions listed in severe condition classification occur at the same time for a 24-hour period.
b. Water system fails (Natural or man-made disaster). Critical condition is reached immediately upon detection.
c. Loss of production of two wells.
d. Water system is contaminated either accidentally or intentionally.
e. Other unforeseen events occur which could cause imminent health or safety risks to the public.

WCID personnel will record water well static levels on a biweekly basis (weekly during summer months). The Conservation Committee will review the water well data on a quarterly basis. When more water well data is available, the committee will review the data and revise the trigger conditions based upon more accurate water well static levels.

C. Actions and Restrictions

When mild, moderate, severe or critical conditions occur, certain procedures must be followed to help reduce water consumption to protect water supplies. The following actions and restrictions will be implemented to help achieve this goal.

Stage 1: Mild Conditions
a. Initiate public information and education efforts.
b. Request voluntary water use reductions from major commercial water users.
c. Publicize voluntary lawn watering schedule.

Stage 2: Moderate Conditions
a. Continue with all relevant actions from Mild Condition (Stage 1).

b. Implement mandatory outdoor watering schedule as follows:

Last Two Numbers of Street Address	**Watering Day**
0 or 9	**Monday**
7 or 8	**Tuesday**
5 or 6	**Wednesday**
3 or 4	**Thursday**
1 or 2	**Friday**

Weekend outdoor watering will be allowed, but only on a limited basis. Watering may only occur between the hours of 6 - 10 a.m. and 8 - 10 p.m.

Stage 3: Severe Conditions

a. Continue with all relevant actions defined under Stages 1 and 2.
b. Ban ALL OUTDOOR WATER USE.
c. Set limits on water use by both commercial and residential users.
d. Establish monetary fines for exceeding water use limits or violations of the Plan. Notify all customers of penalties by notices in local newspapers and public announcements on radio.

Stage 4: Critical Conditions

a. Continue with all relevant actions defined under Stages 1-3.
b. Monitor and/or eliminate non-health orientated businesses water usage.
c. Establish monetary fines for violations of the Plan. Notify all customers of penalties by notices in local newspapers and public announcements on radio.

D. Initiation and Termination Procedures

Once a trigger condition occurs, the Conservation Committee or Office Manager shall decide if to initiate the appropriate stage of rationing. The initiation may be postponed if a reasonable possibility exists that the water system will not be benefitted by the actions or restrictions. If rationing is to be enacted, notice should be published in a local newspaper with penalties and watering restrictions.

Written notice of the rationing procedure shall be placed in the local newspaper and announced on a local radio station. The customer notice shall include the following information:

1. The date rationing shall begin.
2. The stage of rationing to be employed.
3. Evidence of this rationing authority.
4. Affected areas to be rationed.
5. Mandatory Outdoor Watering Schedule, if required.

The rationing measures shall take effect as soon as the notice is published in a local newspaper. A sample Public Notice of Rationing Condition is included in the APPENDIX.

If the rationing period exceeds thirty (30) days, then the Conservation Committee will meet to discuss the possibility of extending the rationing period. The committee will present the reasons for rationing at the next Directors meeting and a full vote of the Board will be required to extend the

rationing period. A rationing period shall not exceed sixty (60) days without extension by action of all members of the Board of Directors.

When the drought trigger conditions no longer pose a threat to the community, then the committee may terminate the period of rationing. The decision must be based on sound judgement of all committee members. Written notice of the end of the rationing period shall be published in a local newspaper.

E. Penalties for Violations

Penalties associated with this Plan help ensure that Plan elements are followed by the water customers. Following the first violation of a rationing provision, the WCID has the authority to install a flow restrictor in the customers service line. The customer shall bear the cost of installing this device to help minimize water flow. A second violation may result in the termination of water service to the customer for up to one (1) week or to the end of the calendar month, whichever is LESS. In addition, the customer will be financially responsible for the disconnection/reconnection fees associated with this service call. These provisions apply to all customers on the water system.

F. Plan Implementation

The Board has instituted a Water Conservation Committee by Resolution. The chairperson is the Office Manager, who will be the responsible representative to make Emergency Water Management decisions. The committee consists of one (1) Board Member, one (1) citizen, and the Office Manager. This committee shall annually review the plan procedures so that revisions can be made to accommodate system growth. The procedures to be followed by the Board are in effect by passage of the ordinance in the APPENDIX.

G. Information and Education

The Board has developed a "Fact Sheet" to be submitted to all new customers informing them of the trigger conditions of the Plan and the actions and restrictions which accompany these trigger conditions. The Fact Sheet is found in the APPENDIX.

H. Future Water Supply Concerns

The Conservation Committee shall annually review the Plan to ensure that the plan is current with the water system and its needs. In addition, the committee should explore other possible water supply sources for the Board. Other sources include additional water wells or cross-connecting with a neighboring water systems.

RESOLUTION

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE BASTROP COUNTY WCID NO. 2 ADOPTING THE ATTACHED WATER CONSERVATION AND EMERGENCY WATER DEMAND MANAGEMENT PLAN

BE IT RESOLVED BY THE BOARD OF DIRECTORS:

THAT, on this 15th day of June , 2000 , we do hereby adopt the attached Water Conservation and Emergency Water Demand Management Plan to be implemented on this date. We hereby also establish a Water Conservation and Emergency Water Demand Management Committee (Conservation Committee) and authorize the Office Manager to be the Board's authorized representative in matters of water conservation and emergency water demand management planning procedures, policies and actions.

Any violation of the provisions of this plan may cause fines to be levied against the customer and/or water service termination. Water service termination policies will only apply to violations of rationing Stages 3 & 4 imposed by Board.

ADOPTED THIS 15th DAY OF June , 2000 at a meeting of the Board of Directors at which a quorum was present.

BOARD OF DIRECTORS

Dale Olson, Vice President

R.W. Fender, Acting Secretary

The WCID will adopt this Water Conservation and Emergency Water Demand Management Plan through a resolution or ordinance. The WCID will consult their legal advisor as to which method is the most appropriate. The WCID will also discuss if they want to include fines (Class C Misdemeanor) as one of the enforcement measures listed in the Plan.

EMERGENCY RATIONING PROGRAM
FACT SHEET

The ensuing water rationing program is adopted for emergency use during periods of acute water shortage on the Bastrop County WCID No. 2.

1. Declaration of Emergency. An emergency may be declared when any one of the following trigger conditions occur.

Stage 1: Mild Conditions: Stage 1 may be enacted when any one of the following conditions occur:

a. Average daily consumption reaches 90% of production capacity (936,600 gpd) for three (3) consecutive days.
b. Loss of production in one (1) well.
c. Consider weather predictions of long, dry periods in impact analysis.

Stage 2: Moderate Conditions

a. Average daily water consumption reaches 100% of production capacity (1,044,000 gpd) for three (3) consecutive days.
b. Storage capacity (300,000 gallons) is not being maintained during period of 100% rated production period.
c. One ground storage tank or one well is taken out of service during mild condition period.
d. Weather predictions indicate mild conditions will exist for five (5) or more consecutive days.

Stage 3: Severe Conditions

a. Average daily water consumption reaches 110% of production capacity (1,148,400 gpd).
b. Average daily water consumption will not enable storage levels to be maintained.
c. System demand exceeds available high service pump capacity
d. Any two (2) conditions listed in moderate condition classification occur at the same time for a 24-hour period.

Stage 4: Critical Conditions

a. Any two (2) conditions listed in severe condition classification occur at the same time for a 24-hour period.
b. Loss of production of both wells.
c. Water system is contaminated either accidentally or intentionally.
d. Water system fails (Natural or man-made disaster). Severe condition is reached immediately upon detection.

e. Other unforeseen events occur which could cause imminent health or safety risks to the public.

2. Notice Requirements: All members affected by the proposed rationing will be notified by notice published in a local newspaper. In addition, the notice must be publicly announced over a local radio station. The notice shall contain the following information:

a. Date rationing begins.
b. Stage of rationing to be employed.
c. Evidence of rationing authority.
d. Affected rationing area.
e. Mandatory Outdoor Watering Schedule, if required.

The rationing will take effect as soon as the notice is published in a local newspaper.

3. Stage Levels of Rationing

Stage 1: Mild Conditions

a. Initiate public information and education efforts.
b. Request voluntary water use reductions from major commercial water users.
c. Publicize voluntary lawn watering schedule.

Stage 2: Moderate Conditions

a. Continue with all relevant actions from Mild Condition (Stage 1).
b. Implement mandatory outdoor watering schedule as follows:

Last Two Numbers of Street Address	**Watering Day**
0 or 9	**Monday**
7 or 8	**Tuesday**
5 or 6	**Wednesday**
3 or 4	**Thursday**
1 or 2	**Friday**

Stage 3: Severe Conditions

a. Continue with all relevant actions defined under Stages 1 and 2.
b. Ban ALL OUTDOOR WATER USE.
c. Set limits on water use by both commercial and residential users.

d. Establish monetary fines for exceeding water use limits or violations of Drought Contingency Plan. Notify all customers of penalties.

Stage 4: Critical Conditions

a. Continue with all relevant actions defined under Stages 1-3.
b. Monitor and/or eliminate non-health orientated businesses water usage.
c. Establish monetary fines for violations of the Plan. Notify all customers of penalties by notices in local newspapers and public announcements on radio.

4. Violation of Emergency Rationing Plan

a. First Violation: The WCID has the authority to install a flow restrictor in the customer's line to control the amount of water used by the customer. The cost of this installation will be the responsibility of the customer.

b. Ensuing Violations: The WCID also has the authority to terminate service at the customer's meter for a period of seven (7) days, or until the end of the calendar month, whichever is LESS. The customer shall bear the costs associated with the disconnection/ reconnection.

5. Exemptions or Variances From Rationing Rules: The Board of Directors may grant any customer of the water system an exemption or variance from the Emergency Rationing Plan, for good cause. However, the Board shall treat ALL customers equally concerning exemptions and variances and shall not employ discrimination in such variances.

6. Rates: All existing rate schedules shall remain in effect during rationing periods, and no charges may be enforced against a customer which are not contained in the approved Emergency Water Demand Management Plan or existing WCID rate schedule.

7. Termination: The goal of the Emergency Rationing Plan is to help conserve the amount of water utilized by customers until the water supply can be restored to normal operating conditions. Public notice shall be given when any rationing stage is terminated and shall clearly state:

a. Date rationing is to be terminated.
b. Stage (s) of rationing to be terminated and if any stage (s) of rationing remains in effect.
c. Area affected by the termination.

BASTROP COUNTY WCID NO. 2
P. O. Box 708
Bastrop, Texas 78602-0708

PUBLIC NOTICE
OF RATIONING CONDITION

DATE: _____

TO: Customers of the Bastrop County WCID No. 2 Water System

FROM: President, Bastrop County WCID No. 2

Due to certain conditions that have affected our WCID's water supply system, our water system is unable to meet the demand of our water customers. Therefore, under the WCID's Emergency Water Demand Management Plan, approved by the Texas Water Development Board (TWDB), Stage 1: Mild Rationing will begin on _____ and will remain in effect until _____, unless the current situation improves. If current conditions do not improve, the Board of Directors will decide on whether to extend the rationing period and/or enlist Stage 2:

Moderate Rationing to help alleviate present concerns.

Stage 1 rationing requests voluntary water use reductions from major commercial water users and for citizens to follow a voluntary outdoor watering schedule. The schedule is as follows:

Last Two Number of Street Address	Watering Day
0 or 9	Monday
7 or 8	Tuesday
5 or 6	Wednesday
3 or 4	Thursday
1 or 2	Friday

Weekend watering will be allowed, but please be conservation orientated. In addition, outdoor watering practices should try to be performed between the hours of 6-10 a.m. and 8-10 p.m.

The WCID has the authority to insert a flow restrictor in your water line at your cost if you are found in violation of these rules. Further flow violations on your behalf may result in temporary water service termination. If you feel that you have good cause for a variance from this rationing program, please contact us in writing at the address above. A complete copy of the WCID's Emergency Water Demand Management Plan is available for review at WCID Office.

Thank you for your cooperation with this matter.

BASTROP COUNTY WCID NO. 2
P. O. Box 708
Bastrop, Texas 78602-0708

Meter Test Authorization
and Test Report

Name:_____
Address:_____
_____
Date of Request: _____ Phone Number (Day): _____
Account Number: _____ Meter Serial Number: _____
Reasons For Request: _____
_____

Customers requesting a meter test may be present during the test, but if not, Customer shall accept test results shown by the WCID. The test shall be conducted in accordance with American Water Works Association (AWWA) standards and methods on a certified test bench. Customer agrees to pay $25.00 for the test if the results indicate an AWWA acceptable performance, plus any outstanding water utility service. In the event that the Customer is required to pay for the test and for outstanding water utility service as set forth herein, said charges shall be applied to the next billing sent to the Customer after the date of the test.

X_____
Signed by Customer

Test Results

Low Flow (1/4 gpm) 103.0 %	_____%	AWWA Standard 97.0 -
Intermediate (2 gpm) 101.5 %	_____%	AWWA Standard 98.5 -
High Flow (10 gpm) 101.5 %	_____%	AWWA Standard 98.5 -

Register test _____ minutes at _____ gallons per minute recorded _____ per _____ gallons.

_____ Meter tests accurately; no adjustments due
_____ Meter tests high; adjustment due on water charges by _____ %
_____ Meter tests low; no adjustments due

Test conducted by _____

Approved _____

Lower Colorado River Authority

Water Utilities Conservation and Drought Contingency Plan

CDM

LOWER COLORADO RIVER AUTHORITY
WATER UTILITIES
CONSERVATION AND DROUGHT CONTINGENCY PLAN

OCTOBER , 2002

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Appendices

1.0 INTRODUCTION

The Lower Colorado River Authority (LCRA) developed this Water Conservation and Drought Contingency Plan (Plan) for its retail and wholesale treated water utility systems to effectively manage public water resources and to plan appropriate responses to emergency and drought conditions. This Plan fulfills requirements of the Texas Administrative Code, Sections 288.2, 288.20 and 288.22, regarding water conservation and drought contingency planning for municipal uses by public water suppliers. The Plan recognizes that conservation is a valuable tool in managing water and wastewater utility systems. Benefits of water conservation include: extending available water supplies; reducing the risk of shortage during periods of extreme drought; reducing water and wastewater utility operating costs; improving the reliability and quality of water utility service; reducing customer costs for water service; reducing wastewater flows; improving the performance of wastewater treatment systems; and enhancing water quality and the environment.

1.1 Scope

This Plan applies to all of LCRA's retail and wholesale treated water utility systems located within LCRA's water service area, as shown in Appendix A. The supply source of an individual system may be either ground or surface water. Individual LCRA water utility systems are described in more detail in Appendices B-N.

As future systems are acquired by LCRA, supplemental appendices will be added with baseline utility, conservation, and drought contingency information specific to that water utility system.

This Plan supersedes LCRA Water Utilities Conservation and Drought Contingency Plan that was approved by LCRA Board of Directors in August 2000.

1.2 Declaration of Policy, Purpose and Intent

The drought contingency portions of this Plan are designed to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation and fire protection. One goal of the Plan is to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions. LCRA hereby adopts the following Water Conservation and Drought Contingency Plan for its retail and wholesale treated water utility systems.

Water uses regulated or prohibited under this Plan are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply conditions are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section 9.4 of this Plan.

2.0 AUTHORIZATION AND IMPLEMENTATION

The General Manager, or his/her designee, of LCRA is hereby authorized and directed to implement the applicable provisions of this Plan. The General Manager, or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Further, the General Manager, or his/her designee, will act as Administrator of the Water Conservation Program. He/she will oversee the execution and implementation of the program and will be responsible for keeping adequate records for program verification. LCRA Water Conservation staff will assist with implementation of conservation and drought management programs.

This Plan was presented to LCRA Board of Directors for approval in June 2002. A certified copy of the minutes approving this plan is included in Appendix O.

3.0 PUBLIC INVOLVEMENT

Four public meetings were conducted when the original Plan was developed in the Spring of 2000. All retail customers affected by modifications to the 2000 Plan were notified of the changes by mail and at a series of customer meetings. These meetings occurred in May and June of 2002. In addition, all wholesale utility customers affected by the changes to this plan were notified and provided an opportunity to give feedback on these changes.

An example of public announcement materials is provided in Appendix P.

4.0 COORDINATION WITH REGIONAL WATER PLANNING GROUPS

Most of the service area of LCRA's water utility systems are located in the lower Colorado River basin within the Region K planning area. The Lometa Water System is temporarily receiving water on a contractual basis through a variety of purveyors from the Brazos River located within the Region G planning area. As a result, LCRA has provided a copy of this plan to both Region G and K planning groups. Appendix Q includes the transmittal letters to these groups.

5.0 APPLICATION

The provisions of this Plan shall apply to all persons, customers, and property utilizing treated water provided by LCRA utility system. The terms "person" and "customer" as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

6.0 DEFINITIONS

For the purposes of this Plan, the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

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

Customer: any person, company or organization using water supplied by LCRA utility system.

Domestic water use: use of water by an individual or a household to support its own domestic activity. Such use may include water for drinking, washing, or culinary purposes; for irrigation of lawns, or of a family garden and/or orchard; for watering of domestic animals; and for water recreation including aquatic and wildlife enjoyment. If the water is diverted, it must be diverted solely through the efforts of the user. Domestic use does not include water used to support activities for which consideration is given or received or for which the product of the activity is sold.

Industrial water use: use of water in processes designed to convert materials of lower value into forms having greater usability and value, including the development of power by means other than hydroelectric.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Livestock water use: use of water for the open-range watering of livestock, exotic livestock, game animals or fur-bearing animals. For purposes of this definition, the terms "livestock" and "exotic livestock" are to be used as defined in §142.001 of the Agriculture Code, and the terms "game animals" and "fur-bearing animals" are to be used as defined in §63.001 and §71.001, respectively, of the Parks and Wildlife Code.

Non-essential water use: water uses that are not essential nor required for the protection of public health, safety and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except for as otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;

(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting or protection of public drinking water supplies.
(j) Use of water for livestock use is not included in the definition of "non-essential water use."

Retail Water Customer: an individual or entity that is provided water from an LCRA water utility and is not resold to or used by others.

Wholesale Treated Water Customer: an individual or entity that for compensation supplies LCRA water to another for resale to the public for human consumption. The term does not include an individual or entity that supplies LCRA water to itself or its employees or tenants as an incident of that service or tenancy when that water is not resold or used by others.

7.0 BASELINE EVALUATION OF UTILITY SYSTEMS AND CUSTOMER USE

This plan applies only to treated water utilities systems owned by LCRA. As of May, 2002, LCRA owned the following water treatment systems:

Bridgepoint Water System
Glen Lake Water System
Harper Water System
Lake Buchanan Water System
Leander Water System
Lometa Water System
Matagorda Dunes Water System
Ridge Harbor Water System
Quail Creek Water System
South Road Water System
Spicewood Beach Water System
Sunrise Beach Water System
West Travis County Water System

Appendices B - N provide a description of the service area for each utility system. As future systems are acquired by LCRA, supplemental information will be added, including baseline utility, conservation and drought contingency information specific to that water utility system.

7.1 Population and Service Area

LCRA's 13 water utility systems provide water to approximately 21,300 in nine water service area counties. The population served by these systems is very diverse, ranging from rural, to suburban and urban, and from weekenders to full-time residents and commercial customers. Due to the varying demands of the population served and the condition of the particular system, conservation and drought response priorities will vary from system to system. For example, plumbing retrofits may be more appropriate in systems with older homes, while irrigation audits are more effective in systems with newer, larger lot-size homes. Maps illustrating LCRA's water service area and its various water utility systems are found in Appendix A. Additional information describing the service area is found in the appendices of individual water systems.

7.2 Water Utility Systems and Water Usage

The supply source of an individual system may be either ground or surface water. In addition, some of the utility systems are retail and some are wholesale. Table 1 below shows each system, its treated water supplier and the water source.

Table 1: LCRA Water Utility Systems: Type of System and Water Supply Source

Name of System	Treated Water Supplier	Water Source
Bridgepoint Water System	LCRA	Groundwater – alluvial
Glen Lakes Water System	LCRA/River Place MUD	Lake Austin
Harper Water System	LCRA	Groundwater – Edwards/Trinity
Lake Buchanan Water System	LCRA	Lake Buchanan
Leander Water System	LCRA	Lake Travis
Lometa Water System	City of Lampasas and Central Texas Water Supply Corp.	Stillhouse Hollow Lake
Matagorda Dunes Water System	LCRA	Groundwater – Gulf Coast
Ridge Harbor Water System	LCRA	Lake Travis
Quail Creek Water System	LCRA	Groundwater - Hickory
South Road Water System	City of Marble Falls	Lake Marble Falls
Spicewood Beach Water System	LCRA	Groundwater - Cretaceous Sycamore Sand
Sunrise Beach Water System	LCRA	Groundwater-Precambrian Granite formation
West Travis County Water System	LCRA	Lake Austin

Annual average use and peak use also vary considerably from one system to another. Table 2 on the next page shows the average daily use, peak day use, and peak to average day ratios of all systems.

Table 2
LCRA Water Utility Systems: 2001 Water Use Data*
(in million gallons)

Name of System	Average Daily Use	Peak Day Use	Peak to Ave Day Ratio
Bridgepoint Water System	.005	.012	2.4
Glen Lakes Water System	.273	.742	2.7
Harper Water System	.022	Na	Na
Lake Buchanan Water System	.103	.252	2.5
Leander Water System	1.407	Na	Na
Lometa Water System	.358	.855	2.4
Matagorda Dunes Water System**	Na	Na	Na
Ridge Harbor Water System**	.047	.129	2.6
Quail Creek Water System**	Na	Na	Na
South Road Water System**	Na	Na	Na
Spicewood Beach Water System	.043	.106	2.3
Sunrise Beach Water System	.112	.300	2.7
West Travis County Water System	2.219	5.299	2.4

* Groundwater systems currently are not monitored daily, so daily water use is not calculated. Ridge Harbor data is from the year 2000.
** Data does not represent entire year.
Na = Data not available.

8.0 WATER CONSERVATION PLAN

8.1 Water Conservation Goals

LCRA will set a goal of decreasing 2003 per capita water use in its retail utility systems by 15% by the year 2020. LCRA will also encourage its wholesale treated water customers to adopt a similar water conservation goal. This goal will be reviewed periodically to determine if it is reasonable and feasible.

8.2 Water Conservation Measures

(1) Universal Metering and Meter Replacement and Repair

All utility customers will be metered. A regularly scheduled maintenance program of meter repair and replacement will be performed in accordance with the following schedule:

Production (master) meters:	Test once a year
Meters larger than 1":	Test once a year
Meters 1" or smaller:	Test once every 10 years

Zero consumption accounts will be checked to see if water is actually being used or not recorded. In addition, the meters will be checked for proper sizing.

(2) Distribution System Leak Detection and Repair

LCRA will conduct leak detection and water audits, making appropriate repairs, in order to keep unaccounted water losses to less than 15%. The unaccounted for water use for each system is found in the appendices.

(3) Plumbing Retrofit Program

State and federal laws require that homes built after 1992 have low-flow (less than 3 gallons per minute) showerheads, faucet aerators and ultra low flush (less than 1.6 gallons per flush) toilets installed. However, many homes in LCRA water service area were built before that time. LCRA conducts ongoing plumbing retrofit programs, whereby residents can obtain low-flow showerheads, faucet aerators, toilet leak detection dye tablets, and other conservation materials for their homes. This equipment is also available at LCRA utility offices.

(4) Water Pricing Incentives

LCRA has a goal of charging rates that reflect the cost of providing service in addition to sending a price signal to customers to encourage water conservation. With the exception of Matagorda Dunes, LCRA charges rates based on the volume of water consumed on a monthly basis (volumetric rate). In most cases, these rates increase after a certain volume of water is consumed. This increasing block rate is used to encourage conservation by charging customers a higher rate for using a greater volume of water. Matagorda Dunes is an exception to LCRA's typical method of charging rates because individual customer meters had not been installed when LCRA purchased Matagorda Dunes in the spring of 2002. Plans are underway to install meters in order to charge a volumetric rate.

Copies of the rates of all utility systems are available upon request.

(5) Continuing education program on water conservation and drought contingency

LCRA's continuing public education and information campaign includes the following:

- Providing water conservation packets for new retail water customers;
- Providing all retail water customers with at least one brochure/flier on water conservation each year;
- Promoting the revised Major Rivers water education curriculum to the school districts in the utility service area.

(6) Landscape Irrigation Audits

LCRA offers irrigation audits to commercial customers with large landscape irrigation needs in the utility service area. In addition, in the spring of 2002, LCRA began offering its Sensible Home Irrigation Program to residential customers. Audits consist of evaluating the irrigation system, checking for leaks and other performance problems, and customizing an irrigation schedule. Residential customers also receive information on WaterWise landscapes. Participants can also receive free rain-sensor shutoff valves.

(7) Other Conservation Strategies

Additional conservation strategies include:

- Working with local entities in the utility service area to develop codes and ordinances that promote the use of water conserving technologies, promote water efficiency and avoid water waste;
- Promoting the recycling and reuse of reclaimed wastewater in areas where LCRA also operates the wastewater system;
- Monitoring and evaluate water conservation measures implemented;
- Employing other measures as may be applicable.

8.3 Conservation Plans for Wholesale Treated Water Customers

Wholesale treated water customers must develop a water conservation plan in accordance with 30 Texas Administrative Code Section 288.2 and provide a copy of its plan to LCRA. This plan must include a Board resolution, ordinance or other official document noting that the plan has been formally adopted by the utility. Wholesale treated water customers must include in their wholesale water supply contracts the requirement that each successive wholesale customer develop and implement a water conservation plan and measures.

LCRA provides technical assistance with the development and review of wholesale treated water customers' water conservation plans and programs. LCRA assists with the development of rules and regulations that encourage water conservation, such as adding water conservation components into landscape ordinances. Irrigation audits are offered to all wholesale commercial customers, and training is available to wholesale customer staff on performing residential irrigation audits. Conservation education materials are available to wholesale customers either free or at a reduced rate.

9.0 DROUGHT CONTINGENCY PLAN FOR RETAIL AND WHOLESALE TREATED WATER CUSTOMERS

The General Manager, or his/her designee, shall monitor water supply and demand conditions on a daily basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Water supply conditions will be determined by the source of supply for each individual system (groundwater, another wholesale water supplier not affiliated with LCRA, surface water), system capacity, and weather conditions while demand will be measured by the peak daily demands on each system.

Public notification of the initiation or termination of drought response stages shall be by means of publication in local media outlets, direct mail to each customer, and signs posted at LCRA utility offices and other public places.

9.1 Triggering Criteria for Initiation and Termination of Drought Response Stages

The following trigger criteria shall apply to LCRA's retail customers and wholesale treated water customers; however, more specific triggering criteria and demand management measures for retail customers are included in Appendices B-N, tailored for each individual system based upon supply and demand conditions.

(1) Stage 1 – Mild Water Shortage Conditions (Voluntary Measures)

Requirements for initiation – Customers shall be requested to voluntarily conserve water and adhere to the Stage 1 Drought Response Measures when one or a combination of such triggering criteria occur:

(a) When total daily water demand equals or exceeds 80 percent of the total design capacity of an LCRA water treatment plant for three (3) consecutive days, or 85 percent on a single day; or,

(b) If a system relies on groundwater for its primary source, the attached appendices include additional trigger criteria for that system; or,

(c) When LCRA Water Management Plan triggers voluntary restrictions for LCRA firm raw water customers; or,

(d) When any other additional trigger criteria for individual systems as listed in the attached appendices are achieved.

Requirements for termination – Stage 1 of the Plan may be rescinded when:

(a) The water treatment plant capacity condition listed above as a triggering event has ceased to exist for a period of five (5) consecutive days; or,

(b) The groundwater source triggers have recovered to a sufficient level as determined by the General Manager, or his/her designee; or,

(c) LCRA, announces that voluntary restrictions by its firm raw water customers are no longer needed under LCRA Water Management Plan.

(d) Any other trigger criteria as outlined in the attached appendices for individual systems have ceased to exist.

(2) Stage 2 – Moderate Water Shortage Conditions (Mandatory Measures)

Requirements for initiation – Customers shall be required to comply with the Stage 2 Drought Response Measures of this Plan when the following triggering criteria are met:

(a) When total daily water demand equals or exceeds 93 percent of the total design capacity of an LCRA water treatment plant for three (3) consecutive days, or 95 percent on a single day; or,

(b) If a system relies on groundwater for its primary source, the attached appendices include additional trigger criteria for that system; or,

(c) When any other additional trigger criteria for individual systems as listed in the attached appendices or LCRA Water Management Plan are achieved.

Requirements for termination – Stage 2 of the Plan may be rescinded when:

(a) The water treatment plant capacity condition listed above as a triggering event has ceased to exist for a period of five (5) consecutive days; or,

(b) The groundwater source triggers have recovered to a sufficient level as determined by the General Manager, or his/her designee; or

(c) Any other trigger criteria as outlined in the attached appendices for individual systems or conditions of LCRA Water Management Plan have ceased to exist.

Upon termination of Stage 2, Stage 1 becomes operative.

(3) Stage 3 – Severe Water Shortage Conditions (Emergency Measures)

Requirements for initiation – Customers shall be required to comply with Stage 3 Drought Response Measures of this Plan when severe water shortage conditions exist. LCRA will recognize that a severe water shortage condition exists when either of the following criteria are met:

(a) When total daily water demand equals or exceeds 95 percent of the total design capacity of an LCRA water treatment plant for three (3) consecutive days, or 97 percent on a single day; or,

(b) If a system relies on groundwater for its primary source, the attached appendices include additional trigger criteria for that system; or,

(c) When any other additional trigger criteria for individual systems as listed in the attached appendices are reached or LCRA declares a drought more severe than the drought worse than record for those customers receiving water from the Highland Lakes.

Requirements for termination – Stage 3 of the Plan may be rescinded when:

(a) The water treatment plant capacity condition listed above as a triggering event has ceased to exist for a period of five (5) consecutive days; or,

(b) The groundwater source triggers have recovered to a sufficient level as determined by the General Manager, or his/her designee; or,

(c) Any other trigger criteria as outlined in the attached appendices for individual systems cease to exist or LCRA declares the cancellation of a drought worse than the drought of record.

Upon termination of Stage 3, Stage 2 becomes operative.

(4) Stage 4 – Emergency Water Conditions

Initiation and termination of water emergencies will operate under measures listed in LCRA's Drinking Water Emergency Response Plan. A copy of this plan is available upon request. LCRA will notify affected retail customers, wholesale customers, and the media of the termination of Stage 4. Examples of a water emergency include, but are not limited to, the following:

(a) Major water line breaks, loss of distribution pressure, or pump or system failures occur, which cause unprecedented loss of capability to provide water service.

(b) Natural or man-made contamination of the water supply source(s).

Upon declaration of Stage 4 – Emergency Water Conditions, water use restrictions outlined in Stage 4 Emergency Response Measures shall immediately apply.

9.2 Drought Response Measures

The General Manager, or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section 9.1. of the Plan, shall determine that a mild, moderate, severe, or emergency condition exists and shall implement the following measures upon publication of notice in local media sources.

The Drought Response Measures are broken into measures for retail customers and measures for wholesale treated water customers to be taken when the General Manager of his/her designee make a determination of the Stage.

9.2.1 Retail Customers

(1) Stage 1 – Mild Water Shortage – Voluntary Measures

Supply Management Measures:

Affected LCRA water utility system(s) will:

Review system operations and identify ways to improve system efficiency and accountability.

Demand Management Measures:

(a) Apply all water use restrictions prescribed for Stage 2 of the Plan to LCRA utility owned facilities and properties.

(b) Provide a limited supply of consumer information and materials on water conservation measures and practices to retail customers.

(c) Voluntarily comply with the water use restrictions outlined in Stage 2 of this Plan.

(2) Stage 2 – Moderate Water Shortage – Mandatory Measures

Supply Management Measures:

In addition to measures implemented in Stage 1 of the Plan, affected LCRA water utility system(s) will:

(a) Water all utility owned landscaped areas only by means of a hand-held hose or drip irrigation system.

(b) Discontinue water main and line flushing unless necessary for public health reasons.

(c) Keep customers and the news media informed on issues regarding current and projected water supply and/or demand conditions.

Demand Management Measures:

Under threat of penalty for violation, the following water use restrictions shall apply to all retail water customers:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to a weekly watering schedule that will vary by individual utility system as outlined the attached appendices.

(b) Outdoor watering hours will be limited to between the hours of 12:00 midnight and 10:00 a.m. and between 7:00 p.m. and 12:00 midnight on designated watering days. This prohibition does not apply to irrigation of landscaped areas if it is by means of:
    1. a hand-held hose,
    2. a faucet filled bucket or watering can of five (5) gallons or less, or
    3. a drip irrigation system.

(c) If a new landscape has been installed within two weeks or after the initiation of Stage 2, then irrigation of that landscape may only occur during the outdoor watering hours listed immediately above and in accordance with the following 30 day irrigation schedule:

    1. for the first 10 days after installation, once a day;
    2. for day 11 through 20 after installation, once every other day; and
    3. for day 21 through 30 after installation, once every third day.

(d) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 7:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public are contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(e) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or jacuzzi-type pools is prohibited except on designated watering days during the designated watering hours.

(f) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a re-circulation system.

(g) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of

water from designated fire hydrants for construction purposes may be allowed under special permit from LCRA water utility system.

(h) Irrigation of a golf course fairway is prohibited except on a designated outdoor water use day between the hours 12:00 midnight and 10:00 a.m. and between 7:00 p.m. and 12:00 midnight. Irrigation of a golf course green or tee is allowed every other day if a plan is filed and approved by the LCRA. These restrictions do not apply if the golf course utilizes an alternate water supply as its only irrigation source, such as reclaimed water, rainwater or graywater.

(i) All restaurants are encouraged to serve water to their patrons only upon request.

(j) The following non-essential uses of water are prohibited at all times:

1. washing down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. washing down buildings or structures for purposes other than immediate fire protection;
3. dust control, there is a demonstrated need to do so because of public health and safety;
4. flushing gutters or allowing a substantial amount of water to run off a property or accumulate in any gutter, street, or parking lot to a depth greater than one-fourth of an inch; and,
5. failing to repair a controllable leak(s), including but not limited to broken irrigation or sprinkler head, leaking valve, or leaking faucet, within a reasonable period after having been given notice directing the repair of such leak(s).

(3) Stage 3 – Severe Water Shortage

Supply Management Measures:

In addition to measures implemented in preceding stages of the Plan, affected LCRA water utility system(s) will explore emergency water supply options.

Demand Management Measures:

Under threat of penalty for violation, all retail customers are required to further reduce non-essential water uses as follows. All requirements of Stage 2 shall remain in effect during Stage 3, with the following modifications and additions:

(a) Irrigation of landscaped areas is absolutely prohibited, except with hand-held hoses, hand-held buckets, or drip irrigation. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) No new landscapes may be installed.

(c) These restrictions do not apply to a golf course if the course utilizes an alternate water supply as its only irrigation source, such as reclaimed water, rainwater, or graywater.

(d) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

(e) The filling, refilling, or adding of water to swimming pools, wading pools, and jacuzzi-type pools is prohibited.

(f) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a re-circulation system.

(g) No applications for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be allowed or approved.

(4) Stage 4 –Emergency Measures

Under threat of penalty for violation, all retail customers are required to further reduce non-essential water uses as follows. All requirements of Stage 3 shall remain in effect during Stage 4, with the following modifications and additions:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited unless the golf course utilizes an alternate water supply source, such as reclaimed water, rainwater, or graywater.

(c) Use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

9.2.2 Wholesale Customers

All LCRA wholesale treated water customers are required to develop and formally adopt drought contingency plans for their own systems in accordance with 30 Texas Administrative Code 288.20 and 288.22 that are at least as stringent as the drought response measures required by LCRA for its retail customers. Wholesale treated water customers must include in their wholesale water supply contracts the requirement that each successive wholesale customer develop and formally adopt a drought contingency plan.

Stage 1 – Mild Water Shortage – Voluntary Measures

LCRA will contact wholesale treated water customers to discuss supply and demand conditions. LCRA will provide a limited supply of consumer information and materials on water conservation measures and practices to wholesale customers.

Stage 2 – Moderate Water Shortage – Mandatory Measures

LCRA will keep wholesale treated water customers and the news media informed on issues regarding current and projected water supply and/or demand conditions. LCRA will initiate discussions with wholesale treated water customers about potential curtailment and the implementation of mandatory measures to reduce all non-essential water uses.

Stage 3 – Severe Water Shortage

LCRA will contact the wholesale treated water customers to initiate mandatory measures to assist in the control of water demand and to ensure capacity for emergency response requirements. Mandatory measures will include the curtailment of non-essential water uses in accordance with the wholesale treated water customer's own drought contingency plan.

In addition, if the Stage 3 triggering criteria is based on a water supply shortage, LCRA will initiate the curtailment of water provided to wholesale treated water customers on a pro rata basis. The wholesale treated water customer's monthly allocation of water shall be based on a percentage of the of the customer's water usage baseline. The percentage will be determined by the General Manager or his/her designee and may be adjusted as conditions warrant.

Stage 4 –Emergency Measures

All requirements of Stage 3 shall remain in effect during Stage 4.

9.3 Public Notification

LCRA will periodically provide information about the drought contingency components of this Plan, including (1) the conditions under which each stage of the Plan is to be initiated or terminated, and (2) the drought response measures to be implemented in each stage. This information will be provided by various means depending on the audience including articles in the local print media and special materials mailed to customers and available at LCRA Utility Office.

9.4 Enforcement

9.4.1 Retail Customers

The following enforcement provisions, shall apply to all LCRA retail water customers:

(1) No person shall knowingly or intentionally allow the use of water from an LCRA water utility system for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by the General Manager, or his/her designee, in accordance with provisions of this Plan.

(2) Any person who violates this Plan shall be subject to the following surcharges and conditions on service:

(a) following the first documented violation, the violator shall be given a notice of violation specifying the type of violation and the date and time the violation was observed, and the surcharges and restrictions on service that may result from additional violations;

(b) following the second documented violation, the violator shall be sent by certified mail a notice of violation and shall be assessed a surcharge in the amount of $200.00;

(c) following the third documented violation, the violator shall be sent by certified mail a notice of violation and shall be assessed a surcharge in the amount of $700.00;

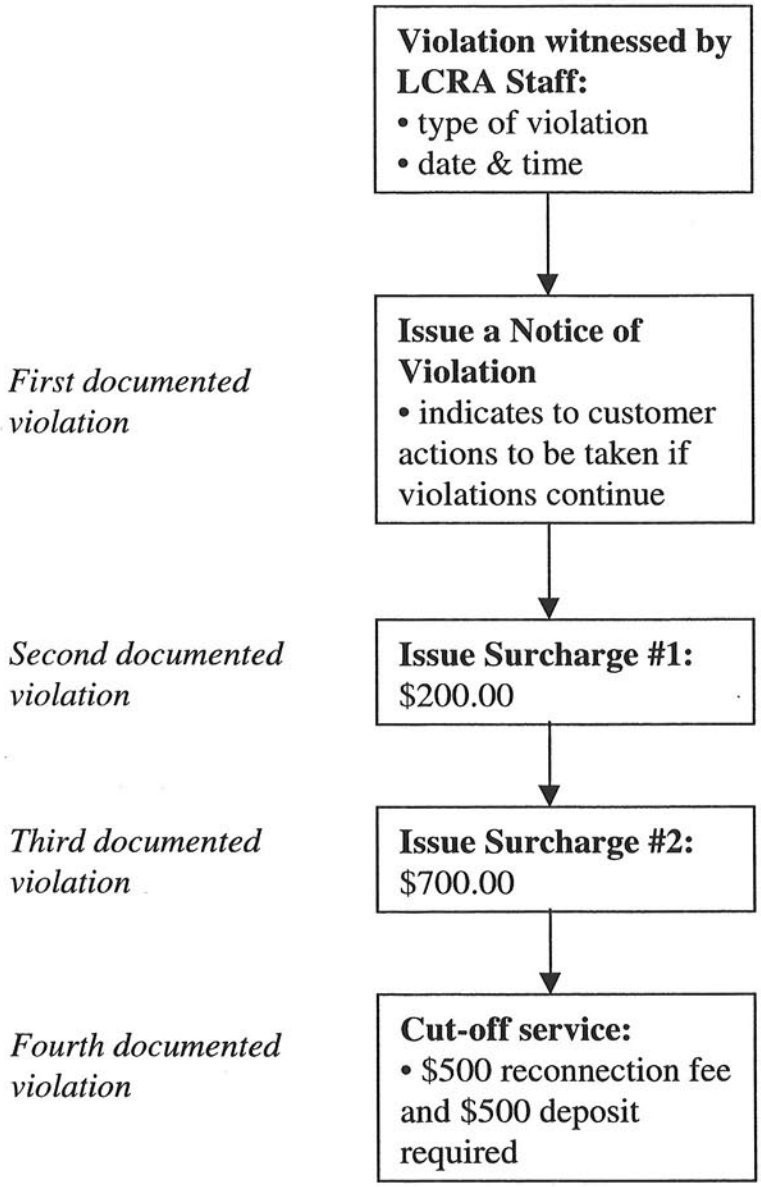
(d) following the fourth documented violation, the General Manager, or his/her designee, shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $500.00, and any other costs incurred by LCRA water utility system in discontinuing service, and any outstanding charges including late payment fees or penalties. In addition, suitable assurance in the amount of a deposit of $500.00 must be given to the General Manager, or his/her designee, that the same action shall not be repeated while the Plan is in effect. The General Manager, or his/her designee, may apply the deposit to any surcharges or penalties subsequently assessed against a customer under this Plan. The deposit, if any, shall be returned to the customer at the time of the customer's voluntary disconnection from the utility system.

(3) Compliance with this plan may also be sought through injunctive relief in the district court.

(4) Each day that one or more of the provisions in this Plan is violated shall constitute a separate violation. Any person, including a person classified as a water customer of LCRA water utility system, in apparent control of the property where a violation occurs or originates shall be presumed to be the violator. Any such person, however, shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of the minor child, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

Table 3 shows a diagram of the drought response enforcement process.

Table 3 – Drought Response Retail Enforcement Process



Note:

- Customers may apply for a variance.
- Repeat violations are tallied only for the mandatory restriction period in effect (i.e., customer would start with clean slate if a new restriction period - separate in time - is declared).

9.4.2 Wholesale Customers

Wholesale treated water customers shall provide LCRA with an order, ordinance, or resolution to demonstrate adequate enforcement provisions for the wholesale customer's own drought contingency plan.

In addition, wholesale treated water customers receiving treated water failing to comply with the drought contingency measures in the Plan may be subject to any other remedies available to LCRA at law or under the terms of the raw water supply and/or wholesale water contracts.

9.5 Variances

The General Manager, or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(1) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(2) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting a variance from the provisions of this Plan shall file a petition for variance with LCRA water utility system within five (5) days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the General Manager, or his/her designee, and shall include the following:

(1) Name and address of the petitioner(s).
(2) Purpose of water use.
(3) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(4) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Plan.
(5) Description of the relief requested.
(6) Period of time for which the variance is sought.
(7) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(8) Other pertinent information.

Variances granted by LCRA water utility system shall be subject to the following conditions, unless waived or modified by the General Manager, or his/her designee:

(1) Variances granted shall include a timetable for compliance.
(2) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

10.0 SEVERABILITY

It is hereby declared to be the intention of LCRA Board of Directors that the sections, paragraphs, sentences, clauses, and phrases of this Plan are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by LCRA Board of Directors without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

11.0 PLAN REVIEW AND UPDATES

This Plan was developed to fulfill requirements of the Texas Administrative Code Subchapter B, Section 288, to prepare a water conservation and drought contingency plan and provide community and water customers with essential water conservation and drought contingency response information, regulations, and services. As future systems are acquired by LCRA, supplemental appendices will be added with baseline utility, population, water use, emergency management and drought contingency information specific to that utility system. In addition, the Plan will be reviewed at a minimum of every five (5) years and updated based on other developments in LCRA's water service area.

Appendix
TWDB Executive Administrator Comments

TEXAS WATER DEVELOPMENT BOARD

June 3, 2004

Mr. Randy J. Goss, P. E.
Executive Manager
Water and Wastewater Utility Services
Lower Colorado River Authority
P. O. Box 220
Austin, TX 78767-0220

RE: Regional Water Supply Facility Grant Contract between the Lower Colorado River Authority (LCRA) and the Texas Water Development Board (BOARD), TWDB Contract No. 2003-483-485, Review of Draft Report entitled "Western Bastrop County Water and Wastewater Planning Study"

Dear Mr. Goss:

Staff members of the Texas Water Development Board have completed a review of the draft report under TWDB Contract No. 2003-483-485. As stated in the above referenced contract, LCRA will consider incorporating comments from the EXECUTIVE ADMINISTRATOR (shown in Attachment 1) as well as other commentators on the draft final report into the final report. LCRA must include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final report.

The Board looks forward to receiving one (1) electronic copy of the entire FINAL REPORT in Portable Document Format (PDF), one (1) unbound single-sided camera-ready original, and nine (9) bound double-sided copies of the final report on this study. Please also submit one (1) electronic copy of any computer programs, maps, or models and an operations manual.

Please contact Mr. David Meesey, the Board's designated Contract Manager for this study, at (512) 936-0852, if you have any questions about the Board's comments.

Sincerely,

William F. Mullican, III
Deputy Executive Administrator
Office of Planning

c: Jason Eichler, LCRA
David Meesey, TWDB

ATTACHMENT 1

TEXAS WATER DEVELOPMENT BOARD

Review of the Draft Final Report: Contract No. 2003-483-485
"Western Bastrop County Water and
Wastewater Planning Study"

1. The population and water demand projections are somewhat higher than the TWDB approved projections for the 2006 Regional Water Plan. However, since more recent estimates indicate growth in Bastrop County is occurring at a rate slightly higher than indicated in the TWDB projections, these projections are acceptable.
2. Section 2.1.3, Page 2-2 - Please define "gpad" or clarify that it should read "gpcd".
3. Section 3, Aqua Water Supply Corp. is incorrectly referred to as Aqua Water **Service** Corp. There are several other minor misspelled words and other typographical errors throughout Section 3.
4. Section 4.3, Page 4-14 - The last sentence states that Alternative 2 is less expensive then Alternative 1, but the tables cite $40.7 M for Alternative 2 and $28.4 M for Alternative 1. Please clarify.
5. Section 5 - Dental "cavities" are referred to in several places as dental "caries."
6. Section 5.1.1, Page 5-1 - In the last sentence, correct the reference information for the service area map to cite Section 1.2 instead of Section 1.3. References also need to be changed in Section 5.1.2 and Section 5.1.3.
7. Section 5.3.1.2, Page 5-19 - Remove text after the words "high quality product" until the end of the section. The three sentences following repeat what was stated earlier in the paragraph.
8. Section 6.2, Page 6-5 - Costs associated with transmission lines for treated water do not appear to be included in the total costs. If a distribution system is already in place, please state that in the text. Otherwise, please explain why these costs were omitted.
9. Tables 6-4, 6-5, and 6-6, Page 6-6 - Please include a note describing the significance of asterisks associated with several of the itemized costs.
10. Section 8 – Discussion of "Funding Options" is incomplete. Please include descriptions of other TWDB financial programs such as the Drinking Water SRF, State Participation Program and state programs for water supply and wastewater treatment programs. TWDB staff will be happy to assist with these program descriptions.