

# **Post Oak Savannah Groundwater Conservation District**

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## **Groundwater Management Plan**

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# **POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT**

## **GROUNDWATER MANAGEMENT PLAN**

### **1. DISTRICT MISSION**

The Post Oak Savannah Groundwater Conservation District (POSGCD) mission is to conserve and preserve groundwater availability and protect groundwater users, by adopting and enforcing Rules consistent with state law. The District will accomplish this mission by imposing spacing requirements, limiting production, requiring permits for wells and production, establishing water drawdown levels and monitoring aquifer levels and production, making appropriate adjustments to allowable and permitted production, and encouraging conservation to limit pumping, thereby extending the quantity and quality of the water available in all the aquifers in Milam and Burleson counties.

### **2. TIME PERIOD OF THIS PLAN**

This plan will become effective upon adoption by the POSGCD Board of Directors and certification as administratively complete by the Texas Water Development Board. The plan will remain in effect for ten (10) years after the date of certification or until a revised plan is adopted and certified.

### **3. BACKGROUND**

The POSGCD was created in Milam and Burleson counties by HB 1784, 77<sup>th</sup> Legislature, 2001, and a local confirmation election in November 2002. The purpose of this bill is to provide locally controlled groundwater districts to conserve and preserve groundwater, protect groundwater users, protect and recharge groundwater, prevent pollution or waste of groundwater in the central Carrizo-Wilcox area, control subsidence caused by withdrawal of water from the groundwater reservoirs in that area, and regulate the transport of water out of the boundaries of the districts. The POSGCD has 10 directors, 5 from each county. It does not have the power to tax and receives all of its revenue from fees imposed on municipal/commercial pumpers and transporters of groundwater. Successful confirmation elections were held in November 2002 in both counties in accordance with Sections 36.017, 36.018, and 36.019, Water Code, and Section 41.001, Election Code.

### **4. GROUNDWATER RESOURCES**

The POSGCD has within its boundaries the Trinity, Carrizo-Wilcox, Queen City, Sparta, Yegua/Jackson and the Brazos River and Little River Alluvium aquifers. The following paragraphs describe the aquifers and their location within the District. Estimates of projected groundwater availability for the aquifers in the District have been made by several organizations including the Brazos Region G planning group, the Texas Water Development Board (TWDB), and the District

Hydrologist (URS). The Central Queen City/Sparta Groundwater Availability Model (hereafter referred to as the GAM), which includes the Carrizo-Wilcox aquifer system, has been applied as a means of evaluating groundwater availability and water budgets for the aquifers and management zones in the District.

**(a) Trinity**

The Trinity aquifer is located only in the northwest corner of Milam County, with its recharge area located in the counties to the north and west. Based on the 2002 Water Plan, the projected groundwater availability in Milam County is 321 acre-feet per year.

**(b) Carrizo-Wilcox (includes Simsboro Aquifer)**

The Carrizo-Wilcox aquifer is a major regional aquifer system that occurs throughout most of the POSGCD. The outcrop of the Carrizo-Wilcox forms a southwest to northeast trending belt through central Milam County, with the downdip portion of the aquifer to the southeast underlying southern Milam County and most of Burleson County. A large number of domestic wells, as well as public water supply systems, are screened in the Carrizo-Wilcox aquifer, with much of the water produced from the Simsboro aquifer within the Carrizo-Wilcox.

Evaluation of groundwater availability in this large aquifer system by management zones using the GAM suggests that approximately 124,500 acre-feet per year is available in the District. Section 16 provides additional information on the basis of this estimate.

**(c) Brazos River and Little River Alluvium**

Water bearing alluvial sediments occur in floodplain and terrace deposits of the Little River in Milam County and of the Brazos River along the eastern boundary of Milam and Burleson counties. Based on results of GAM 05-05 (a specific GAM simulation performed by the TWDB in March 2005), the alluvium aquifer receives recharge primarily through precipitation on the flood-plain surface. For the most part, the water discharges from the alluvium mainly through seepage to the Brazos River, evapotranspiration, and wells. In some locations, water levels in the alluvium are higher than the underlying Sparta aquifer and some groundwater downflow does occur. Irrigation accounts for almost all of the pumpage from this aquifer. Projected groundwater availability in Burleson County is 9,400 acre-feet per year. Only a small area of Brazos River alluvium occurs in Milam County, and no estimates of groundwater availability in the Little River alluvium in Milam County are available.

**(d) Queen City**

The Queen City aquifer crops out in a 5 to 8 mile wide zone generally along the Milam-Burleson County line. The aquifer extends down dip in Burleson County and is a source of groundwater for numerous domestic wells and some public water supply systems. Results of the GAM 05-05 indicate that recharge alone in this aquifer consists of 4,086 acre-feet per year in Milam County and 4,774 acre-feet per year in Burleson County for a District total of 8,860 acre-feet per year.

**(e) Sparta**

The Sparta aquifer crops out in a 3 to 5 mile wide zone trending southwest-northeast just north of Highway 21 in Burleson County. The Sparta extends downdip to the south throughout most of Burleson County. Like the Queen City aquifer, the Sparta is used for numerous domestic water wells and some small public water supply systems in the District. The GAM 05-05 results indicate that recharge to the Sparta in Burleson County amounts to 7,707 acre-feet per year.

**(f) Yegua/Jackson**

The Yegua and Jackson formations include local aquifers that provide small to moderate amounts of groundwater to domestic and irrigation wells in much of Burleson County. Because of the relatively low yields of wells in these aquifers, groundwater availability estimates have not been performed at this time for the Yegua or Jackson formations.

## **5. MANAGEMENT ZONES**

The District will be divided into seven groundwater management zones for the purpose of evaluating and managing groundwater resources recognizing the different characteristics and anticipated future development of the aquifers in the District. Figures 1 and 2 illustrate the locations of the management zones. The District will establish and enforce Rules for the spacing of wells, the maximum allowable production of groundwater per acre of land located over an aquifer, require permits for production, limit water drawdown levels, and provide for a reduction in the maximum allowable production and permitted production based on the different characteristics and continuing evaluation and monitoring within the Management Zones; provided that the Trinity Aquifer, the Brazos and Little River Alluviums and the Yegua/Jackson Aquifer will be regulated and managed only by regulating spacing and maximum production. These Management Zones are as briefly described below:

### **5.1 Trinity Management Zone**

This zone includes that part of the Trinity aquifer located in the northwest part of the District. Monitoring wells are not planned for this Management Zone.

### **5.2 Brazos River and Little River Alluvium Management Zone**

This zone is located along the eastern boundaries of the District and along the Little River in Milam County. It is limited to the water bearing alluvial sediments of the Brazos and Little Rivers. Monitoring wells are not planned for this Management Zone.

### **5.3 Queen City and Sparta Management Zone**

This zone includes all of the waterbearing outcrop and downdip formations of the Queen City and Sparta aquifers which are found in the District.

### **5.4 Shallow Carrizo-Wilcox (Simsboro) Management Zone**

This zone includes all of the waterbearing formations of the outcrop and downdip of the Carrizo-Wilcox and Simsboro aquifers including, and north and west of, the Milano Fault Zone.

### **5.5 Deep Simsboro Management Zone**

This zone includes that portion of the Simsboro aquifer downdip (south and east) of the Milano Fault Zone.

### **5.6 Deep Carrizo-Wilcox Management Zone**

This zone includes the Carrizo-Wilcox aquifer (except for the Simsboro aquifer) located south and east of the Milano Fault Zone.

### **5.7 Yegua/Jackson Management Zone**

This zone includes the outcrop and downdip portions of the Yegua Formation and the Jackson Group, which occur in the southern portion of Burleson County. Monitoring wells are not planned for this Management Zone.

## **6. PRODUCTION AND SPACING OF WELLS**

Production and spacing of all wells within the District will be regulated by the District according to the Rules of the District. The Trinity Aquifer, the Brazos and Littler River Alluviums, and the Yegua/Jackson Aquifer will be managed only by regulating the spacing of wells and the permitted production. The District does not anticipate installing any monitoring wells in either the Trinity Aquifer, the Brazos and Little River Alluviums, or the Yegua/Jackson Aquifer.

## **7. MANAGEMENT OF GROUNDWATER SUPPLIES**

The District will evaluate and monitor groundwater availability and regulate production consistent with the District rules and the supply of groundwater. Production will be regulated as needed to conserve groundwater, preserve groundwater availability, and protect groundwater users, in a manner not to unnecessarily and adversely limit production or impact the economic viability of the groundwater users, public and private. In consideration of the importance of groundwater availability to the economy and culture of the District, the District will identify and engage in such activities and practices that will permit groundwater production and, as appropriate, protect the aquifer and groundwater availability by reducing permitted production of groundwater. A well observation network will be established and maintained in order to monitor aquifer conditions within the District. The District will make a regular assessment of water supply and groundwater storage conditions and will report those conditions to the Board and to the public. The District will undertake investigations, and co-operate with third-party investigations, of the groundwater resources within the District, and the results of the investigations will be made available to the public upon being presented at a meeting of the Board.

The District will adopt rules to regulate groundwater withdrawals by means of well spacing and production limits. The District may deny a well construction permit or limit groundwater withdrawals in accordance with the rules of the District. In making a determination to deny a permit or limit groundwater withdrawals, the District will consider the available evidence and, as

appropriate and applicable, weigh the public benefit against the individual needs and hardship.

The relevant factors to be considered in making a determination to deny a well or production permit or limit groundwater withdrawals will include:

1. The purpose of the rules of the District;
2. The equitable distribution of the resource;
3. The economic hardship resulting from grant or denial of a permit, or the terms prescribed by the permit; and
4. The potential effect the permit may have on the aquifer, sustainability of the recharge on the aquifer as a whole, and groundwater users.

The transport of groundwater out of the District will be regulated by the District according to the Rules of the District.

In pursuit of the District's mission of protecting the resource, the District may require reduction of groundwater withdrawals to amounts that, based on then current information, will not knowingly cause permanent harm to an aquifer. To achieve this purpose, the District may, at the Board's discretion after notice and hearing, amend or revoke any permit for non-compliance, or reduce the production authorized by permit for the purpose of protecting the aquifer and groundwater availability. The determination to seek the amendment of a permit will be based on aquifer conditions observed by the District. The determination to seek revocation of a permit will be based on compliance and non-compliance with the District's rules and regulations. The District will enforce the terms and conditions of permits and the rules of the District, as necessary, by fine and enjoining the permit holder in a court of competent jurisdiction as provided for in Texas Water Code (TWC) Ch. 36.102, etc.

A contingency plan to cope with the effects of water supply deficits due to climatic or other conditions will be developed by the District and will be adopted by the Board after notice and hearing. In developing the contingency plan, the District will consider the economic effect of conservation measures upon all water resource user groups, the local implications of the degree and effect of changes in water storage conditions, the unique hydro geologic conditions of the aquifers within the District and the appropriate conditions under which to implement the contingency plan.

The District will employ reasonable and necessary technical resources at its disposal to evaluate the groundwater resources available within the District and to determine the effectiveness of regulatory or conservation measures. A public or private user may appeal to the Board for discretion in enforcement of the provisions of the water supply deficit contingency plan on grounds of adverse economic hardship or unique local conditions. The exercise of discretion by the Board, shall not be construed as limiting the power of the Board.

## **8. ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION**

The District will implement the provisions of this plan and will utilize the provisions of this plan as a guidepost for on-going evaluation determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District and any additional planning efforts in which the District may participate will be consistent with the provisions of this plan.

The District will adopt rules relating to the permitting of wells, production and transport of groundwater. The rules adopted by the District shall be adopted pursuant to TWC Chapter 36 and provisions of this plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical data reasonably available.

The District shall treat all citizens equally. Citizens may apply to the District for a variance in enforcement of the rules on grounds of adverse economic effect or unique local conditions. In granting a variance to any rule, the Board shall consider the potential for adverse effect on adjacent landowners. The exercise of said discretion by the Board, shall not be construed as limiting the power of the Board.

The District will seek cooperation with other agencies in the implementation of this plan and the management of groundwater supplies within the District. All activities of the District will be undertaken in co-operation and coordinated with the appropriate state, regional or local water management entity.

## **9. METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS**

The general manager of the District will prepare and present an annual report to the Board of Directors on the performance of the District in regards to achieving management goals and objectives. The presentation of the report will occur during the last monthly Board meeting each fiscal year, beginning after the adoption and certification of this plan. The report will include the number of instances in which each of the activities specified in the Districts management objectives was engaged in during the fiscal year. Each activity will be referenced to the estimated expenditure of staff time and budget in accomplishment of the activity. The notations of activity frequency, staff time and budget will be referenced to the appropriate performance standard for each management objective describing the activity, so that the effectiveness and efficiency of the Districts operations may be evaluated. The Board will maintain the adopted report on file, for public inspection, at the District's offices. This methodology will apply to all management goals contained within this plan.

## **10. MANAGEMENT GOALS, OBJECTIVES, & PERFORMANCE STANDARDS**

### **10.1 Efficient Use of Groundwater**

#### Management Objectives:

1. The District will establish the POSGCD Aquifer Water Level Observation Well Program with at least 10 observation wells located according to management zones

within the District, and measure those wells at least once annually.

2. The District will provide educational leadership to citizens within the District concerning this subject. The activity will be accomplished annually through at least one printed publication, such as a brochure, and public speaking at service organizations and public schools as provided for in the District's Public Education Program.

Performance Standards:

1. Establish the POSGCD Aquifer Water Level Observation Well Program and its criteria, and begin measurements of at least 10 of the observation wells within one year following the adoption and certification of this plan.
2. Number of observation wells measured annually by the District. Water levels at these observation wells will be measured a minimum of once annually.
3. The number of publications and speaking appearances by the District each year under the District's Public Education Program.

## **10.2 Controlling and Preventing Waste of Groundwater.**

Management Objectives:

The District will provide educational leadership to citizens within the District concerning this subject. The activity will be accomplished annually through at least one printed publication, such as a brochure, and public speaking at service organizations and public schools as provided for in the District's Public Education Program. The District will also offer at least one grant, during years when the District's revenues remain at a level sufficient to fund the program, to sponsor the attendance of students at summer camps/seminars that place emphasis on the conservation of water resources.

Performance Standards:

The number of publications and speaking appearances by the District each year, and the number of grants offered and students actually accepting and attending an educational summer camp or seminar.

## **10.3 Control and Prevent Subsidence**

Subsidence is unlikely to occur in the Post Oak Savannah Groundwater Conservation District. The geologic formations in the District range in age from Tertiary (sandstones and shales of the Wilcox, Carrizo, Sparta, Queen City, Yegua, and Jackson units) to Quaternary (floodplain deposits of the Brazos River Alluvium). The Tertiary formations are generally



consolidated to semi-consolidated, and have little potential for compaction and subsidence due to groundwater withdrawals. The Brazos River Alluvium is poorly consolidated, but generally too thin to experience measurable (if any) subsidence due to groundwater withdrawals.

#### **10.4 Conservation of Groundwater including Rainwater Harvesting, Precipitation Enhancement, Brush Control, and/or Recharge Enhancement of Groundwater Resources in the District**

##### Management Objectives:

1. The District will provide educational leadership to citizens within the District concerning this subject. The educational efforts will be through at least one printed publication, such as a brochure, and at least one public speaking program at a service organization and/or public school as provided for in the District's Public Education Program. Each of the following topics will be addressed in that program:
  - A. Conservation
  - B. Rainwater Harvesting
  - C. Brush Control
2. The District will offer to sponsor the attendance of at least one student at summer camps/seminars that place emphasis on the conservation of groundwater, groundwater recharge enhancement, or precipitation enhancement of water resources.
3. The District will encourage and support projects and programs to conserve and/or preserve groundwater, and/or enhance groundwater recharge by annually funding the District's Groundwater Conservation and Enhancement Grant Program, during years when the District's revenues remain at a level sufficient to fund the program. The objective of this program is to obtain the active participation and cooperation of local water utilities in the funding and successful completion of programs and projects that will result in the conservation of groundwater and the protection or enhancement of the aquifers in the District. The qualifying water conservation projects and programs will include, as appropriate, projects that: result in the conservation of groundwater, reduce the loss or waste of groundwater, recharge enhancement, rainwater harvesting, precipitation enhancement, brush control, or any combination thereof. The District's objective is to benefit the existing and future users of groundwater in the District by providing for the more efficient use of water, increasing recharge to aquifers, reducing waste, limiting groundwater level declines, and maintaining or increasing the amount of groundwater available, by awarding at least one grant under the program in each county annually.
4. The District will implement the POSGCD Well Closure Program. The objective of the well closure program is to obtain the closure and plugging of derelict and abandoned

wells in a manner that is consistent with state law, for the protection of the aquifers, the environment, and the public safety. The District will conduct a program to identify, inspect, categorize and cause abandoned and derelict water, oil and gas wells to be closed and plugged, by annually funding the program or segments or phases of the program appropriate to be funded in such fiscal year. The District will fund the closure of at least one abandoned well during years when the District's revenues remain at a level sufficient to fund the program.

Performance Standards:

1. The number of publications and speaking appearances by the District each year under the District's Public Education Program.
2. The number of students sponsored to attend a summer camp/seminar emphasizing the conservation of water.
3. Annual funding, when applicable, for the District's Groundwater Conservation and Enhancement Grant Program, and the number of projects and programs reviewed, approved, and funded under that program.
4. Annual funding, when applicable, for the District's Well Closure Program, and the number of wells closed and plugged as a result of the Well Closure Program.

## **10.5 Conjunctive Use of Surface and Groundwater**

Management Objective:

Each year the District will confer at least once with the Brazos River Authority (BRA) on cooperative opportunities for conjunctive resource management.

Performance Standard:

The number of conferences with the BRA on conjunctive resource management each year.

## **10.6 Develop a Management Strategy to Address Drought Conditions**

Management Objective:

The District will develop and adopt a Drought Management Strategy Plan within five years of the adoption and certification of this plan, review it annually, and revise it if necessary. The plan will be implemented when specified conditions require.

Performance Standard:

1. Development and adoption of a Drought Management Strategy Plan within five years of the adoption and certification of this plan.
2. Review all of the conditions and requirements specified in the Drought Management Strategy Plan that would trigger implementation on an annual basis.

#### **10.7 Address Natural Resource Issues That Impact the Use and Availability of Groundwater and Which are Impacted By the Use of Groundwater**

##### Management Objective:

1. Each year the District will confer at least once with a representative of the Texas Railroad Commission (RRC) on the impact of oil and gas production on groundwater availability, as well as the impact of groundwater production on the production of oil and gas in the District.
2. Also, during each year the District will evaluate all permit applications for new wells, if any are filed, and the information submitted by the applicants on those wells prior to drilling, in order to assess the impact of these wells on the groundwater resources in the District.

##### Performance Standard:

1. The number of conferences with a representative of the Texas RRC each year; and
2. Monthly reports to the POSGCD Board of Directors on the number of new well permit applications filed, and the possible impacts of those new wells on the groundwater resources in the District.

#### **10.8. Mitigation**

##### Management Objective:

The District will assess the need and benefit of adopting a mitigation plan for the District on an annual basis, with the first study to be completed within one year of the adoption and certification of this plan. Upon determining the need for a mitigation plan, the District will prepare a draft plan, seek public comment, hold appropriate hearings and adopt a plan for mitigation within one year of the assessment that finds a need for a mitigation plan. The plan will be reviewed on an annual basis thereafter. Possible practices for mitigation within the District would include producers funding projects that are included in a natural or artificial recharge plan adopted under the following paragraph 11, establishing fees to fund

infrastructure in areas of the District in which groundwater was but is no longer readily available, and producers contracting to provide water to such areas at or near their cost.

#### **10.9. Precipitation Enhancement**

The District will assess the need and opportunity for precipitation enhancement in the District at least once every five years, with the first study to be completed within five years of the adoption and certification of this plan. Upon determining the need for precipitation enhancement, the District will adopt a plan for precipitation enhancement within two years of the assessment for the need for precipitation enhancement. The District will review that plan on an annual basis. Possible practices for precipitation enhancement in the District would be cloud seeding.

#### **11. NATURAL OR ARTIFICIAL RECHARGE ENHANCEMENT OF GROUNDWATER WITHIN THE DISTRICT**

The District will assess the need and opportunity for recharge enhancement in the District at least once every five years, with the first study to be completed within five years of the adoption and certification of this plan. Upon determining the need for recharge the District will adopt a plan for natural and/or artificial recharge within two years of the assessment for the need of that recharge. The plan will be reviewed on an annual basis. Possible practices for recharge in the District would be Brush Management or construction of surface ponds in key recharge areas.

## 12. PROJECTED WATER DEMANDS WITHIN THE DISTRICT

Below is a table of Projected Water Demands within the District in acre-feet per year according to Table 2 of the 2002 State Water Planning Database.

### BURLESON COUNTY

Water Use Group	Category	2000	2010	2020	2030	2040	2050
Caldwell	Municipal	768	791	810	838	853	879
Somerville	Municipal	247	265	272	306	298	297
County-Other	Municipal	1,181	1,188	1,213	1,213	1,246	1,342
Irrigation	Irrigation	6,612	6,337	6,072	5,819	5,594	5,344
Livestock	Livestock	1,318	1,318	1,318	1,318	1,318	1,318
Manufacturing	Manufacturing	131	145	158	171	182	194
Mining	Mining	29	24	18	15	13	13
<b>Total Projected Water Demands in acre-feet per year</b> =		<b>10,286</b>	<b>10,068</b>	<b>9,861</b>	<b>9,680</b>	<b>9,504</b>	<b>9,387</b>

### MILAM COUNTY

Water Use Group	Category	2000	2010	2020	2030	2040	2050
Cameron	Municipal	1,363	1,336	1,304	1,308	1,310	1,334
Rockdale	Municipal	1,730	1,803	1,842	1,943	2,035	2,151
Thorndale	Municipal	143	140	136	136	136	139
County-Other	Municipal	1,796	1,834	1,850	1,851	1,848	1,836
Irrigation	Irrigation	1,400	1,389	1,377	1,366	1,354	1,343
Livestock	Livestock	1,627	1,627	1,627	1,627	1,627	1,627
Manufacturing	Manufacturing	6,820	6,820	8,250	8,250	8,250	9,800
Mining	Mining	30,008	20,008	20,009	20,009	20,009	20,009
Steam Electric Power	Steam Electric Power	8,680	8,680	12,500	12,500	12,500	16,000
<b>Total Projected Water Demands in acre-feet per year</b> =		<b>53,567</b>	<b>43,637</b>	<b>48,895</b>	<b>48,990</b>	<b>49,069</b>	<b>54,239</b>

<b>Total Projected Water Demands (acre-feet per year)</b> <b>for Burleson and Milam Counties =</b>	<b>63,853</b>	<b>53,705</b>	<b>58,756</b>	<b>58,670</b>	<b>58,573</b>	<b>63,626</b>
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TWDB 07/23/03

The District also established future Municipal Groundwater Use Demands in the District for planning purposes. Following are the methodology and results of that effort:

### **Method for Establishing Future Municipal Use Demands of Groundwater in the District**

The District adopted a resolution, dated March 11, 2003, establishing production rights for Local Water Utilities (water supply corporations, special utility districts, municipal utility districts and cities) in the District, as a rule. This rule allowed these Local Water Utilities to obtain a permit to produce a volume of water annually according to one of two methods:

1. An amount equal to the highest annual pumpage it reported from wells within the District in any consecutive twelve months prior to September 31, 2001; or
2. The Local Water Utility could present to the Board a Long-Term Plan prepared by a qualified engineer that projects the annualized long-term water needs as the official projection of the water required by that Local Water Utility in the planning period (for not more than forty (40) years) for providing retail water service within that Local Water Utility's defined service area. Having adopted this plan on or before March 30, 2004, and the Board finding that the highest annual pumpage projected in the Long-Term Plan (the "Plan Amount") is not unreasonable, the Local Water Utility might then obtain a permit to pump and produce up to the Plan Amount.

The table below contains the results of this effort:

Municipal Use Groundwater Demands Projected through 2044	
Producer	Estimated Acre Feet per year
<b>Burleson County</b>	
Apache Hills	11
Birch Creek	16
Burl. Co. MUD	73
Burl. Investm.	7
Cade Lakes	123
Centerline	21
Caldwell	1,969
Snook	154
Somerville	670
Clara Hills	5
Clay	7
Cooks Point	10
Deanville	350
Lakeview	21

Little Oak Forrest	5
Lyons	106
Post Oak Hill	11
Shupak Utilities	19
Tunis	108
Whispering Woods	7
Wilderness Sound	15
Total for Burleson Co.	3,708
<b>Milam County</b>	
ALCOA	702
Rockdale	2,129
Gause	74
Marlow	108
Milano	673
Minerva	28
North Milam	369
Southwest Milam	2,492
Total for Milam Co.	6,575
<b>DISTRICT TOTALS</b>	<b>10,283</b>

### **13. PROJECTED WATER SUPPLIES WITHIN THE DISTRICT**

Below is a table of Projected Water Supplies within the District in acre-feet per year according to Table 5 of the 2002 State Water Planning Database. This includes projected surface water and groundwater supplies.

The District has participated and will in the future participate in regional water planning, and consider the water supply needs and water management strategies included in the adopted state water plan.

**PROJECTED WATER SUPPLIES  
POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT**

**BURLESON  
COUNTY**

Water Use Group	Source Type	Source Name	2000	2010	2020	2030	2040	2050
Caldwell	Groundwater	Carrizo-Wilcox Aquifer	1,935	1,935	1,935	1,935	1,935	1,935
Somerville	Groundwater	Sparta Aquifer	593	593	593	593	593	593
County-Other	Groundwater	Carrizo-Wilcox Aquifer	21,837	21,837	21,837	21,837	21,837	21,837
Irrigation	Surface Water	Irrigation Local Supply	5,580	5,580	5,580	5,580	5,580	5,580
Irrigation	Groundwater	Brazos River Alluvium Aquifer	1,704	1,704	1,704	1,704	1,704	1,704
Irrigation	Groundwater	Carrizo-Wilcox Aquifer	3,436	3,436	3,436	3,436	3,436	3,436
Irrigation	Groundwater	Sparta Aquifer	228	228	228	228	228	228
Livestock	Groundwater	Queen City Aquifer	672	672	672	672	672	672
Livestock	Groundwater	Carrizo-Wilcox Aquifer	7,861	7,861	7,861	7,861	7,861	7,861
Manufacturing	Groundwater	Carrizo-Wilcox Aquifer	2,591	2,591	2,591	2,591	2,591	2,591
Mining	Surface Water	Brazos River Authority System	5	0	0	0	0	0
Mining	Groundwater	Sparta Aquifer	529	529	529	529	529	529
<b>Total Projected Water Supplies in acre-feet per year =</b>			<b>46,971</b>	<b>46,966</b>	<b>46,966</b>	<b>46,966</b>	<b>46,966</b>	<b>46,966</b>

**MILAM COUNTY**

Water Use Group	Source Type	Source Name	2000	2010	2020	2030	2040	2050
Cameron	Surface Water	Brazos Run-Of-River	2,629	2,629	2,629	2,629	2,629	2,629
Rockdale	Groundwater	Carrizo-Wilcox Aquifer	2,121	2,121	2,121	2,121	2,121	2,121
Thorndale	Surface Water	Brazos Run-Of-River	0	0	0	0	0	0
Thorndale	Groundwater	Carrizo-Wilcox Aquifer	333	333	333	333	333	333
County-Other	Surface Water	Brazos River Authority System	924	924	924	924	924	924
County-Other	Surface Water	Brazos Run-Of-River	162	162	162	162	162	162
County-Other	Groundwater	Carrizo-Wilcox Aquifer	2,472	2,472	2,472	2,472	2,472	2,472
County-Other	Groundwater	Trinity Aquifer	291	291	291	291	291	291
Irrigation	Surface Water	Irrigation Local Supply	8,188	8,188	8,188	8,188	8,188	8,188
Irrigation	Groundwater	Carrizo-Wilcox Aquifer	2,119	2,119	2,119	2,119	2,119	2,119
Livestock	Groundwater	Carrizo-Wilcox Aquifer	1,627	1,627	1,627	1,627	1,627	1,627
Manufacturing	Surface Water	Brazos Run-Of-River	112	112	112	112	112	112
Manufacturing	Surface Water	Brazos River Authority System	5,000	5,000	0	0	0	0
Manufacturing	Surface Water	Brazos Run-Of-River	0	0	0	0	0	0
Manufacturing	Groundwater	Carrizo-Wilcox Aquifer	7,778	17,778	17,777	17,777	17,777	17,777
Mining	Groundwater	Carrizo-Wilcox Aquifer	30,008	20,008	20,009	20,009	20,009	20,009
Steam Electric Power	Surface Water	Alcoa Lake/Reservoir	9,002	9,002	9,002	9,002	9,002	9,002
<b>Total Projected Water Supplies in acre-feet per year =</b>			<b>72,766</b>	<b>72,766</b>	<b>67,766</b>	<b>67,766</b>	<b>67,766</b>	<b>67,766</b>

<b>Total Projected Water Supplies (acre-feet per year) for Burleson and Milam Counties =</b>	<b>119,737</b>	<b>119,732</b>	<b>114,732</b>	<b>114,732</b>	<b>114,732</b>	<b>114,732</b>
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TWDB 07/23/03



# 14. ESTIMATE OF GROUNDWATER BEING USED WITHIN THE DISTRICT

Following are tables of estimated Groundwater use within the District in acre-feet per year according to Texas Water Development Board's Water User Survey Database.

<b>HISTORICAL GROUNDWATER USE</b> <b>POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT</b> <b>BURLESON COUNTY</b>							
<b>Aquifer Name</b>	<b>Year</b>	<b>Municipal</b>	<b>Manufacturing</b>	<b>Power</b>	<b>Mining</b>	<b>Irrigation</b>	<b>Livestock</b>
Brazos River Alluvium	1996	0	0	0	0	8,781	0
Carrizo-Wilcox		841	0	0	0	0	42
Other Undifferentiated		156	0	0	29	0	270
Queen City		317	0	0	0	0	225
Sparta		853	110	0	0	0	160
Brazos River Alluvium	1997	0	0	0	0	19	0
Carrizo-Wilcox		842	0	0	0	0	41
Other Undifferentiated		130	0	0	29	0	266
Queen City		294	0	0	0	0	222
Sparta		843	110	0	0	0	158
Brazos River Alluvium	1998	0	0	0	0	3,650	0
Carrizo-Wilcox		844	0	0	0	0	32
Other Undifferentiated		140	0	0		0	206
Queen City		331	0	0	0	0	172
Sparta		844	110	0	0	0	122
Brazos River Alluvium	1999	0	0	0	0	1,000	0
Carrizo-Wilcox		788	0	0	0	0	33
Other Undifferentiated		156	0	0	29	0	213
Queen City		303	0	0	0	0	177
Sparta		788	110	0	0	0	126
Brazos River Alluvium	2000	0	0	0	0	14,845	0
Carrizo-Wilcox		765	0	0	0	0	34
Other Undifferentiated		148	0	0	29	0	221
Queen City		319	0	0	0	0	183
Sparta		765	110	0	0	0	131

TWDB 07/28/03

**HISTORICAL GROUNDWATER USE  
POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT**

**MILAM COUNTY**

<b>Aquifer Name</b>	<b>Year</b>	<b>Municipal</b>	<b>Manufacturing</b>	<b>Power</b>	<b>Mining</b>	<b>Irrigation</b>	<b>Livestock</b>
Brazos River Alluvium	1996	3	0	0	0	52	21
Carrizo-Wilcox		2980	32,138	0	8	259	546
Other Undifferentiated		20	0	0	0	0	124
Queen City		4	0	0	0	0	28
Brazos River Alluvium	1997	3	0	0	0	62	20
Carrizo-Wilcox		2882	30,798	0	8	307	508
Other Undifferentiated		18	0	0	0	0	115
Queen City		4	0	0	0	0	26
Brazos River Alluvium	1998	0	0	0	0	65	20
Carrizo-Wilcox		2940	27,786	0	8	322	515
Other Undifferentiated		0	0	0	0	0	117
Queen City		0	0	0	0	0	26
Brazos River Alluvium	1999	0	0	0	0	67	21
Carrizo-Wilcox		2907	27,218	0	8	336	556
Other Undifferentiated		0	0	0	0	0	126
Queen City		0	0	0	0	0	29
Brazos River Alluvium	2000	0	0	0	0	130	20
Carrizo-Wilcox		2931	31,968	0	8	649	541
Other Undifferentiated		0	0	0	0	0	123
Queen City		0	0	0	0	0	28

TWDR 7/28/2003

## 15. PROJECTED ANNUAL RECHARGE OF GROUNDWATER RESOURCES WITHIN THE DISTRICT

Following is a table of projected annual recharge of groundwater for all aquifers (except the Trinity, Brazos River and Little River Alluvium, and Yegua/Jackson aquifers) within the District according to the GAM 05-05 simulation. This recharge is the result of precipitation.

<b>Projected Annual Recharge For Groundwater Resources Post Oak Savannah Groundwater Conservation District</b>	
<b>County</b>	<b>Average Recharge (acre-ft/yr.)</b>
Milam	31,587
Burleson	13,349
<b>Total</b>	<b>44,936</b>

## 16. ESTIMATE OF ANNUAL DISCHARGES AND FLOWS OF GROUNDWATER

The GAM for the central part of the Queen City, Sparta, and Carrizo-Wilcox aquifers for the year 2050 has been run by the TWDB (GAM Run 05-05). The following tables summarize the results of GAM 05-05 and show the flow of groundwater in and out of the counties, as well as the discharge from the aquifers to streams.

Pumpage in the model is based on the 2002 State Water Plan, and long-term average annual recharge is assumed. However, as part of the joint planning for GMA 12 and GMA 8, the District will assess current conditions and develop updated GAM-based estimates of groundwater discharge to surface water and groundwater flow into and out of the district and between aquifers in the district. Appendix A includes a table that provides more detail on the groundwater flow budget for these aquifers.

### Groundwater Flow Budget (acre-feet per year) for Carrizo-Wilcox and Queen City-Sparta Aquifers (based on results of GAM 05-05 simulation by TWDB)

Aquifer	Milam County			Burleson County		
	Discharge to streams	Lateral Outflow	Lateral Inflow	Discharge to streams	Lateral Outflow	Lateral Inflow
Sparta	0	0	0	2,254	774	528
Weches	0	0	0	179	54	66
Queen City	1,818	889	531	2,936	961	1,416
Reklaw	485	370	55	70	210	391
Carrizo	1,470	3,242	1,549	0	6,026	3,720
Calvert Bluff	1,935	3,137	601	0	1,107	3,776
Simsboro	1,057	20,417	4,859	0	20,181	13,568
Hooper	668	5,245	1,539	0	1,377	5,267
<b>Total</b>	<b>7,434</b>	<b>33,300</b>	<b>9,135</b>	<b>5,439</b>	<b>30,691</b>	<b>28,732</b>

## 17. ESTIMATE OF EXISTING TOTAL USEABLE GROUNDWATER WITHIN THE DISTRICT

The total estimate of existing useable groundwater in the District was derived from several sources and is presented in the following paragraphs. The source for the Trinity and the Brazos and Little River Alluvium, aquifers in the District is the Projected Water Availability in acre-feet per year according to Table 4 of the 2002 State Water Planning Database. Since none of these aquifers appear to be targeted for a substantial increase in production activity, these estimates should prove satisfactory.

### Shallow Carrizo-Wilcox Management Zone

The shallow Carrizo-Wilcox management zone is entirely within Milam County and approximately 75% of the Carrizo-Wilcox aquifer in the county lies within the Shallow Carrizo-Wilcox management zone. The goal of the groundwater management strategy for this management zone is to protect historic users. The principal water-bearing unit within the Carrizo-Wilcox is the Simsboro Sand. The Brazos Region G planning effort has developed the following groundwater availability estimates for Milam County.

#### Estimate of Groundwater Availability Shallow Carrizo-Wilcox Management Zone

Aquifer	Groundwater Availability Estimate (ac-ft/yr) (based on 75% of land area)
Carrizo	11,250
Simsboro	22,500
<b>Total</b>	<b>33,750</b>

Note: estimates are based on Brazos Region G planning values.

An evaluation of Simsboro water levels relative to the position of water well screens in major water supply wells in this management zone shows that generally less than 200 feet of water is above the tops of screens. There are some wells in which water levels are below the tops of the screens.

The POSGCD will use water level measurements at monitoring wells to evaluate aquifer conditions. Specifically, drawdown of 50 feet or greater in any POSGCD monitoring well in three consecutive months compared to baseline established in 2005 will trigger evaluation/action (as described in the District Rules). In additions, GAM 05-05 simulations of the Simsboro Sand show that drawdowns of 50 feet may occur by 2030.

## **Deep Simsboro Management Zone**

The Deep Simsboro management zone occurs southeast of the Mexia-Talco fault zone in Milam and Burleson Counties. The fault zone separates the heavily-utilized portion of the Simsboro from the undeveloped and much deeper portion of the Simsboro. Pumpage included in the GAM is reported to be 1,281 ac-ft/yr for the year 2000.

The District authorized an evaluation of groundwater availability using the GAM. The GAM was run to simulate groundwater pumping that would reduce the pressure head above the top of the Simsboro Sand by approximately 25% in the management zone, but no more than 400 feet, to evaluate the amount of groundwater produced. Under these constraints, the GAM produced approximately 60,000 ac-ft/yr of groundwater in the Simsboro Sand.

The estimate of 60,000 ac-ft/yr for the Deep Simsboro represents a value that is appropriately constrained by the best available, stakeholder-driven data, based on 2004 regional conditions as represented in the GAM, and a conservative assumption of a steady-state (no contribution from storage) flow conditions.

The District also used the results of the GAM simulation to establish an evaluation-trigger drawdown level within the Deep Simsboro management zone. A trigger drawdown level in the Deep Simsboro was identified as drawdown less than the simulated maximum (400 feet) that would enable "timely evaluation" when aquifer conditions approach the groundwater availability estimate. A value of 75% of the maximum simulated drawdown of 400 feet (that yielded the estimate of 60,000 ac-ft/yr) was identified to provide the District with sufficient time to evaluate drawdown trends before the 400-foot drawdown value is reached. This early evaluation indicator is consistent with the "Response Level 1" for public awareness and notification in drought conditions (ref. Draft Drought Management Strategy Plan). Therefore, the District has identified a trigger drawdown level of 300 feet below 2005 baseline water levels as a management tool for the Deep Simsboro management zone.

## **Deep Carrizo-Wilcox Management Zone**

The Deep Carrizo-Wilcox Management Zone occurs southeast of the Mexia-Talco fault zone in Milam and Burleson Counties.

The District authorized an evaluation of groundwater availability using the GAM. The GAM was run to simulate groundwater pumping that would reduce the pressure head above the top of the Carrizo-Wilcox by approximately 25% in the management zone, but no more than 250 feet, to evaluate the amount of groundwater produced. Under these constraints, the GAM produced an estimate of 30,750 ac-ft/yr of groundwater in the Deep Carrizo-Wilcox management zone.

The District also used the results of the GAM simulation to establish an evaluation-trigger

drawdown level within the Deep Carrizo-Wilcox management zone. A trigger drawdown level in the Deep

Carrizo-Wilcox was identified as drawdown less than the simulated maximum (250 feet) that would enable "timely evaluation" when aquifer conditions approach the groundwater availability estimate. A value of 75% of the maximum simulated drawdown of 250 feet (that yielded the estimate of 30,750 ac-ft/yr) was identified to provide the District with sufficient time to evaluate drawdown trends before the 250-foot drawdown value is reached. This 75% indicator is consistent with the "Response Level 1" for public awareness and notification in drought conditions (ref. Draft Drought Management Strategy Plan). Therefore, the District has identified a trigger drawdown level of 190 feet below 2005 baseline water levels as a management tool for the Deep Carrizo-Wilcox management zone.

### **Queen City/Sparta Management Zone**

The Queen City/Sparta Management Zone occurs entirely within Burleson County and is currently used for domestic and small-scale municipal uses. This aquifer system has not been heavily utilized, and is not forecast to be intensively developed in the future.

The GAM 05-05 simulation indicates that the sum of recharge estimates for the Queen City and Sparta aquifers is 16,567 ac-ft/yr (for average recharge conditions in 2050). The Brazos Region G planning estimate adopted for the combined Queen City and Sparta aquifer is 13,792 ac-ft/yr for the entire Southeastern Subregion. This suggests that the Brazos Region G estimate for this aquifer system would be on the order of 50% of this value, or approximately 7,000 ac-ft/yr. To resolve these estimates and generate an improved estimate of groundwater availability, the District authorized the evaluation of groundwater availability using the GAM values for recharge in this management zone for 2004. Based on these simulations, the groundwater availability estimate for the Queen City and Sparta aquifers is 14,500 ac-ft/yr.

## **SUMMARY OF EXISTING TOTAL USEABLE GROUNDWATER**

The District will periodically revise the estimate based on changes in the anticipated groundwater use in nearby counties, the presumed physical and hydraulic properties of the subsurface deposits, and changes to the GAM. As additional information becomes available, the District will also reevaluate the estimate based on other criteria such as migration of the fresh water line and localized impacts in different management zones.

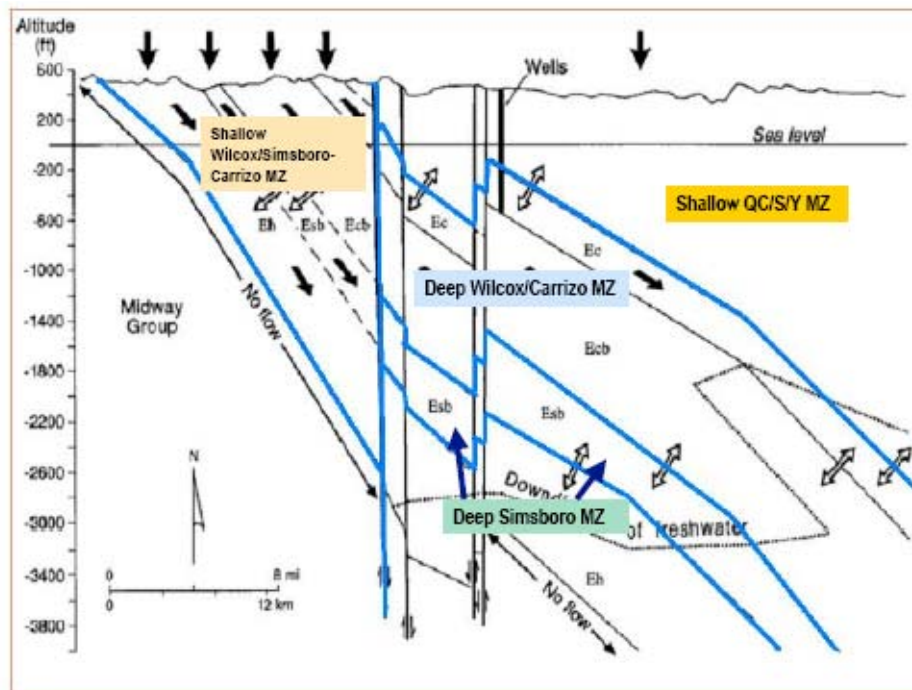
<b>Management Zone</b>	<b>Aquifer</b>	<b>Estimated Useable Groundwater (ac-ft/yr)</b>
Trinity	Trinity	321
Brazos Alluvium	Brazos Alluvium	9,400
Queen City/Sparta	Queen City/Sparta	14,500
Deep Carrizo-Wilcox	Carrizo-Wilcox	30,750
Shallow Carrizo-Wilcox	Carrizo-Wilcox (inc. Simsboro)	33,750
Deep Simsboro	Simsboro	60,000

## **Future Desired Conditions of the Groundwater Resources in the District**

As of March 2006, the District is engaged in joint planning with other GCDs in Groundwater Management Areas No. 12 and No. 8. Statements regarding future desired conditions of groundwater resources will be developed from this effort and will be incorporated into the Districts' Groundwater Management Plan in compliance with the schedule established by the Texas Water Development Board.



**Figure 1. Map of Groundwater Management Zones**



**Figure 2. Schematic Cross-Section of Aquifer Management Zones.**



